

Within-firm Pay Inequality and Firm Performance

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ABSTRACT

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Keywords: Pay inequality, firm performance, fair wage-effort hypothesis, unions

JEL classification: G32, G38, J31, K31, L25, M41, M52

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1. Introduction

What is the cost of pursuing “wage fairness” within the firm for company shareholders? Is there an optimal within-firm wage dispersion common across companies? In this paper, we tackle these questions first theoretically and then empirically. Using a large set of microdata on the compensation of workers of Italian firms during the period 1994 through 2000, we test the predictions from the model of Charness and Kuhn (2007). Consistent with these predictions, we show that in companies where workers are more sensitive to pay inequality, pay is compressed, and operating performance is lower than in similar firms where workers have a lower demand for equality.

Despite the increased awareness and disclosure of within-firm pay inequality, there is little direct evidence of the effect of pay inequality on firm performance and corporate decisions.¹ Most studies thus far are based on experiments or confined to a single firm. Moreover, the evidence from extensive sets of actual firm data is typically limited to correlations (Faleye et al. (2013), Mueller et al. 2017b; Rouen 2020). Thus, empirically identifying the causal effect of pay inequality on firm performance is essential for academics and policymakers alike. Our main contribution is to identify the causal effect of a quasi-exogenous shock on firms’ ability to increase pay inequality on firm performance in a countrywide sample of firms and employees covering a wide range of sectors.

Theoretically, the observed wage dispersion within a firm in a competitive market economy is the output of a negotiation between a profit-seeking firm and its workers, who contribute with their effort to increase firm output. Our empirical predictions follow the model of Charness and Kuhn (2007). Building on the intuition of the *fair wage-effort hypothesis* of Akerlof and Yellen

¹ On October 17, 2015, the Securities and Exchange Commission (SEC) adopted a new rule, effective from January 1, 2017, that mandated U.S. firms to disclose the ratio of CEO pay to the median employee wage.

(1990), the model predicts that firms where workers' effort is less affected by pay fairness should optimally choose higher pay dispersion between more and less qualified workers. These firms are also expected to outperform firms where workers' effort is more sensitive to pay inequality.

To test the theoretical predictions, we use a unique data set of over two million matched employer-employee-year observations corresponding to 10,284 unique employers and 694,518 employees in Italy over the 1994-2000 period. We use a countrywide labor regulation reform in 1997 as a quasi-exogenous shock to firms' flexibility to set wages and pay dispersion. Akerlof and Yellen (1990) write that "the behavior of union-nonunion wage differentials is also consistent with the fair wage-effort hypothesis."² Accordingly, we use the percentage of all unionized workers in the province where the firm is headquartered as a proxy for the sensitivity of the firm's workers to the fair wage-effort hypothesis. We exploit the large variation in unionization rates across the country to compare the performance, investment, and payout policy before and after the 1997 labor reform (first difference) of firms facing the same economic conditions but exposed to different levels of unionization (second difference).

Consistent with the model predictions, we report two main findings. First, after the reform that grants all firms higher flexibility for setting wages, pay dispersion increases significantly more for firms in provinces with low unionization (treated firms) than for those in provinces with high unionization (control firms). This evidence is consistent with the prediction that control firms optimally internalize their workers' concern about wage inequality when such concern is sufficiently strong. Second, we find that the return on assets (ROA) is significantly higher for treated firms than for control firms after the reform. This evidence supports the inefficient

² Faber et al. (2021) present extensive survey evidence supporting the role unions in decreasing income inequality in the US over the 20th century. There is also evidence that unions shape the political orientation of affiliated workers and managers (see, for instance, Ahlquist (2017) and Matzat, and Schmeißer (2023)).

compression in effort predicted by the model due to pay inequality concerns among less qualified workers: After compressing salaries, more (less) qualified workers optimally supply less (more) effort. Additionally, we show that firms that increase pay dispersion after the reform invest significantly more and pay more dividends than similar firms in provinces with higher unionization rates.

Importantly, these results cannot be explained by an increase in unionization rates (which remain unaltered after the reform), differences across regions or industries (we control for both region-year and industry-year fixed effects), or the direct pressure of unions within firms (we control for firm fixed effects). We also show that dividends and investment in fixed assets increase in firms located in provinces with lower relative to higher unionization rates after the labor reform. This suggests that the increase in workers' pay ratios observed among firms in less unionized provinces after the reform allows shareholders to enjoy higher current (dividends) and future (via investments) cash flows. Additionally, we control for an extensive set of firm and employee control variables in all our analyses and find similar results. Other robustness tests show that an overall salary reduction or worker replacement after the labor reform does not drive our findings. As a final robustness test, we show that our results cannot be replicated when we randomize the treatment effect across firms.

Our paper contributes to the literature seeking to understand the effect of pay structures within firms on corporate decision-making. While tournament theory (Lazear and Rosen 1981) suggests a positive relation between within-firm pay dispersion and firm performance based on the implicit incentives for promotion embedded in an unequal pay distribution, equity theory (Akerlof and Yellen 1990) suggests a negative relation because of workers' demotivation induced by sentiments of unfairness. These competing predictions highlight the importance of a proper

identification strategy to analyze the effect of within-firm pay dispersion on firm performance. However, the empirical literature is scant and has relied only on field experiments, often confined to a single firm (e.g., Charness and Kuhn, 2007; Card et al. 2012; Cohn et al. 2014; Breza et al. 2018; Dube et al. 2019). More recently, Mueller et al. (2017a), Mueller et al. (2017b), and Rouen (2020) focus on the pay gap between top-ranking executives and the rest of a firm’s workers and find a positive correlation between pay dispersion and firm operating performance, consistent with tournament theory.³

In practice, however, not all firms (more specifically, their less qualified workers) are expected to be equally concerned about pay inequality. In contrast to the papers mentioned before, our extensive dataset, coupled with a clean identification strategy, allows us to compare the decisions of firms whose workers have different sensitivities to “fair wages” and draw causal conclusions. Additionally, our firms are relatively small; thus, talent competition is much more subdued in our study than in Mueller et al. (2017b) or Rouen (2020). This allows us to focus on the effects of pay dispersion among non-executive workers. Our findings suggest that firms optimally internalize this sensitivity and forgo the opportunity to increase pay dispersion when their workers strongly dislike pay inequality, consistent with equity theory and the fair wage-effort hypothesis (Akerlof and Yellen 1990).⁴ In contrast, firms whose workers are less sensitive to pay inequality outperform and have more free cash flows to reinvest or pay out to their shareholders. Although the data is not recent and includes only Italian firms, we believe the conclusions are valid currently and exportable to other countries with similar characteristics. First, regarding the period, as explained in section 3, it is relatively clean from other confounding events or crises besides the

³ Other recent studies on pay inequality include Krueger et al. (2022) and Potemkina (2022).

⁴ Our findings are also in line with Dittmann et al. (2023) who show that some investors may have pro-social preferences, which, in turn, have substantial effects on long-run abnormal returns.

regulatory reform that we use in our identification strategy. Second, the sample reflects the predominance of small and medium firms typical of the Italian economy and shared by many other economies, both in Europe (like Spain, Portugal, or Greece) and in developing countries where there is a public debate about the tradeoffs between inequality and economic outcomes addressed in this study.⁵ Finally, we should emphasize the coverage's exceptionality (spanning many firms, locations, and industries) and the data's granularity (at the worker level).

The remainder of the paper is organized as follows. Section 2 presents the theoretical framework and develops the empirical predictions. Section 3 describes the data and the research design. Section 4 presents the empirical analysis. Section 5 concludes the paper.

2. Theoretical framework and predictions

Our theoretical framework follows the model of Charness and Kuhn (2007) (hereafter CK). In this section, we summarize the three testable predictions from the model that will form the basis for our empirical analyses in Section 4.

The model assumes a representative firm that hires two types of workers, one more qualified (i.e., productive) than the other. Firm sales depend on the workers' effort. The effort of the more qualified worker coincides with her wage. To model the fair wage hypothesis of Akerlof and Yellen (1990), the effort of the less qualified worker is assumed to be a function of her wage relative to that of her coworker. The firm internalizes its workers' sensitivity (hence effort) to relative wages and chooses wages for each worker to maximize the total output net of labor costs. The predictions are formally derived in Appendix B.

Prediction 1: *Wage dispersion within the firm increases when workers are less concerned about wage inequality.*

⁵ See, for instance, Cingano (2014) and Criscuolo et al. (2020).

This is the reciprocal of the expected wage-compression prediction implied by the fair wage-effort hypothesis (Akerlof and Yellen 1990). Comparing the two firms, we expect higher wage dispersion in the firm where workers are less sensitive to the fair wage hypothesis. Next, we study how the fair-wage hypothesis affects the wages of both types of workers.

