

Turning a ‘Blind Eye’? Compliance with Minimum Wage Standards and Employment

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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 predictions of the model are tested empirically 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.

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 policymakers. 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 rationalize the lack of strong negative effects, the literature has looked into the role of other margins of adjustments (e.g. the rest of the wage structure, prices, profitability, productivity)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, then any deviation below that threshold implies a lower marginal cost and a higher level of employment. In this setting, Basu *et al.* (2010) argue, turning a ‘blind eye’—that is, 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 does it minimize 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, then non-compliance may represent an alternative option for companies to adjust to an increase in the minimum wage, and would contribute to explaining 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. For 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 of establishing 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—that is, 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 of 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 expected typically. In this context, we show that when the probability of being referred to a court is minor and the number of underpaid workers 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 I). 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 USA.

The remainder of this paper is organized as follows. Section I provides a short description of wage setting institutions and enforcement in Italy. Section II develops a theoretical model of partial non-compliance and employment. Section III describes the empirical strategy and the data used to investigate the role of non-compliance on employment. Section IV presents the main results, and Section V concludes and discusses the policy implications.

I. 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 organizations at the industry level. Currently, there are more than 900 industry-wide collective agreements that set pay scales for practically all private sector employees in Italy (a sector can be covered by more than one agreement), while trade union density (the number of members over the total number of employees) is below 30% in the private sector, and employers' organizations density just above 50% (OECD 2019; 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 from 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.* (2022) 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 *et al.* (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

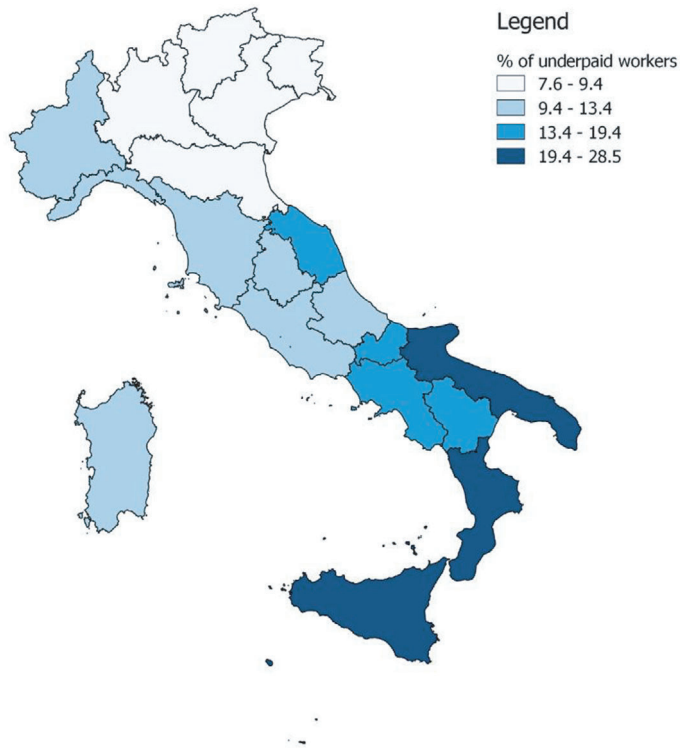


FIGURE 1. Share of underpaid workers in Italy by region, 2015.

Source: Authors's calculations using data from ISTAT LFS 2008–15 and negotiated wages database. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)].

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% 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, 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 (see Figure 1).

Such high levels of non-compliance with negotiated wage floors can be the result of opportunistic behaviour to save on labour costs and/or the presence of loopholes in the collective bargaining system and a lack of proper enforcement. Out of the 900 collective agreements currently in force, less than a third have been signed by representative unions and employers' organizations. 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' organization set up or influenced by an employer). The enforcement of wage floors negotiated by representative trade unions and employers' organizations 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 2021), implicitly out of fear of harming employment prospects of 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) provide estimates of non-compliance in 11 developing countries and find that non-compliance ranged from 5% in Vietnam to 51% in Indonesia in the late 2000s. Bhorat *et al.* (2015) provide 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 from the US Bureau of Labor Statistics estimate it at around 2%, while survey data for Germany show that 3–4% of all employees are paid less than the minimum wage (Bruttel *et al.* 2018). However, two reports by the UK Low Pay Commission (2017, 2020) suggest that up to 20% of minimum wage workers may actually be paid less than they are legally entitled to. 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.