Prediction 2: *A decrease in workers' sensitivity to wage inequality within the firm increases the wages of more qualified workers. The wage of the less qualified workers decreases provided that the effort of the more skilled workers is less than unit elastic relative to the fair-wage sensitivity of the less skilled workers.*

On the one side, it is always optimal for a firm with less fair-pay sensitive workers to pay more to its more qualified workers since they are more productive. The prediction is more ambiguous for the less qualified workers (expectedly, those with lower wages). In principle, symmetrically to the case of the more qualified workers, lower sensitivity to relative wages should imply lower wages for the less qualified workers. However, if the increase in the wages of the high-productivity workers is high enough, less-qualified workers, after comparing themselves to their better-paid colleagues, will demand higher wages themselves. The outcome depends on the relative magnitude of these two effects, and it is a purely empirical question. Finally, we analyze the net expected effect of these dynamics on the firm's sales and operating profits.

Prediction 3: *Firm sales and profits increase when workers are less concerned about wage inequality. Moreover, the increase in profits is larger the higher the salary of the more qualified worker.*

It is important to note that Prediction 2 shows that the increase in profits does not follow trivially from savings in total wages. When the relative sensitivity of the worker's effort to the wage gap with respect to her coworker changes, incentives for the more qualified workers change,

and so do optimal wages for both workers. Thus, the higher performance of firms where workers are less concerned about wage inequality is driven by the increase in the efficiency of the incentives for all workers. This increase should be higher among companies where more qualified workers are paid more.

3. Research design and data

3.1 Institutional framework and the labor market in Italy: The 1997 Treu Reform

The Maastricht Agreement of 1992 and the conditions imposed after that to join the Economic and Monetary Union (EMU) made long overdue structural reforms unavoidable in Italy. In this context, it was assumed that greater labor market flexibility could help Italy adjust to economy-wide shocks due to the introduction of the euro and the consequent loss of control over monetary policy.

The fundamental impulse to reform the system came after the general election in April 1996, when Romano Prodi took office and appointed Tiziano Treu, a labor law professor, as Minister of Labor and Social Protection. Tiziano Treu had also been the Minister of Labor and Social Protection in the previous government headed by Lamberto Dini and had already attempted to reform the labor market without success.

In this context, it is also important to highlight the role of the three leading trade union organizations. The smaller *Confederazione Italiana dei Sindacati dei Lavoratori* (CISL) and the *Unione Italiana del Lavoro* (UIL) favored a labor reform. They were open to introducing firm-level bargaining over employment contracts into the labor market. In contrast, the most prominent left-wing (pro-equality) union – *Confederazione Generale Italiana del Lavoro* (CGIL) – was

critical and seriously concerned that the new employment contracts would lead to greater pay dispersion and unequal treatment of workers.⁶

Despite this resistance, Prime Minister Romano Prodi and his coalition secured a mandate from the Italian Parliament to reform the labor market in June 1997. After six months of discussion with the major parties, in December 1997, the Parliament approved the Treu Package with a large majority.⁷ The reform relaxed the rules for the standard temporary contracts and introduced a comprehensive set of new “atypical” temporary contracts without revising open-ended employment contracts (Pinelli et al. 2017). Specifically, the key elements of the reform were 1) an easing of regulations on flexible employment contracts, such as apprenticeships, 2) incentives to use part-time work, and 3) a liberalization of temporary work. Specific labor grants were also made available to firms to adopt more flexible, less burdensome employment contracts that would make these firms more competitive than their international peers. At the same time, the reform relaxed the conditions for converting fixed-term contracts into open-ended contracts, allowing cheaper fixed-term contracts to be used almost indefinitely.

3.2. Data

The data for our empirical analyses come from two primary sources. First, we rely on employment-related information from the administrative archives of the *Istituto Nazionale della Previdenza Sociale* (INPS).⁸ This database represents one of the most extensive employer-

⁶ For example, the Italian newspaper *La Repubblica* reports that the CGIL was very critical of the proposed labor reform (available at <https://ricerca.repubblica.it/repubblica/archivio/repubblica/1995/05/20/lavoro-in-arrivo-il-pacchetto-treu.html>, last accessed April 12, 2023). In line with this reasoning, Onal et al. (2022) show that left leaning (pro-equality) sentiment restrains CEOs from rent extraction. However, contrary to Onal et al. (2022), our focus is on studying the effect of pay dispersion of the total workforce on firm performance.

⁷ The Italian Parliament’s website provides an overview of the 1997 Treu Reform (available at <https://www.parlamento.it/parlam/leggi/971961.htm>, last accessed May 12, 2022).

⁸ Note that the data were gathered by the *Fondazione Rodolfo Debenedetti* (FRDB) and confidentially provided to us upon request.

employee-matched data available for research in Italy.⁹ The sampling process starts by including employment-related information on the entire population of firms in northeastern Italy from 1975 to 2001, except for firms operating in agriculture and public administration industries and those with no employees. Each employee is followed for her work life, even when another firm outside northeastern Italy hires her. For example, if a worker moves to another firm outside her province or region of residency, her new employer and the working histories of all her coworkers enter the sample. Hence, the number of firms, their geographical coverage, and the number of workers increase over time as new employer-employee matches are created. This allows us to retrieve information on a comprehensive sample of firms and workers distributed across 18 of 20 Italian regions.¹⁰

The database contains information on the compensation of more than one million unique workers, which we use to construct our pay inequality variables. In addition, the database includes a set of worker characteristics (i.e., age, gender, place of birth, tax residency, and tenure) that we use as controls in our empirical analyses. The workforce consists of *all* workers of the firm, except for executive positions. Hence, any observable difference in pay among workers across and within firms is unlikely to reflect the “superstar premium” of Rosen (1981), typically used to explain pay gaps between top and bottom ranks within the firm.

The second data source is the Orbis database published by BvDEP, a leading company financial and ownership information source. Orbis provides comprehensive coverage for over 200 million publicly listed and privately held companies worldwide. BvDEP collects firm-level data

⁹ The other major employer-employee matched database is provided by the *Laboratorio Riccardo Revelli* (available at http://www.laboratoriorevelli.it/whip/whip_datahouse.php?lingua=eng&pagina=documentazione, last accessed April 12, 2023).

¹⁰ Because of the sampling process, the database does not include information on firms located in Molise or Valle d’Aosta. However, we note that Molise and Valle d’Aosta are the two smallest regions in Italy, which together make up less than 1% of both the total population and the total number of firms in the country over the sample period. Hence, we are confident that their exclusion does not bias our results.

from financial reports obtained through chambers of commerce, securities commissions, tax authorities, and a network of national and international data providers. We combine several editions of Orbis to maximize coverage and address survivorship bias concerns over the sample period.

Our data set construction starts with identifying all firms in the INPS database. From this initial set of firms, we exclude micro-entities with fewer than ten employees, and observations for which data to construct the variables we use in our analyses are missing. Based on these criteria, we identify 8,271,253 matched employer-employee-year observations corresponding to 55,487 unique employers and 1,375,109 employees. We then merge our INPS data with the Orbis data using the VAT number identifiers and company name and drop observations with missing financial data for our analysis. Our final sample comprises 2,154,240 matched employer-employee-year observations corresponding to 10,284 unique employers and 694,518 employees over the 1994-2000 period. Panel A of Table 1 provides further details on the sample selection procedure.

[Insert Table 1 about here]

Panel B (Panel C) of Table 1 presents our sample distribution by year (region). Given the sampling process, approximately 74% of the 38,967 firm-year observations are in the Veneto region, which is the most represented region in our sample. Veneto is immediately followed by Lombardia (6.71%), Friuli-Venezia Giulia (5.45%), Emilia-Romagna (4.58%), Trentino-Alto Adige (1.98%), and Piemonte (1.78%). While the distribution of firms is uneven across regions and over the sample period, it mirrors the significant regional variation in economic development within Italy, with the regions in Southern Italy being substantially less developed than the regions in the North (see Figure 2 and, e.g., Guiso et al. 2004; Pinotti 2015; Slutzky and Zeume 2019). Despite these regional differences, we show that our results are not driven by the North-South

divide, as they hold (even more strongly) when we drop Northern regions from the sample. Finally, Panel D of Table 1 provides information on our sample distribution by the number of employees.¹¹ Consistent with the economic landscape of Italy, most firms included in our sample are small, with more than three-quarters of companies employing fewer than 50 employees.¹²

[Insert Figure 2 about here]

3.3 Estimation strategy

We study whether firms optimally internalize their workers' concerns about inequality in their compensation policy and, if so, whether this affects their operating performance. We proceed sequentially. We first explain the empirical strategy to test predictions 1 and 2. We then discuss how we test prediction 3.

3.3.1 Testing Predictions 1 and 2

The observed pay distribution across workers within a firm is the final output of a negotiation process unobserved by the econometrician. Workers are not randomly assigned to a firm; many unobserved factors determine the simultaneous matching between a worker and a firm and a firm's optimal pay policy (e.g., Jovanovic 1979; Miller 1984; Moscarini 2005). Because of the endogenous nature of the matching process, a standard OLS regression of within-firm pay inequality on a set of worker and firm characteristics would be subject to a clear problem of omitted variable bias. For example, a more business-friendly environment could attract both firms with steeper compensation incentives that favor pay dispersion and a competitive labor force that is arguably less concerned with fair wages. Similarly, such a research design does not exclude the

¹¹ Figures A1 and A2 of the Online Appendix provide further information on the distribution of firm-year observations by the number of employees, age, and geographic area.

¹² A key advantage of using Italian data is that all limited liability firms are mandated to disclose financial information, including income statement and balance sheet items. However, the disadvantage is that our sample mainly consists of small and medium businesses. Hence, to assess the representativeness of our sample, we compare our sample vis-à-vis the full population of Italian firms in the Orbis database and find differences in size, performance, and leverage to be statistically insignificant. The results are available upon request.

possibility of reverse causality. For example, firms concerned with pay inequality are more likely to attract certain types of workers who value pay fairness.

Therefore, to overcome endogeneity, we perform a difference-in-differences analysis using the 1997 labor reform described in Section 3.1 as a shock to firms' ability to increase pay inequality. The theoretical framework outlined in Section 2 predicts that, absent any legal cap on wages, firms choose their (unconstrained) optimal level of pay inequality after considering their workers' skills and their concern for fair wages. In their seminal article, Akerlof and Yellen (1990) argue that "*the behavior of union-nonunion wage differentials is also consistent with the fair wage-effort hypothesis*" and use the pressure of unionized employees of General Motors to homogenize pay increases among top versus bottom positions within the firm as anecdotal evidence of their hypothesis (see, also, Freeman and Medoff, 1984).

Hence, following Akerlof and Yellen (1990), we proxy for workers' concern about pay inequality (i.e., the parameter α in the model in Appendix B) with the number of *all* workers affiliated with the CGIL union relative to the workforce in the same province where the firm is headquartered. Hence, our proxy for unionization, which we call the *Unionization rate*, is a ratio of *all* unionized workers in a given Italian province relative to the workforce of the same province. The underlying hypothesis is that a less qualified worker in a firm headquartered in a province with a low unionization rate should be significantly less concerned about pay inequality (i.e., the parameter α in the model should be lower) relative to a similar worker in a firm headquartered in a province with a high unionization rate. It is worth emphasizing that we are not interested in testing the *direct* effect of unionized workers within the firm on wage compression. The percentage of unionized workers aggregated at the province level captures the concern of less qualified

workers (more likely to be unionized) for fair wages without directly inducing wage compression at the firm level.

Under this assumption, prediction 1 in Section 2 states that (*treatment group*) firms headquartered in provinces with lower unionization rates are expected to optimally set a higher pay ratio relative to (*control group*) firms headquartered in provinces with higher unionization rates after the 1997 labor reform. To test this prediction, we estimate the following equation:

$$\ln\left(\text{Pay ratio } \frac{y}{1-y}\right)_{i,p,t} = \alpha + \beta_1(1 - \text{Unionization rate}_{p,t}) \times \text{Post} + \beta_2(1 - \text{Unionization rate}_{p,t}) + \beta_3 X_{i,t} + \mu_i + s_{i,t} + r_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $\ln(\text{Pay ratio } y/(1-y))_{i,p,t}$ is the natural logarithm of the ratio between the top y percentile relative to the bottom $(1-y)$ percentile of the firm's pay distribution, with $y \in \left\{\frac{80}{20}, \frac{75}{25}, \frac{66}{33}\right\}$ in firm i headquartered in province p in year t . $\text{Unionization rate}_{p,t}$ is the number of all workers affiliated with the CGIL union in province p relative to the province's workforce in year t . Post is an indicator variable that takes the value of one in the years following the labor reform (from 1997 onward) and zero otherwise. In line with prior literature (e.g., Mueller et al. 2017b), we add a vector ($X_{i,t}$) of firm-level characteristics: *PPE*, *Leverage*, *Size*, and *Cash holdings*. We also add several employee-level controls (i.e., gender, labor mobility, tenure) to ensure that observable worker characteristics do not spuriously drive the results (e.g., Orefice and Peri 2020).

Furthermore, Eq. (1) controls for firm fixed effects (μ_i), industry–year fixed effects ($s_{i,t}$), and region–year fixed effects ($r_{i,t}$). These fixed effects ensure we compare firms before and after the labor reform in the same industry, year, and region. For example, firms from Bari, Brindisi, Foggia, Lecce, and Taranto are all located in the Apulia region but differ with respect to the

province to which they belong and the related unionization rate. Importantly, the region–year fixed effects are crucial in our setting because of the disparities in culture, economic development, and formal and informal institutions across Italian regions (e.g., De Vito and Jacob 2023). Additionally, this fixed-effects structure allows us to control for industry shocks that could affect a firm’s optimal pay policy while eliminating the impact of time-varying economy-wide shocks within the same regional economic environment. The statistical inference is based on robust standard errors clustered at the province level (Petersen 2009).

The treatment variable ($1 - \textit{Unionization rate}_{p,t}$) allows us to identify the differential effect of the 1997 labor reform on pay inequality for firms headquartered in provinces with lower unionization rates relative to those headquartered in provinces with higher unionization rates.¹³ The interaction between this variable and the (potentially binding) explicit or implicit legal constraints on the pay ratio before the legal reform defines four possible cases with different predictions on the signs of coefficients β_1 and β_2 in equation (1). These cases are illustrated in Figure 3.

[Insert Figure 3 about here]

Line *T* denotes the treatment group firms, whereas line *C* denotes the control group firms. Before the reform, both firms could be constrained in their optimal pay ratio, given that the available employment contracts were fewer and more homogeneous across the workforce. This is depicted by the red line in Figure 3, which represents the maximum pay inequality implicitly allowed by the labor legislation before the reform. In Panel A, we expect no difference in the pay ratio between treatment and control group firms before or after the reform. This case indicates that province-level unionization rates do not affect the wage distribution within firms. Hence,

¹³ To ensure that firms are correctly assigned to treatment and control groups, we verify whether firms change their headquarters locations over the sample period, and we find no such changes.

regardless of the location of the red line, we expect both coefficients β_1 and β_2 in equation (1) to be equal to zero. This is the null hypothesis that rejects prediction 1.

Panel B depicts the scenario in which neither treatment nor control group firms were constrained in their choice of pay inequality before 1997. In this case, prediction 1 states that β_1 is equal to zero while β_2 is higher than zero. That is, equation (1) would detect the difference in the average within-firm pay inequality between firms in low-unionization provinces and firms in high-unionization provinces *before* the 1997 labor reform, but such a difference would be statistically nonsignificant *after* the reform. In Panel C, only treatment group firms headquartered in provinces with low unionization were constrained before the 1997 labor reform. After the reform, both treatment and control group firms become unconstrained. Hence, in this scenario, hypothesis 1 predicts that both β_1 and β_2 are higher than zero.¹⁴ Finally, in Panel D, both treatment and control group firms are constrained before 1997, and neither group can attain the optimal pay ratio before the reform. Hence, there should be no difference in pay ratios between these groups before the reform, and β_2 should be zero. However, after the reform, the coefficient β_1 is expected to be higher than zero, capturing the full sensitivity of the pay ratio to the unionization rate.¹⁵

To test prediction 2, we replace each pay ratio with the top and bottom pay percentiles and re-estimate the equation (1) separately. For the top percentiles, the predictions about the coefficients in (1) are the same as before: a lower unionization rate (a proxy for the parameter α in the model) should lead to higher salaries among the top-paid workers (arguably, more productive) after the regulatory change. For bottom-percentile workers, the prediction is ambiguous and

¹⁴ If treatment group firms are still constrained after the reform but less so than before 1997, both coefficients β_1 and β_2 are still expected to be positive albeit β_2 will have a lower magnitude.

¹⁵ Clearly, if control group firms were still constrained after the reform, albeit less so than prior to the reform, the predicted sign for β_1 would still be positive, albeit of a lower magnitude.

depends on the elasticity of the (unobservable) effort of the more skilled workers with respect to the unionization rate.