II. 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 that employers may face when workers appeal to a labour court to be paid a 'fair' wage (according to article 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 employ workers only in production. Output is $y = \theta f(L)$, where $f(L)$ is a strictly concave function, and θ is an efficiency parameter, while prices are normalized to 1. 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 care only 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; 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 from opportunistic behaviour (i.e. simply paying a wage below the bargained levels) to save on labour costs. 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, then they incur additional costs. These costs, in part, are made up of fixed administrative charges (τ), due mainly 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 who 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, then the latter pays only the administrative charges τ . By contrast, if the court decides against, then 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 probability q .

When deciding whether or not to comply with the collective contract provisions, the employer takes into account the probabilities that workers who are underpaid will accept the lower wage offer, or appeal to the labour court to obtain the payment of 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 $U(\pi^{NC})$ (where *NC* indicates no case). Conversely, when workers appeal to a court, the employer may either win the case and receive the payoff $U(\pi^W)$ (where *W* indicates win) or lose the case and receive the payoff $U(\pi^L)$ (where *L* indicates lose). Clearly, $\pi^L < \pi^W < \pi^{NC}$:

$$(1) \quad \pi^j = \theta f(L) - w^B L^B - w(L - L^B) - I_j \tau - Q_j \lambda (w^B - w)(L - L^B),$$

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

$$I_j = 1 \text{ if } j = W, L, \quad Q_j = 1 \text{ if } j = L, \quad I_j = Q_j = 0 \text{ otherwise.}$$

Employer’s expected utility is then

$$(2) \quad \begin{aligned} EU(\pi) = & [1 - \varphi(L - L^B)] U(\pi^{NC}) + q \varphi(L - L^B) U(\pi^W) \\ & + (1 - q) \varphi(L - L^B) U(\pi^L), \end{aligned}$$

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: that is, $\varphi'(L - LB) > 0$ and $\varphi''(L - LB) > 0$.⁷

The employer maximizes 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 equation (2) with respect to L and L^B , and assuming that the optimal L^B falls within the interval $(0, L)$, we obtain the first-order conditions⁸

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

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

where

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

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

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

Equation (3) describes the optimal choice of L for some given level of compliance L^B , and 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 $w^B - w$, and 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, then the direct and indirect effects cancel out. In practice, substituting equation (4) in equation (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, then 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, then 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 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

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

In practice, to rule out full non-compliance, the right-hand side of inequality (5) must be sufficiently large. Notice that the right-hand side 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 met easily 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 that 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 upwards 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.

III. 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 firm i operating in industry j , located in region r , depends on the industry-wide bargained wage (w_{jt}^B), 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 an unobserved error component (ρ_{ijrt}). Specifically, we assume

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

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 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 is unlikely to report truthfully 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-level variables by their level in industry j and region r , as specified in the equation

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

where L_{jrt} is the total employment in industry j and region r in year t , NC_{jrt} is the average rate of non-compliance of firms in the industry–region, and γ_{jr} are the industry–region fixed effects; 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 ordinary least squares (OLS) may be biased, we expect that any unobserved idiosyncratic firm-specific shock—such as a positive productivity shock that 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 provide only suggestive evidence of the correlation between employers' non-compliance decisions and employment levels.

To minimize 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–region characteristics to control for time-varying characteristics of industries and regions. Namely, our more general specifications include the share of young workers (aged under 35), the share of temporary employment, the share of women, the share of extra-EU immigrants, the share of employment in small and medium enterprises (SMEs), and the share of low-educated workers (less than a 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–year and region–year fixed effects.

Data

In the empirical analysis, we combine information from different sources. Wage floors for the most representative collective agreements—that is, those agreements that *de facto* cover (almost) all employees in the sector—are collected and monitored by the Italian Statistical Office (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.¹⁵ Other local labour market characteristics at the industry–region level are also included. We focus on the 2008–15 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). Data on wage floors are matched with the LFS at the NACE Rev. 2 two-digit level using a correspondence table elaborated by ISTAT (available on request).

Wage floors collected by ISTAT 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, and supplementary payments agreed at the company or local level, are excluded.¹⁶ The data cover all business sectors in the period 2008–15. In 2015, gross minimum wages in collective agreements were on average 1387 euros per month, including the 13th and 14th months (if paid), 12.7% higher in nominal terms than in 2008 when they were around 1230 euros per 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 LFS over the period 2008–15 and aggregated at the region (NUTS2 level)¹⁷ and industry (NACE Rev. 2 two-digit) level. 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 thus are less likely to be misreported by employers to ‘formally’ comply with regulations (i.e. as done typically 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 and ‘inadvertent’ underpayment, as well as the use of ‘pirate agreements’ (signed with poorly representative or ‘yellow’ unions).¹⁸ 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 anticipate only 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 find only an overall effect.