Before testing predictions 1 and 2, we run two analyses to back up two assumptions underlying our approach. First, we verify that the unionization rates across Italian provinces do not change in response to the reform. Reassuringly, Figure 4 shows that the unionization rates were unchanged across Italian provinces before (1996) and after (1998) the labor reform. Therefore, any observed change in pay inequality should not be attributed to a simultaneous change in the number of unionized workers induced by the 1997 labor reform.

[Insert Figure 4 about here]

Second, our difference-in-differences empirical design rests on the parallel-trends assumption; that is, absent the 1997 labor reform, the average changes in pay ratios of firms in provinces with low unionization relative to those in provinces with high unionization would have been the same. To examine whether the parallel trends assumption plausibly holds in our sample, in Figure 5, we plot the cumulative difference in *Pay ratio 80/20* as defined above for both treatment and control group firms from $t - 2$ to $t + 2$ around the 1997 labor reform ($t = 0$). We observe a parallel trend between the treated and control groups before the labor reform, rejecting the conjecture that firms anticipate the change in labor legislation. However, once the law comes into effect at t , the treated firms decrease their pay compression (i.e., increase pay inequality) significantly relative to the control group firms. More importantly, the increase in pay inequality appears persistent and does not reverse in the following years.

[Insert Figure 5 about here]

3.3.2 Testing Prediction 3

To test prediction 3, we replace the dependent variable in equation (1) with three firm sales growth proxies and two proxies for firm profits. We then estimate the following equation:

$$\begin{aligned} \text{Operating Performance}_{i,p,t} = & \alpha + \beta_1(1 - \text{Unionization rate}_{p,t}) \times \text{Post} + \\ & \beta_2(1 - \text{Unionization rate}_{p,t}) + \beta_3 X_{i,t} + \mu_i + s_{i,t} + r_{i,t} + \varepsilon_{i,t}, \end{aligned} \quad (2)$$

where the dependent variables are three alternative operating performance metrics: *RNOA*, *ROA*, and *sales growth*. The first dependent variable, *RNOA*, return on net operating assets, is calculated as operating income divided by the average net operating assets (*NOA*) (Nissim and Penman 2003; Li et al. 2014).¹⁶ *NOA* is defined as operating assets minus operating liabilities. Operating assets correspond to total assets less cash and short-term investments. Operating liabilities are total assets less the long- and short-term debt portions, less the total equity book value. This definition of operating liabilities follows that of Soliman (2008). The second dependent variable, *ROA*, is computed as earnings before interest and taxes (*EBITDA*) relative to the prior year's total assets. Finally, the third dependent variable, *Sales growth*, is the natural logarithm of the growth rate of sales from $t-1$ to t . We again include the same controls and fixed effects as in Eq. (1).

Figure 3 also represents the testable implications of prediction 3 after replacing the *Pay Ratio* with *Sales growth* and *Operating Performance* on the vertical axis. Thus, if province-level unionization rates are unrelated to wage distribution within firms, then firms' sales and profits will not significantly differ for treatment or control group firms, either before or after the labor reform 1997. This scenario is depicted in Panel A, where both β_1 and β_2 are expected to be zero in Eq. (2). In contrast, if less qualified workers are concerned about pay inequality proxied by the

¹⁶ We use *RNOA* as our primary measure of operating performance because Nissim and Penman (2003) and Penman (2012) note that *RNOA* better distinguishes operating from financing activities by appropriately excluding the effects of financial assets and financial liabilities on the denominator. Nonetheless, our results are robust to the use of alternative dependent variables, such as *ROA* and net income divided by the average total assets, as in Bird and Knopf (2009) (untabulated and available upon request).

unionization rate of the province, the model predicts that (*treatment* group) firms located in provinces with low unionization will outperform similar (*control* group) firms in provinces with high unionization. Whether the difference in performance entirely accrues before (Panel B) or after (Panel D) the labor reform or is split between the two periods (Panel C) depends on whether the pay ratio is 1) unconstrained for both treatment and control firms before 1997 (β_1 is equal to zero and β_2 is higher than zero), 2) constrained for both groups (β_1 is higher than zero and β_2 is equal to zero), or 3) constrained only for treatment group firms (both β_1 and β_2 are higher than zero).

Similar to the previous analyses, before testing prediction 3, we examine whether the parallel trends assumption also holds for the operating performance metrics. In Figure 6, we repeat the same exercise as in Figure 5 but replace the pay ratio with our primary operating performance metric *RNOA*. We find that firms in provinces with high and low unionization rates exhibit similar trends before the reform. However, after the reform comes into effect at t , firms in provinces with low unionization rates significantly outperform their peers in provinces with high unionization rates. These preliminary findings appear to be consistent with prediction 3 in Section 2.

[Insert Figure 6 about here]

4. Results

4.1 Unionization rate and within-firm pay inequality

Table 3 reports the baseline difference-in-differences estimation results based on Eq. (1). Across all specifications and pay ratios, the coefficient β_1 is positive and statistically significant, at least at the 5% level. This result is robust to the addition of firm-level control variables, which we interpret as an indication that the labor reform is not systematically correlated with firm-level variables. In terms of economic significance, a decrease of one standard deviation in the unionization rate increases the *Pay ratio 80/20* by approximately 2.3% ($=0.23 \times 10\%$) after the 1997

labor reform. Relatedly, the *Pay ratio 75/25 (Pay ratio 66/33)* increases by approximately 2.93% (1.85%) for a decrease of one standard deviation in the unionization rate after the labor reform.

[Insert Table 3 about here]

With respect to the coefficient β_2 , we find that it is positive but insignificant across all specifications. The *joint* evidence on the coefficients β_1 and β_2 is consistent with the scenario depicted in Panel D of Figure 3, which suggests that both treatment and control group firms were constrained in their optimal pay inequality before the labor reform of 1997. However, after the reform, treatment group firms headquartered in provinces with low unionization rates become unconstrained. This explains the difference in pay inequality relative to firms headquartered in provinces where workers are concerned about pay inequality after the reform (β_1 higher than zero). These findings support the *fair wage-effort hypothesis* among workers of firms in provinces with high unionization rates. The sensitivity of workers' efforts to fair wages is internalized by firms in provinces with high unionization when setting optimal wage structures, as in prediction 1.

Regarding the control variables, we observe that firm size is inversely related to pay inequality with statistical significance at the 1% level. This finding contrasts with the positive relation between firm size and pay inequality documented by Mueller et al. (2017b). However, it is worth noting that these authors study the pay gap between executives and lower-ranking employees, and they interpret the positive coefficient as evidence of compensating managerial talent, with more talented managers matching to larger firms (Gabaix and Landier 2008; Terviö 2008). In contrast, our sample consists of relatively small private companies where the market for managerial talent is much less competitive. In this context, smaller firms are more likely to merge management and control in the same person, increasing the gap between the compensation of the manager/owner and that of the rest of the firm's workers.

Furthermore, pay inequality is lower when labor mobility is lower. This suggests that firms hiring locally face higher wage compression, likely due to lower competition in the local labor market. Finally, pay inequality increases with tenure, consistent with senior employees receiving higher salaries.

It is also worth emphasizing that these findings are not due to an increase in unionization rates (which remains unaltered after the reform) or differences across regions or industries, since we control for region–year and industry–year fixed effects. The coefficient on ($1 - \textit{Unionization rate}$) is nonsignificant across specifications, mitigating the concern of a direct effect of union power at the province level on within-firm pay inequality.

[Insert Table 4 about here]

To test prediction 2, we decompose each pay ratio into top and bottom percentiles and re-estimate Eq. (13) in Table 4. Consistent with the model’s prediction, for each of the top percentiles – $P80$, $P75$, and $P66$ – we find a positive difference between firms in provinces with low unionization rates and firms located in provinces with high unionization rates after the 1997 labor reform and no significant effect before the reform. On the other hand, we find that the three bottom percentiles – $P20$, $P25$, and $P33$ – of firms in provinces with low unionization rates are significantly lower relative to those of firms in provinces with high unionization rates after the reform (and not significant effect before the reform). In economic terms, we find that a decrease of one standard deviation in the unionization rate increases (decreases) the compensation of higher-paid (lower-paid) employees by approximately 0.60% (2.45%).¹⁷ According to the model, this is what we should expect if the elasticity of effort of more skilled workers with respect to the fair-wage sensitivity of less skilled workers is (in absolute terms) less than one. These findings confirm

¹⁷ We take the average of the β_1 coefficients in columns (1), (3), and (5) [(2), (4), and (6)] of Table 4 and multiply it by the standard deviation of the unionization rate ($= 0.0598 \times 0.1002$) [$= 0.2453 \times 0.1002$], to obtain 0.0059 [0.0245].

the scenario depicted in Panel D of Figure 3 and the results in Table 3, and they suggest that after the 1997 labor reform, firms in which workers are less sensitive to pay inequality take advantage of the labor reform to optimally increase (decrease) the wages of higher-paid (lower-paid) employees.

To provide a sharper estimate of the magnitude of the pay dispersion, we consider the region of Tuscany, which has the highest variation in unionization rates across its ten provinces over the sample period. We take the provinces of Livorno and Prato, which have the region's highest and lowest unionization rates, respectively. Specifically, Livorno has a unionization rate of 2.5 standard deviations higher than Prato's. The coefficient β_1 in column (2) of Table 4 shows that after 1997, the average wage in *P20* across firms in Livorno is six percentage points higher than that in Prato. In euro terms, this implies that the average worker in the top quintile in Livorno earns approximately EUR 18.325,65 versus EUR 17.288,35 earned by the equivalent worker in Prato.

4.2 Unionization rate and operating performance

Table 5 reports the results based on Eq. (2). Consistent with prediction 3, we find that the coefficient β_1 is positive and statistically significant across all specifications. These results also hold after we control for firm- and employee-specific characteristics. In economic terms, in column (2) of Table 5, we find that a decrease of one standard deviation in the unionization rate leads firms' profitability to increase by approximately 2.6 percentage points after the 1997 labor reform. As in the pay ratio analyses, adding firm-level control variables appears to have no impact on the estimated coefficient or statistical significance. Moreover, these conclusions remain similar when we replace *RNOA* with either *ROA* or *sales growth* in columns (3) to (6).

[Insert Table 5 about here]

With respect to the coefficient β_2 , we find that it is positive but mostly insignificant across all specifications. In line with the graphical analysis in Figure 6, the *joint* evidence of the coefficients β_1 higher than zero and β_2 statistically nondifferent from zero further supports the difference in workers' sensitivity vis-à-vis fair wages between firms in provinces with higher versus lower unionization rates. Hence, this evidence is consistent with the scenario in Panel D of Figure 3 and the results in Table 4.

In addition to the model predictions, we further explore whether the decision of firms in provinces where workers are less sensitive to within-firm wage inequality affected other corporate decisions after the 1997 labor reform. We investigate whether investment in fixed assets and dividends were affected. We conjecture that firms whose workers are less sensitive to wage differences see their cash flows increase relative to firms more affected by relative wage concerns. This would affect the company's ability to invest and pay dividends to shareholders.

To address the question, we replace the dependent variable in equation (2), *Operating Performance* $_{i,p,t}$ with *Investment* $_{i,p,t}$, defined as the change in fixed assets before depreciation relative to the prior year's total assets in firm i , from province p in year t . Table 6 reports the results. All specifications include firm, industry-year, and region-year fixed effects. In economic terms, in column (1), we find that a one standard deviation decrease in the unionization rate increases firm investment by approximately 0.30 percentage points after the labor reform. Importantly, the coefficient β_2 is nonsignificant, suggesting no relevant differences in investment between treatment and control firms before 1997.

Next, we use *Payout* $_{i,p,t}$, defined as the payout ratio of firm i from province p in year t , as the dependent variable in equation (5). In column (2), we find that a one-standard-deviation decrease in unionization leads to an increase of approximately 1.7 percentage points in the payout

ratio after the labor reform. Relatedly, the coefficient β_2 is positive and statistically significant at the 1% level, suggesting that before the reform, companies whose workers showed lower concern for pay inequality already had a payout ratio approximately five percentage points higher than companies located in provinces with higher concern for pay inequality. The findings reported in Table 6 suggest that internalizing workers' concern for wage inequality affects firms' short-term operating performance (as shown in Table 5) and long-term corporate decisions, such as investment and payout policies.

[Insert Table 6 about here]

4.3 Interpretation of the results and alternative explanations

The results presented in Tables 3 to 6 are consistent with the notion that firms in provinces with low unionization rates optimally increase wage dispersion relative to similar firms in provinces with high unionization rates, as predicted by the model in Section 2. Moreover, firms in provinces with low unionization rates significantly outperform those in provinces with high unionization rates after the 1997 labor reform, consistent with the third prediction of the model.

At first sight, this evidence could look trivial because, after the reform, labor costs decrease, and only treatment group firms can cut wages relative to control group firms. *Ceteris paribus*, the profitability of treatment (control) group firms increases (decreases). However, this interpretation ignores that workers' efforts and sales are endogenously determined by their compensation, as made clear by prediction 3 of the model. According to this model, firms optimally choose wages after considering a worker's productivity and her optimal effort decision, which depends on her absolute compensation and (in the case of the less qualified worker) her compensation relative to that of her coworker. Hence, firms choose their optimal compensation policies considering the optimal level of pay inequality. Put differently, firms incorporate a worker's optimal effort in

response to changes in pay inequality. Thus, the model predicts that profit-maximizing (control group) firms in provinces with high unionization rates, which internalize workers' relative wage concerns, optimally choose to pay their less qualified workers more than similar treatment group firms in provinces with low unionization rates. This also explains why sales grow more for treatment firms than control firms after the reform, independent of any cost reduction. In this interpretation, it is also important to highlight that if control group firms paid their less qualified workers less, as treatment firms do, they would be worse off: the savings in wages would be undone by the decrease in profits caused by the lower effort (hence sales) exerted by workers with relative wage concerns.

We now consider some possible alternative explanations to strengthen the interpretation of our findings. First, one could argue that unions compress salaries (see, e.g., Card et al. 2004), and therefore, our tests are just picking a higher proportion of unionized firms in certain provinces. However, recent evidence with proper identification strategies seems to challenge this conjecture.¹⁸ Moreover, the firm-fixed effects in our regressions should capture the effect of unions at the firm level. Although we cannot control for the time-variant effect of unions at the firm level, Figure 2 suggests that the aggregate rates at the province level are very stable. Tables 3-5 also show that unionization rates at the province level fail to explain any difference in wage inequality or firm profitability before the labor reform (the coefficient β_2 in these regressions is nonsignificant virtually across all specifications). Finally, while there is evidence of spillover effects of unionization on wage compression across firms within the same industry in the United States (Khan and Curme 1987), the industry-year fixed effects in our regressions should address this concern.

¹⁸ DiNardo and Lee (2004) show that, at least in recent decades, unions have been unsuccessful in securing wage gains in the US. Their effect on firm productivity and survival is also modest.

A second alternative interpretation is that the wages and profitability of the treatment and control firms differ after the labor reform because workers are replaced nonrandomly after the shock. The main argument in the CK model is effort incentives and relative wage concerns. To interpret coefficients in our regressions as supportive of the model’s predictions, workers’ turnover should not differ significantly between treated and control firms after the labor reform. If, for instance, firms in provinces with lower unionization rates replace overpaid workers more than similar firms in provinces with higher unionization rates, this could explain their higher pay inequality and productivity (through labor cost savings) after 1997 without involving any relative wage concern. To address this concern, we estimate employment growth and turnover in our sample, both in the aggregate and for each of the percentiles in regression (13). An advantage of our data is that we can “identify” each worker in each firm. Hence, our worker turnover variables measure the number of workers who remain in the company during a given period. We run the following regression:

$$\begin{aligned}
 f_{i,p,t} = & \alpha + \beta_1(1 - \textit{Unionization rate})_{p,t} \times \textit{Post} \\
 & + \beta_2(1 - \textit{Unionization rate})_{p,t} + \beta_3\textit{Controls}_{i,t} + \mu_i + s_{i,t} + r_{i,t} \quad (3) \\
 & + \varepsilon_{i,t}.
 \end{aligned}$$

In specification (1) of Table 7, the dependent variable $f_{i,p,t}$ is *Employment growth* in province p and year t . This variable is replaced with *Turnover for All Employees* (within each firm-year $i-t$ in province p) in the specification (2) and with *Turnover* (within each firm-year $i-t$ in province p) for workers with compensation in percentiles 80, 20, 75, 25, 66, 33 in specifications

(3) through (8), respectively. The construction of each of these variables is explained in Appendix A. We include the same controls and firm fixed effects as in equation (1).¹⁹

[Insert Table 7 about here]

Employment does not grow differently across firms in provinces with lower versus higher unionization rates before or after the labor reform. Likewise, worker turnover is statistically indistinguishable across firms located in both types of provinces both before and after the reform. This is true both at the aggregate firm level (across all employees) and for each of the percentiles in terms of wages considered in our analysis. We are considering the same nominal workforce before and after the law. Figure 7 shows the accumulated coefficients, year by year, from the regression of turnover for all employees. The coefficients do not change after the 1997 reform. With this evidence, we can rule out workers' turnover as a driver of our results, further supporting the fair wage-effort interpretation.