The LFS collects net wage data, 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 percentage 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 14th month (around 40% of the agreements in the sample). Finally, only

TABLE 1
DESCRIPTIVE STATISTICS, 2005–15

	Mean	S.D.	Min	Max
<i>Main variables</i>				
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
<i>Controls</i>				
% Young workers (< 35 years old)	29.13	20.09	0	100
% Temporary workers	12.73	15.29	0	100
% Women	29.75	26.23	0	100
% Immigrants ex-EU	4.29	7.86	0	100
% Employees in SMEs	26.04	22.75	0	100
% Workers with less than tertiary education	87.47	18.48	0	100
<i>Sector</i>				
Agriculture	2.61			
Manufacturing	34.41			
Services	62.98			
<i>Region</i>				
North	37.67			
Centre	21.26			
South	30.41			
Islands	10.65			

Notes

See Section III for more details.

Source: Authors’ calculations using the LFS and the database on negotiated wages by ISTAT.

employees above 15 years 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 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),¹⁹ 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%.²⁰

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 an 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, just around 2% in agriculture, the rest in manufacturing and. Finally, 37% work in the north of the country, 21% in the centre, 30% in the south, and 10% in Sardinia and Sicily.

IV. RESULTS

Baseline results

Table 2 reports our estimates of the employment relationship (equation (6')) using standard errors clustered at the region–industry level and a different set of controls for each specification. As discussed above, OLS estimates may yield biased estimates (column (1) in Table 2) as they do not control for time-invariant effects that may drive part of the relationship between employment and non-compliance. Results using fixed effects, across all specifications, show that non-compliance is positively and significantly associated with the (log of) employment levels (columns (2)–(4) in Table 2).²¹ The elasticity of employment to non-compliance, evaluated at its average level, is estimated at around 0.2, suggesting that when non-compliance increases by 10% around its average value, employment also rises by approximately 2%. 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—that is, 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 wage of about 1% is associated with a decrease in employment between 1.2% and 1.6%. Notice that while an elasticity above 1 is quite sizeable, compared to standard estimates of own-wage elasticities of labour demand,²² when estimated at the level of the minimum wage elasticities are generally

TABLE 2
 BASELINE RESULTS: NON-COMPLIANCE AS CONTINUOUS VARIABLE, 2008–15

	Employment (in log)			
	OLS (1)	Fixed effects (2)	Fixed effects (3)	Fixed effects (4)
Non-compliance ($\times 100$)	2.19*** (0.22)	1.45*** (0.17)	1.49*** (0.17)	1.48*** (0.17)
Non-compliance ² ($\times 100$)	-0.03*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)
Log wage floors		-1.24***	-1.28***	
% Young (< 35)			0.19***	(0.31)
% Temporary employment			-0.19**	(0.07)
% Women				(0.08)
% Immigrants ex-EU			-0.03	-0.05 (0.07)
% Employment in SME			-0.10	(0.15)
% Low education				(0.07)
				0.12 (0.09)
Year fixed effects	Yes	Yes	Yes	Yes
Industry and region fixed effects	Yes	Yes	Yes	Yes
R-squared	0.85	0.95	0.95	0.95
Observations	5816	5816	5816	5816

Notes

This table gives the estimates (OLS in column (1) and fixed effects in columns (2)–(4)) of equation (6') on the log of employment using a quadratic form of the share of workers paid 90% or less, compared to the reference wage floor set by the collective agreement in the sector of reference.

All variables are defined at the industry–region level (respectively two-digit NACE Rev. 2 and NUTS2). Standard errors (in parentheses) are clustered at the region–sector level.

***, **, * indicate statistically significant at the 1%, 5%, 10% level, respectively.

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.* 2000), while Cahuc *et al.* (2019) report an even larger elasticity close to -4 .

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 wage, 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, and a change in compliance status is associated with a 30% increase in employment levels. Notice that in this case, the estimated effects are likely

TABLE 3
 BASELINE RESULTS: NON-COMPLIANCE AS A DUMMY, 2008–15

	Employment (in log)			
	OLS (1)	Fixed effects (2)	Fixed effects (3)	Fixed effects (4)
Non-compliance	0.61*** (0.05)	0.29*** (0.03)	0.30*** (0.03)	0.30*** (0.03)
Log wage floors			-1.20*** (0.30)	-1.26*** (0.30)
% Young (< 35)				0.14** (0.07)
% Temporary employment				-0.24*** (0.08)
% Women				-0.08 (0.07)
% Immigrants ex-EU				-0.02 (0.15)
% Employment in SME				-0.14* (0.07)
% Low education				0.12 (0.09)
Year fixed effects	Yes	Yes	Yes	Yes
Industry and region fixed effects	Yes	Yes	Yes	Yes
R-squared	0.85	0.89	0.90	0.91
Observations	5816	5816	5816	5816

Notes

This table gives the estimates (OLS in column (1) and fixed effects in columns (2)–(4)) of equation (6') on the log of employment using a dichotomous measure of non-compliance that takes value 0 when employers fully comply with the negotiated minimum wage, and value 1 when employers comply only partially—i.e. within any given region–sector—or do not comply at all.