[Insert Figure 7 about here]

4.4 Robustness tests

In this section, we test the robustness of our results by excluding the year of the reform, requiring no gaps in the sample, randomly generating the treatment and control groups, and excluding one region (or capital region) at a time.

In Panel A of Table 8, we test the robustness of the results reported in Table 3. In specifications (1)-(3), we test equation (13) by removing the year of the labor reform (1997) from the sample. In specifications (4)-(6), we remove the first and last years from the sample. Finally, in specifications (7)-(9), we include only firms for which we have observations across all years from 1994-2000. We include the same controls as in Table 3 plus firm, industry-year, and region-

¹⁹ It is worth highlighting that, for each turnover test, we ensure that the identities of the workers do not change before and after the shock to avoid new workers entering the firm and exerting pressure on wages.

year fixed effects. The results are robust across all specifications. Panel B repeats the same tests replacing *Pay ratio* with *Sales growth*, *RNOA*, and *ROA* to test equation (2). We include the same controls and fixed effects as before. The results are analogous to those reported in the base regression in Table 4.

[Insert Table 8 about here]

Next, we simulate the data to randomly assign the unionization rate to a firm. We repeat the procedure 500 times and find that the average estimates are zero and statistically insignificant (Figure A3 of the Online Appendix). Moreover, we investigate whether a specific region (or regional capital) drives the results. For this purpose, we run equation (1) but exclude one region (or regional capital) at a time. Figures A4 and A5 of the Online Appendix plot the coefficient estimates following this exercise. The results remain significant, and the coefficients on $(1 - \text{unionization rate}) \times \text{post}$ are of approximately equal magnitudes. Finally, in untabulated robustness tests, we perform additional analyses based on matched-treated-control pairs. Specifically, we apply entropy balancing matching to find similar firms based on size (i.e., total assets measured in the year before the labor reform) and industry (e.g., Jacob et al. 2019). Reassuringly, the results remain unchanged.

5. Conclusion

Not all firms are equally concerned about pay inequality. Our extensive data sample and identification strategy allow us to compare the decisions of firms whose workers have different levels of within-firm pay-dispersion sensitivity and draw causal conclusions.

Our results support the notion that firms optimally internalize this sensitivity. Specifically, firms whose workers are less sensitive to wage inequality take advantage of the reform to increase pay dispersion. In contrast, other similar firms with more sensitive workers forgo this opportunity

and decide not to increase pay inequality after the reform. Moreover, firms with less sensitive workers have better operating performance than those with more sensitive workers, thereby revealing a shadow cost of preserving wage inequality. Further corroborating this argument, firms whose workers are less concerned about wage fairness invest more and pay out more dividends, arguably enhancing their future growth.

These results have policy implications. Amid the strong social and institutional pressure to rein in the growing inequality in labor income in advanced economies, we document the shadow costs of restricting pay dispersion within firms ad hoc. Legislators should ponder the consequences of such limits on firm profits, payout, and investment (hence, economic growth) before deciding their optimal social welfare tradeoff.

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Appendix A. Variable Definitions

<i>Variable</i>	<i>Definition</i>
<u><i>Inequality Variables</i></u>	
<i>Pay Ratio 80/20</i>	Natural logarithm of the ratio of the salaries in the top quintile to the salaries in the bottom quintile (Source: VW Histories from INPS).
<i>Pay Ratio 75/25</i>	Natural logarithm of the ratio of the salaries in the top quartile to the salaries in the bottom quartile (Source: VW Histories from INPS).
<i>Pay Ratio 66/33</i>	Natural logarithm of the ratio of the salaries in the top tercile to the salaries in the bottom tercile (Source: VW Histories from INPS).
<u><i>Profitability Variables</i></u>	
<i>Sales Growth</i>	Natural logarithm of the growth rate of sales (<i>turn</i>) from <i>t-1</i> to <i>t</i> (Source: Orbis).
<i>RNOA</i>	Earnings before interest and taxes (<i>oppl</i>) relative to the average net operating assets. Average net operating assets are operating assets minus operating liabilities. Operating assets are total assets (<i>toas</i>) less cash (<i>cash</i>). Operating liabilities are total assets (<i>toas</i>) less the long- and short-term portions of debt (<i>culi</i> and <i>ltdb</i>) less the book value of total equity (<i>shfd</i>) (Source: Orbis).
<i>ROA</i>	Earnings before interest and taxes (<i>oppl</i>) relative to the prior year's total assets (<i>toas</i>) (Source: Orbis).
<u><i>Employment Variables</i></u>	
<i>Total labor costs</i>	Natural logarithm of a firm's total wages (Source: VW Histories from INPS).
<i>Employment Growth</i>	Change in the natural logarithm of employment (Source: VW Histories from INPS).
<i>Turnover</i> – <i>All employees</i>	One minus the number of workers who work both the beginning and the end of the period in the firm divided by the minimum between the total number of workers at the beginning of the period and the total number of workers at the end of the period (Source: VW Histories from INPS).
<i>Turnover – P80</i>	One minus the number of workers in the top quintile who remain in the firm from the beginning to the end of the period divided by the minimum between the number of workers in the top quintile at the beginning of the period and the number of workers in the top quintile at the end of the period (Source: VW Histories from INPS).
<i>Turnover – P20</i>	One minus the number of workers in the bottom quintile who remain in the firm from the beginning to the end of the period

divided by the minimum between the number of workers in the bottom quintile at the beginning of the period and the number of workers in the bottom quintile at the end of the period (Source: VW Histories from INPS).

Turnover – P75

One minus the number of workers in the top quartile who remain in the firm from the beginning to the end of the period divided by the minimum between the number of workers in the top quartile at the beginning of the period and the number of workers in the top quartile at the end of the period (Source: VW Histories from INPS).

Turnover – P25

One minus the number of workers in the bottom quartile who remain in the firm from the beginning to the end of the period divided by the minimum between the number of workers in the bottom quartile at the beginning of the period and the number of workers in the bottom quartile at the end of the period (Source: VW Histories from INPS).

Turnover – P66

One minus the number of workers in the top tercile who remain in the firm from the beginning to the end of the period divided by the minimum between the number of workers in the top tercile at the beginning of the period and the number of workers in the top tercile at the end of the period (Source: VW Histories from INPS).

Turnover – 33

One minus the number of workers in the bottom tercile who remain in the firm from the beginning to the end of the period divided by the minimum between the number of workers in the bottom tercile at the beginning of the period and the number of workers in the bottom tercile at the end of the period (Source: VW Histories from INPS).

Investment and Payout Variables

Investment

Change in fixed assets (*fias*) before depreciation (*depr*) relative to the prior year's total assets (*toas*) (Source: Orbis).

Payout

Net income (*pl*) net of the change in total equity (*shfd*) relative to the prior year's total assets (*toas*) (Source: Orbis).

Firm Controls

PPE

Fixed assets (*fias*) relative to the prior year's total assets (*toas*) (Source: Orbis).

Leverage

Total liabilities (*ncli + culi*) relative to total assets (*toas*) (Source: Orbis).

Size

Natural logarithm of total assets (*toas*) (Source: Orbis).

Cash Holdings

Cash (*cash*) relative to the prior year's total assets (*toas*) (Source: Orbis).

Employee Controls

<i>% Same Region Employees</i>	Percentage of employees from the same region where a firm resides in a fiscal year (Source: VW Histories from INPS).
<i>% Same Province Employees</i>	Percentage of employees from the same province where a firm resides in a fiscal year (Source: VW Histories from INPS).
<i>% Female Employees</i>	Percentage of female employees in a fiscal year (Source: VW Histories from INPS).
<i>Avg. Tenure</i>	Total tenure (in years) of the employees scaled by the number of employees in a fiscal year (Source: VW Histories from INPS).
<u><i>Labor reform Variables</i></u>	
<i>Post</i>	Indicator variable equal to one in the years following the reform (from 1997 onward) and zero otherwise.
<i>Unionization rate</i>	One minus the unionization rate for each Italian province, computed as the number of workers affiliated with the CGIL union divided by the estimated workforce (Source: CGIL and ISTAT).

Appendix B. The model

Each firm hires two workers, denoted worker h and worker l . Worker h is more qualified than worker l , which results in higher marginal productivity. Firm sales depend on the workers' effort. The effort of the more qualified worker h coincides with her wage:

$$E_h(w_h) = w_h \quad (\text{B1})$$

For the less qualified worker l , we follow the CK model and assume she makes her effort decision based on the “fair wage-effort hypothesis.” Akerlof and Yellen (1990) provide several examples that justify this hypothesis in firms with, for instance, more unionized workers. According to this hypothesis, the effort is a linear combination of the worker's wage, denoted w_l , and her wage relative to that of her coworker:²⁰

$$E_l(w_l, w_h) = (1 - \alpha)w_l + \alpha(w_l - w_h) \quad (\text{B2})$$

with $0 \leq \alpha \leq 1$ the relative sensitivity of the worker's effort to the wage gap with respect to her coworker ($w_l - w_h$).