All variables are defined at the industry–region level (respectively two-digit NACE Rev. 2 and NUTS2). Standard errors (in parentheses) are clustered at the region–sector level.

***, **, * indicate statistically significant at the 1%, 5%, 10% level, respectively.

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 1.²³

Next, we test the hypothesis that the non-compliance–employment trade-off may vary according to the local labour market 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 from 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 decreases monotonically as the size of the local labour market increases, a pattern that is consistent with the hypothesis that in a small local labour market, monitoring and control may be weaker and a 'blind eye' attitude more easily tolerated.

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

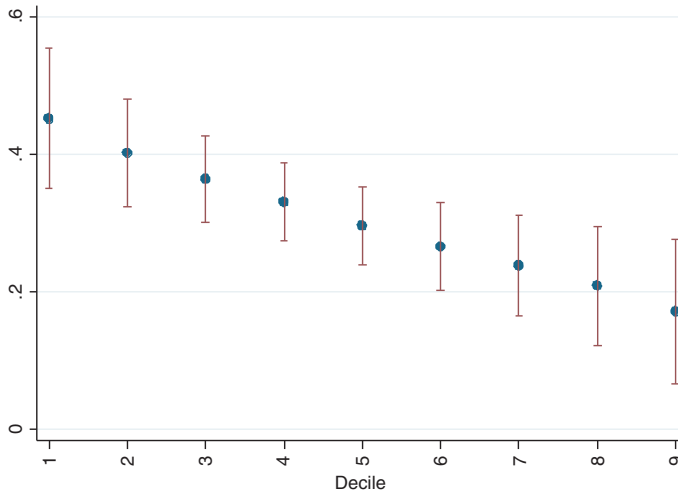


FIGURE 2. Non-compliance by employment deciles, coefficients and confidence intervals.

Notes: 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 (4) of Table 3. The vertical bars indicate 95% confidence intervals. [Colour figure can be viewed at wileyonlinelibrary.com].

referred to a labour court and sanctioned increases drastically. In the latter case, the expected costs will be internalized 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-estimate our preferred specification using a set of dummies for different levels of non-compliance within local labour markets (i.e. below 2%, 2–4%, 5–9%, 10–19%, 20–29%, 30–49%, and 50% and above). We find that the employment trade-off disappears for levels of non-compliance higher than 50%.²⁴ 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.

The role of the efficiency of labour courts

Previous literature (Giacomelli and Menon 2017; 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,²⁵ we follow Giacomelli and Menon (2017), and use a caseload approach to construct an index that proxies the average length of proceedings (in years), calculated as

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

where P are pending cases at the beginning of 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

TABLE 4
FIXED EFFECTS ESTIMATES USING NON-COMPLIANCE DUMMIES, 2008–15

	Employment (in log)	
	(1)	(2)
Non-compliance $\geq 0\%$ and $< 2\%$	0.36 ^{***} (0.03)	0.36 ^{***} (0.03)
Non-compliance $\geq 2\%$ and $< 4\%$	0.32 ^{***} (0.03)	0.33 ^{***} (0.03)
Non-compliance $\geq 4\%$ and $< 10\%$	0.33 ^{***} (0.02)	0.33 ^{***} (0.02)
Non-compliance $\geq 10\%$ and $< 20\%$	0.33 ^{***} (0.03)	0.33 ^{***} (0.03)
Non-compliance $\geq 20\%$ and $< 30\%$	0.31 ^{***} (0.04)	0.31 ^{***} (0.04)
Non-compliance $\geq 30\%$ and $< 50\%$	0.27 ^{***} (0.04)	0.27 ^{***} (0.05)
Non-compliance $\geq 50\%$	0.10 [*] (0.06)	0.11 [*] (0.06)
Wage floors	Yes	Yes
Controls	No	Yes
Year fixed effects	Yes	Yes
Industry and region fixed effects	Yes	Yes
R-squared	0.95	0.95
Observations	5816	5816

Notes

This table gives the estimates of equation (6') on the log of employment using a set of dummies for different levels of non-compliance within local labour markets (i.e. below 2%, 2–4%, 5–9%, 10–19%, 20–29%, 30–49%, and above 50%). The controls are: share of young workers (under 35 years old), share of temporary employees, share of women, share of immigrants from outside the EU, share of employees in SMEs, share of low-educated workers (i.e. less than tertiary diploma).

All variables are defined at the industry–region level (respectively two-digit NACE Rev. 2 and NUTS2). Standard errors (in parentheses) are clustered at the region–sector level.

***, **, * indicate statistically significant at the 1%, 5%, 10% level, respectively.

the year. This index provides an estimate of the average lifetime of proceedings in a court, for the period 2008–15.²⁶ 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.²⁷

Robustness tests

The relationship that we detect between non-compliance and employment is robust and strong to a number of sensitivity analyses.

First, 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 wage is only weakly correlated with employment (i.e. the coefficient is not statistically significant), suggesting a

TABLE 5
ESTIMATES AUGMENTED WITH THE EFFICIENCY OF THE LABOUR COURT, FIXED EFFECTS, 2008–15

	Employment (in log)			
	(1)	(2)	(3)	(4)
Non-compliance ($\times 100$)	1.48*** (0.18)	1.04** (0.45)		
Non-compliance ² ($\times 100$)	-0.02*** (0.00)	-0.02*** (0.01)		
Non-compliance dummy			0.30*** (0.03)	0.31*** (0.04)
Non-compliance \times Duration Labour Court		0.23 (0.23)		
Non-compliance ² \times Duration Labour Court		-0.00 (0.00)		
Non-compliance dummy \times Duration Labour Court				0.00 (0.05)
Duration Labour Court	-0.02 (0.03)	-0.04 (0.03)	-0.01 (0.02)	-0.01 (0.06)
Wage floors	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry and region fixed effects	Yes	Yes	Yes	Yes
R-squared	0.95	0.95	0.96	0.96
Observations	5816	5816	5816	5816

Notes

This table gives the estimates of equation (6') on the log of employment using in columns (1) and (2) a quadratic form of the share of workers paid 90% or less, compared to the reference wage floor set by the collective agreement in the sector of reference, and in columns (3) and (4) a dichotomous measure of non-compliance that takes value 0 when employers fully comply with the negotiated minimum wage, and value 1 when employers comply only partially—i.e. within any given region–sector—or do not comply at all, interacted with the duration of trials in labour court as measured in equation (7). The controls are: share of young workers (under 35 years old), share of temporary employees, share of women, share of immigrants from outside the EU, share of employees in SMEs, share of low-educated workers (i.e. less than tertiary diploma).

All variables are defined at the industry–region level (respectively two-digit NACE Rev. 2 and NUTS2). Standard errors (in parentheses) are clustered at the region–sector level.

***, **, * indicate statistically significant at the 1%, 5%, 10% level, respectively.

different bite of negotiated wage floors. This result is probably capturing the stronger role that decentralized 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 reflect closely pay levels negotiated by sector-level agreements.

Second, 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 relative to the north, partly due to the higher level of the negotiated minimum wage compared to the median wage (i.e. the Kaitz index) paid by local firms.²⁸ Our main findings are confirmed even when restricting the sample period to selected years (see Table 7), such as the years of the global financial crisis (2008–9),²⁹ or the latest years available (2014–15), when Italy was experiencing a slow recovery. In other words, the trade-off between non-compliance and employment does

TABLE 6
HETEROGENEITY ACROSS SECTORS AND REGIONS, FIXED EFFECTS, 2008–15

	Employment (in log)			Employment (in log)				
	Manufacturing (1)	Services (2)	Manufacturing (3)	Services (4)	South (5)	North (6)	South (7)	North (8)
Non-compliance ($\times 100$)	1.33*** (0.31)	1.54*** (0.28)			1.65*** (0.28)	1.30*** (0.24)		
Non-compliance ² ($\times 100$)	-0.02*** (0.00)	-0.02*** (0.00)			-0.02*** (0.00)	-0.02*** (0.00)		
Non-compliance dummy			0.36*** (0.06)	0.30*** (0.04)			0.36*** (0.04)	0.24*** (0.04)
Log wage floors	-0.14 (0.61)	-2.00*** (0.47)	-0.12 (0.60)	-1.88*** (0.47)	-0.94* (0.57)	-1.45*** (0.38)	-1.14** (0.56)	-1.33*** (0.38)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry and region fixed effects	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	1602	3362	1602	3362	2387	3429	2387	3429

Notes

This table gives the estimates of equation (6) by sectors and macro-regions on the log of employment, using in columns (1), (2), (5) and (6) a quadratic form of the share of workers paid 90% or less, compared to the reference wage floor set by the collective agreement in the sector of reference, and in columns (3), (4), (7) and (8) a dichotomous measure of non-compliance that takes value 0 when employers fully comply with the negotiated minimum wage, and value 1 when employers comply only partially—i.e. within any given region-sector—or do not comply at all. The controls are: share of young workers (under 35 years old), share of temporary employees, share of women, share of immigrants from outside the EU, share of employees in SMEs, share of low-educated workers (i.e. less than tertiary diploma). All variables are defined at the industry-region level (respectively two-digit NACE Rev. 2 and NUTS2). Standard errors (in parentheses) are clustered at the region-sector level. ***, **, * indicate statistically significant at the 1%, 5%, 10% level, respectively.