Each worker generates sales, S , that are increasing ($S'(E) > 0$) and concave ($S''(E) < 0$) with respect to the worker's effort.²¹ Hence, within the same firm, the sales generated by worker l are $S_l = S(E_l(w_l, w_h))$. Worker h is more productive than worker l and generates sales equal to $S_h = \theta S(E_h(w_h))$, with $\theta > 1$. The firm's operating profits are therefore equal to:

$$\Pi = S(w_l - \alpha w_h) + \theta S(w_h) - w_l - w_h. \quad (\text{B3})$$

²⁰ CK model the case of nonsymmetric fair-wage hypothesis, whereby the worker puts less effort when her wage trails that of her coworker but fails to put more effort otherwise. The empirical implications are analogous to those derived in the symmetric setting that we analyze.

²¹ The superscripts ' and '' denote the first and the second derivatives with respect to effort, respectively. We will see these are sufficient and necessary conditions for the optimal wages.

The firm must choose wages, w_l for worker l and w_h for worker h , that maximize its expected profits in (B3). The first-order conditions of this problem imply the following optimality conditions for effort:²²

$$S'(E_h) = \frac{1 + \alpha}{\theta} \tag{B4}$$

$$S'(E_l) = 1$$

Given that S is increasing and concave with respect to effort and $\theta > 1$, for $\alpha = 0$, $E_h > E_l$. Given (B1) and (B2), wages can be written as a function of effort as follows:

$$w_h = E_h \tag{B5}$$

$$w_l = E_l + \alpha E_h$$

The equations in (B5) show that the wages for both workers increase one to one with their effort. However, due to the relative wage preferences of worker l , her wage also increases with the effort spent by her coworker. This is because the higher effort of coworker h widens the wage gap, which decreases the effort exerted by worker l , making it optimal for the firm to increase her wage by αE_h .

Taking the total derivative of (B4) with respect to α , we obtain the following expressions:

$$\frac{\partial E_h}{\partial \alpha} = \frac{1}{S''(E_h)\theta} < 0 \tag{B6}$$

$$\frac{\partial E_l}{\partial \alpha} = 0$$

The more qualified worker works harder and sells more when the less qualified worker's sensitivity to wage inequality is lower. Meanwhile, the effort decision of the less qualified worker (and, therefore, her sales) is independent of α . We next study the implications of these results for

²² The second order conditions require $S''(E_h) < 0$ and $S''(E_l) < 0$, respectively.

wage dispersion within firms. Let the ratio $\frac{w_l}{w_h}$ represent the wage gap.²³ Given (B5), we can write this ratio as follows:

$$\frac{w_l}{w_h} = \alpha + \frac{E_l}{E_h} \quad (\text{B7})$$

Taking the derivative of (B7) with respect to α and given (B6), we obtain the following expression:

$$\frac{\partial}{\partial \alpha} \frac{w_l}{w_h} = 1 - \frac{E_l}{(E_h)^2} \frac{\partial E_h}{\partial \alpha} > 0 \quad (\text{B8})$$

This result leads to **Prediction 1**.

What are the implications for the wages of each worker type? Does higher wage dispersion necessarily imply savings in total wages for the firm?

To answer these questions, we take the partial derivative of the optimal wage equations in (B5) with respect to α . Replacing (B6), we obtain the following expressions:

$$\begin{aligned} \frac{\partial w_h}{\partial \alpha} &= \frac{\partial E_h}{\partial \alpha} < 0 \\ \frac{\partial w_l}{\partial \alpha} &= \frac{\partial E_l}{\partial \alpha} + E_h + \alpha \frac{\partial E_h}{\partial \alpha} \end{aligned} \quad (\text{B9})$$

Given that $\frac{\partial E_l}{\partial \alpha} = 0$, the bottom equation in (B9) implies that $\frac{\partial w_l}{\partial \alpha} > 0$ if and only if

$$-\frac{\frac{\partial E_h}{\partial \alpha}}{\frac{E_h}{\alpha}} < 1 \quad (\text{B10})$$

In other words, the optimal wage of the more skilled workers is expected to increase when α decreases. The salary of the less skilled worker is expected to decrease when her sensitivity to

²³ The convention is to represent the wage gap by the ratio of higher pay to lower pay within the firm $\frac{w_h}{w_l}$. However, given (5), the algebra is much simpler with the inverse ratio and the conclusions are, obviously, symmetrical.

the wage gap decreases if and only if the elasticity of the more skilled worker's effort with respect to α is less than one. Intuitively, as shown in the bottom equation in (B5), holding E_h constant, the wage of the less skilled worker decreases when α decreases. However, decreasing α simultaneously increases the optimal effort provision E_h . Therefore, w_l decreases when α decreases only if the percentage change in α is less than or directly proportional (1 to 1) to the effort provision of the more skilled worker. Since E_h is unobservable, how the salary of less skilled workers changes with their sensitivity toward fair wages is an empirical question. This is

Prediction 2.

What is the net expected effect of these dynamics on the firm's sales and operating profits? The company's total sales are given by $S = S(E_l) + \theta S(E_h)$. Taking the derivative with respect to α and given the equations in (B4) and (B6), we obtain the following expression:

$$\frac{dS}{d\alpha} = \frac{\partial E_l}{\partial \alpha} + \theta \frac{1 + \alpha}{\theta} \frac{\partial E_h}{\partial \alpha} = \frac{1 + \alpha}{\theta S''(E_h)} < 0 \quad (\text{B11})$$

Therefore, when the sensitivity to fair wages decreases, sales are expected to increase since more productive workers will have incentives to put forth more effort.

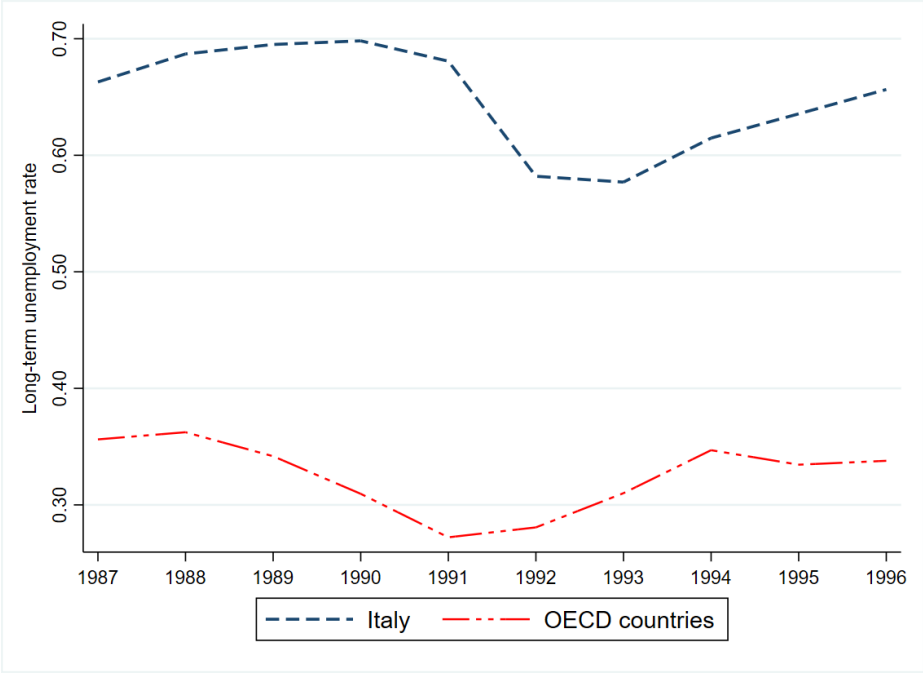
Using the first-order conditions for wages in (B4), that is, $\frac{\partial \Pi}{\partial w_h} = \frac{\partial \Pi}{\partial w_l} = 0$, we can write the total derivative of the firm's profit in equation (B3) with respect to α . Given (B4), it follows that:

$$\frac{d\Pi}{d\alpha} = \frac{\partial \Pi}{\partial \alpha} = -S'(E_l)w_h = -w_h < 0 \quad (\text{B12})$$

This is **Prediction 3**. It is important to note that Prediction 2 shows that the increase in profits does not follow trivially from savings in total wages. When α changes, incentives for the more qualified workers change—as shown in (B6)—and so do optimal wages for both workers—as predicted by (B9)—to keep profits unchanged. According to (B11), the higher performance of firms where workers are less concerned about wage inequality is driven by the increase in the