TABLE 7
ESTIMATES IN CRISIS (2008–9) AND POST-CRISIS YEARS (2014–15), FIXED EFFECTS

	Employment (in log)			
	2008–9 (1)	2014–15 (2)	2008–9 (3)	2014–15 (4)
Non-compliance ($\times 100$)	1.45*** (0.35)	2.28*** (0.29)		
Non-compliance ² ($\times 100$)	-0.03*** (0.01)	-0.03*** (0.00)		
Non-compliance			0.48*** (0.06)	0.54*** (0.05)
Log wage floors	-1.68*** (0.46)	-1.11*** (0.40)	-2.05*** (0.44)	-1.16*** (0.38)
Controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry and region fixed effects	Yes	Yes	Yes	Yes
R-squared	0.07	0.14	0.06	0.12
Observations	1470	1418	1470	1418

Notes

This table gives the estimates of equation (6') by years before and after the global financial crisis on the log of employment, using in columns (1) and (2) a quadratic form of the share of workers paid 90% or less, compared to the reference wage floor set by the collective agreement in the sector of reference, and in columns (3) and (4) a dichotomous measure of non-compliance that takes value 0 when employers fully comply with the negotiated minimum wage, and value 1 when employers comply only partially—i.e. within any given region–sector—or do not comply at all. The controls are: share of young workers (under 35 years old), share of temporary employees, share of women, share of immigrants from outside the EU, share of employees in SMEs, share of low-educated workers (i.e. less than tertiary diploma).

All variables are defined at the industry–region level (respectively two-digit NACE Rev. 2 and NUTS2). Standard errors (in parentheses) are clustered at the region–sector level.

***, **, * indicate statistically significant at the 1%, 5%, 10% level, respectively.

not seem to be related exclusively to the business cycle and the crisis years, while it probably highlights a structural feature of the Italian labour market.³⁰

Third, in Table A.1 in the Online Appendix, we re-estimate equation (6') weighting the estimations by the size of the industry–region cell in 2008 to give a sense of the aggregate effect of non-compliance. While the sign and significance of the results are not affected, the magnitude of the effects is reduced to about half of that obtained using unweighted regressions. Similarly, when we drop small cells (sector–region cells below the 5th percentile or the 10th percentile in terms of employment) or outliers (sector–region cells below the 5th percentile and above the 95th percentile, or below the 10th percentile and above the 90th percentile), the magnitude of the coefficients is reduced (Table A.4 in the Online Appendix). This further confirms that the trade-off between non-compliance and employment is not very large.

Finally, we replicate the baseline results (column (4) 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 Online Appendix (see Figures A.1 and A.2) show that this is not the case.

V. 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 test empirically 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 the 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 internalize 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 wage 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 minimize 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 for relatively modest employment gains does not qualify as a sustainable strategy. Moreover, even if non-compliance may result in 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' organizations 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 discretionary adjustments by employers.

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This study reflects only the authors’ views and should not be attributed to the OECD, the European Commission or any member country. The European Commission is not responsible for any use that may be made of the information that the study contains.

NOTES

1. See, among many, Dickens *et al.* (2015) for the UK or Cengiz *et al.* (2019) for the USA.
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, and 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 that has signed a collective agreement are covered, including temporary or part-time workers.
5. There is wide empirical evidence showing that judges in labour courts exploit some degree of discretion in settling the cases. Some studies have shown the existence of some regularities between local labour market conditions (i.e. unemployment rate) and labour 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 labour 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 subgroup 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 with 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 to euros.
10. Notice that φ is itself a function of the non-compliance level $(L - L^B)$. The comparative statics that we refer to is obtained by differentiating $\Psi/EU'(\pi)$ with respect to the probability of being sued for any level of non-compliance. The details and a proof of these statements are available from the authors on request.
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, we lack a suitable firm-level instrumental variable for employer’s compliance 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 Labour Force Survey is the main source of statistical information on the labour market in Italy. It is used to compute the official statistics on employment and unemployment. Every year, more than 600,000 individuals distributed in about 1400 Italian municipalities are interviewed. The survey is carried out during every week of the year on a rotating basis: each person is interviewed for two consecutive quarters, followed by a break for the next two quarters, after which she is interviewed again for two more quarters. We use data aggregated at the sector–region level using NACE Rev. 2 two-digit sector codes and NUTS2 territorial units (Provincia Autonoma di Bolzano and Provincia Autonoma di Trento are considered as a single territorial unit). Our sector–region cells include, on average, 11,379 workers.
16. The ISTAT minimum wage data are classified by NACE Rev. 2 at two-digit codes using a mapping established by ISTAT (and by NACE Rev. 1 before 2011).
17. Provincia Autonoma di Bolzano and Provincia Autonoma di Trento are considered as a single territorial unit in our analysis.

18. 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.
19. Note that measurement error in wages 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) shows that the distribution of wages in the LFS is in line with that of administrative sources, and non-compliance displays the same patterns across firm size and regions.
20. 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 (the top coding is not relevant for underpayment). However, the bottom coding is set at at 250 euros per month, which is well below any negotiated minimum wage, and therefore unlikely to affect our estimation of the head count of underpaid workers.
21. The results are robust also when including region-year or sector-year fixed effects (see Table A. 3 in the Online Appendix).
22. Standard estimates of own-wage elasticity of labour demand, at the mean (or median) wage, fall within the range -0.7 to -0.3 .
23. In a number of exercises, we also experimented with adding an interaction term between non-compliance 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.
24. Very extreme values of non-compliance are not the result of small cells. The results in Table 4 remain valid when excluding cells whose size is below the 5th percentile or the 10th percentile (results available on request).
25. Data on 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 (accessed 12 March 2022).
26. 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.
27. Notice that enforcement through the 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.
28. 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.2 in the Online Appendix.
29. Italy experienced a double-dip crisis. GDP growth fell in 2008–10 during the global financial crisis, and then again in 2012–13 with the European sovereign crisis.
30. To exploit fully the time-variation of the crisis, we ran an event study type analysis and found no significant differences over time (results available on request).

REFERENCES

- AARONSON, D. (2001). Price pass-through and the minimum wage. *Review of Economics and Statistics*, **83**, 158–69.
- ABOWD, J. M., KRAMARZ, F., MARGOLIS, D. N. and PHILIPPON, T. (2000). The tail of two countries: minimum wages and employment in France and the United States. IZA Discussion Paper no. 203.
- ASHENFELTER, O. and SMITH, R. (1979). Compliance with the minimum wage law. *Review of Economics and Statistics*, **87**(3), 333–50.
- AZAR, J., HUET-VAUGHN, E., MARINESCU, I., TASKA, B. and VON WACHTER, T. (2019). Minimum wage employment effects and labor market concentration. NBER Working Paper no. 26101.
- BASU, A. K., CHAU, N. H. and KANBUR, R. (2010). Turning a blind eye: costly enforcement, credible commitment and minimum wage laws. *Economic Journal*, **120**(543), 244–69.
- BELL, B. and MACHIN, S. (2018). Minimum wages and firm value. *Journal of Labor Economics*, **36**(1), 159–95.
- BELLOC, M., NATICCHIONI, P. and VITTORI, C. (2019). Urban wage premia, cost of living, and collective bargaining. IZA Discussion Paper no. 12806.
- BERGER, H. and NEUGART, M. (2012). How German labor courts decide: an econometric case study. *German Economic Review*, **13**(1), 56–70.

- BHORAT, H., KANBUR, R. and STANWIX, B. (2015). Minimum wages in sub-Saharan Africa: a primer. CEPR Discussion Paper no. 10760.
- BOERI, T., ICHINO, A., MORETTI, E. and POSCH, J. (2022). Wage equalization and regional misallocation: evidence from Italian and German provinces. *Journal of the European Economic Association*, forthcoming.
- BRUTTEL, O., BAUMANN, A. and DÜTSCH, M. (2018). The new German statutory minimum wage in comparative perspective: employment effects and other adjustment channels. *European Journal of Industrial Relations*, **24**(2), 145–62.
- CAHUC, P., CARCILLO, S. and LE BARBANCHON, T. (2019). The effectiveness of hiring credits. *Review of Economic Studies*, **86**(2), 593–626.
- CARD, D. and KRUEGER, A. B. (1994). Minimum wages and employment: a case study of the fast-food industry in New Jersey and Pennsylvania. *American Economic Review*, **84**(4), 772–93.
- CENGİZ, D., DUBE, A., LINDNER, A. and ZIPPERER, B. (2019). The effect of minimum wages on low-wage jobs. *Quarterly Journal of Economics*, **134**(3), 1405–54.
- CHANG, Y.-M. and EHRlich, I. (1985). On the economics of compliance with the minimum wage law. *Journal of Political Economy*, **93**(1), 84–91.
- D'AMURI, F. and NIZZI, R. (2017). Recent developments of Italy's industrial relations system. Bank of Italy, Occasional Papers no. 416.
- DICKENS, R., RILEY, R. and WILKINSON, D. (2015). A re-examination of the impact of the UK national minimum wage on employment. *Economica*, **82**(328), 841–64.
- DRACA, M., MACHIN, S. and VAN REENEN, J. (2011). Minimum wages and firm profitability. *American Economic Journal: Applied Economics*, **3**(1), 129–51.
- ECKSTEIN, Z., GE, S. and PETRONGOLO, B. (2011). Job and wage mobility with minimum wages and imperfect compliance. *Journal of Applied Econometrics*, **26**, 580–612.
- FANFANI, B. (2020). The employment effects of collective bargaining. Working Papers del Dipartimento di Economia e Finanza, Università Cattolica del Sacro Cuore, Dipartimenti e Istituti di Scienze Economiche (DISCE).
- GARNERO, A. (2018). The dog that barks doesn't bite: coverage and compliance of sectoral minimum wages in Italy. *IZA Journal of Labor Policy*, **7**(1), 3.
- , KAMPELMANN, S. and RYCX, F. (2015). Sharp teeth or empty mouths? European institutional diversity and the sector-level minimum wage bite. *British Journal of Industrial Relations*, **53**(4), 760–88.
- GIACOMELLI, S. and MENON, C. (2017). Does weak contract enforcement affect firm size? Evidence from the neighbour's court. *Journal of Economic Geography*, **17**(6), 1251–82.
- GIANFREDA, G. and VALLANTI, G. (2017). Institutions' and firms' adjustments: measuring the impact of courts' delays on job flows and productivity. *Journal of Law & Economics*, **60**(1), 135–72.
- GOTTSCHALK, P. and HUYNH, M. (2010). Are earnings inequality and mobility overstated? The impact of non-classical measurement error. *Review of Economics and Statistics*, **92**, 302–15.
- ICHINO, A., POLO, M. and RETTORE, E. (2003). Are judges biased by labor market conditions? *European Economic Review*, **47**(5), 913–44.
- JIMENO, J. F. and THOMAS, C. (2013). Collective bargaining, firm heterogeneity and unemployment. *European Economic Review*, **59**, 63–79.
- KRAMARZ, F. and PHILIPPON, T. (2001). The impact of differential payroll tax subsidies on minimum wage employment. *Journal of Public Economics*, **82**, 115–46.
- LOW PAY COMMISSION (2017). National minimum wage: Low Pay Commission report 2017.
- (2020). Non-compliance and enforcement of the national minimum wage.
- LUCIFORA, C. and VIGANI, D. (2021). Losing control? The effects of 'pirate' collective agreements on wages. *Industrial Relations*, **60**(2), 188–218.
- MOENE, K. O. and WALLERSTEIN, M. (1997). Pay inequality. *Journal of Labor Economics*, **15**(3), 403–30.
- OECD (2019). *Negotiating Our Way Up: Collective Bargaining in a Changing World of Work*. Paris: OECD Publishing.
- RANI, U., BELSER, P., OELZ, M. and RANJBAR, S. (2013). Minimum wage coverage and compliance in developing countries. *International Labour Review*, **152**(3–4), 381–410.
- RILEY, R. and ROSAZZA BONDIBENE, C. (2017). Raising the standard: minimum wages and firm productivity. *Labour Economics*, **44**, 27–50.
- SESTITO, P. and VIVIANO, E. (2018). Firing costs and firm hiring: evidence from an Italian reform. *Economic Policy*, **33**(93), 101–30.
- SOUNDARARAJAN, V. (2019). Heterogeneous effects of imperfectly enforced minimum wages in low-wage labor markets. *Journal of Development Economics*, **140**, 355–74.
- TOMASSETTI, P. (2015). La nozione di sindacato comparativamente più rappresentativo nel decreto legislativo n. 81/2015. *Diritto delle Relazioni Industriali*, **26**(2), 368–92.

YANIV, G. (2001). Minimum wage noncompliance and the employment decision. *Journal of Labor Economics*, **19**(3), 596–603.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table A.1 Baseline results weighted, fixed effects, 2008–2015

Table A.2 Further results on regional heterogeneity fixed effects, 2008–2015

Table A.3 Baseline results with additional fixed effects, fixed effects, 2008–2015

Table A.4 Exclusion of small region-sector cells or outliers, fixed effects, 2008–2015

Figure A.1 Robustness: excluding one sector at the time, fixed effects, 2008–2015

Figure A.2 Robustness: excluding one region at the time, fixed effects, 2008–2015