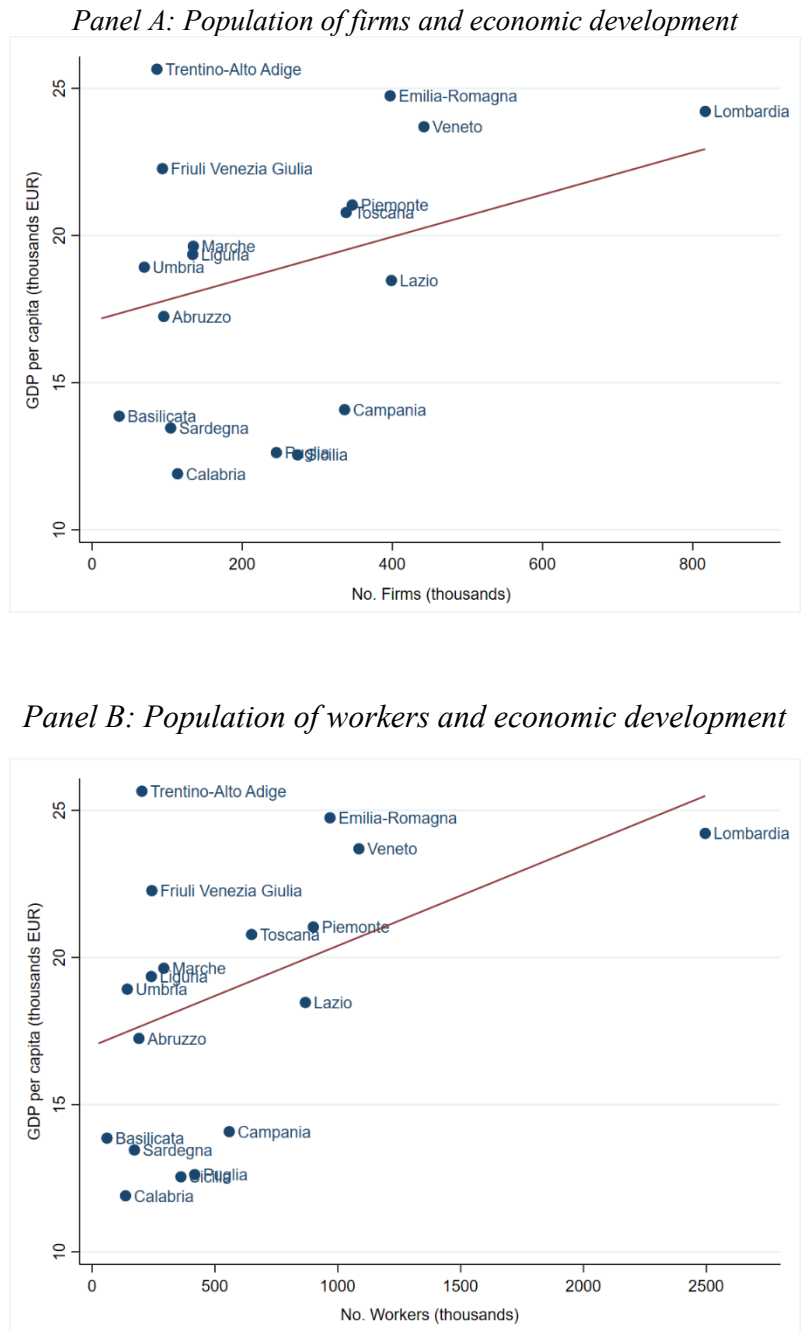
efficiency of the incentives for less skilled workers. This increase should be higher among companies where more qualified workers are paid more.

Figure 1. The long-term unemployment rate in Italy relative to OECD countries before the 1997 Treu Reform



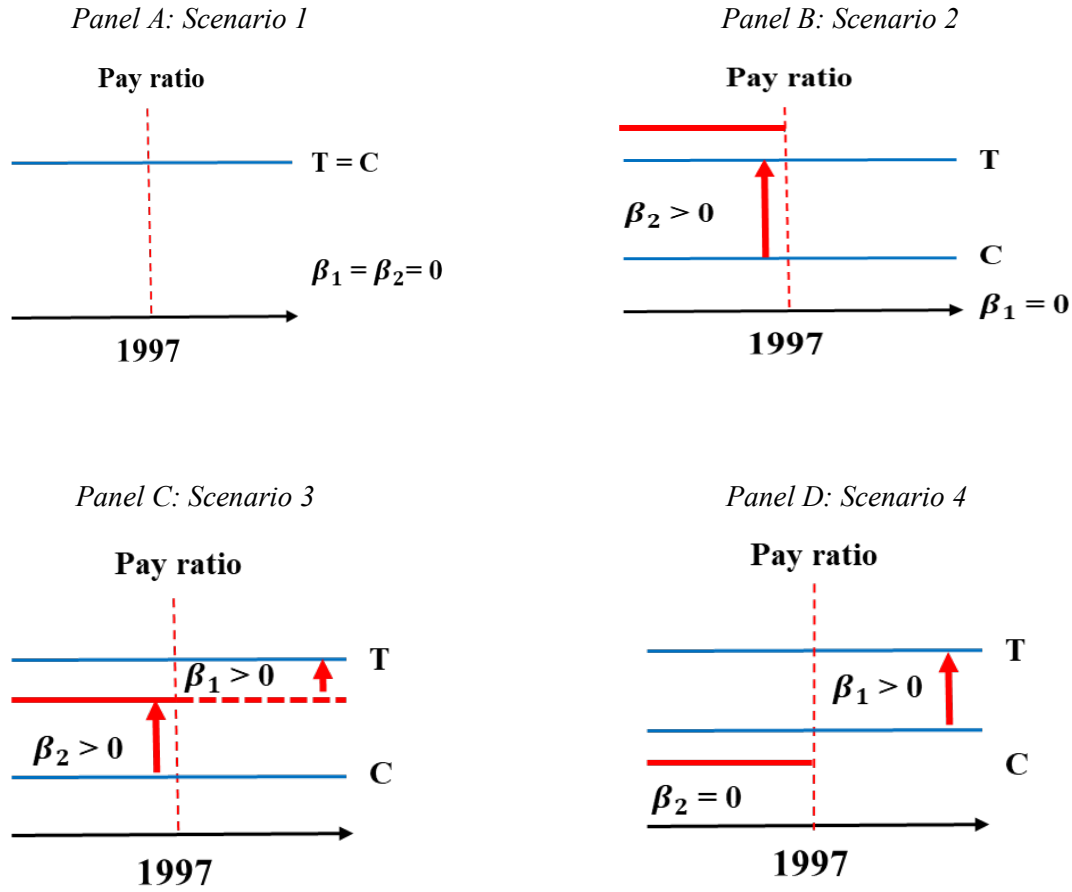
This figure displays the variation in the long-term unemployment rate in Italy relative to the average long-term unemployment rate of OECD countries from 1987 to 1996.

Figure 2. Distribution of firms and workers and economic development in Italy



This figure depicts the relation between economic development (y-axis) and the number of firms (Panel A) and workers (Panel B) for Italian regions. Economic development is proxied with GDP per capita using ISTAT data for the 1987-1996 period. The numbers of firms and workers are measured as the population of registered firms and workers in Italy using ISTAT data for the 1987-1996 period.

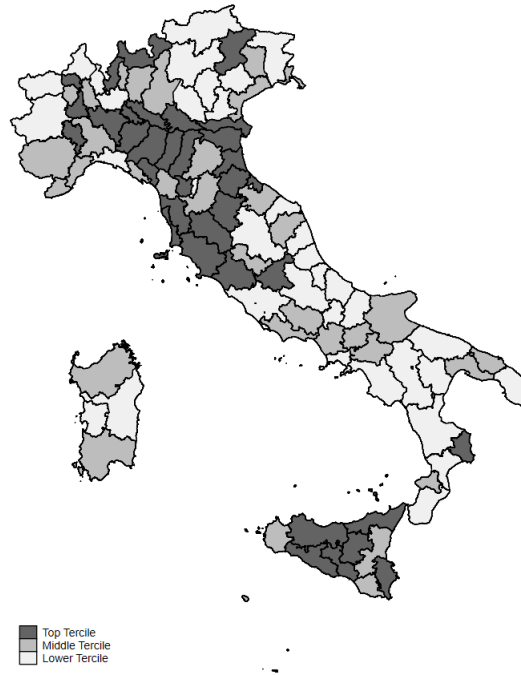
Figure 3. Conceptual framework of our study



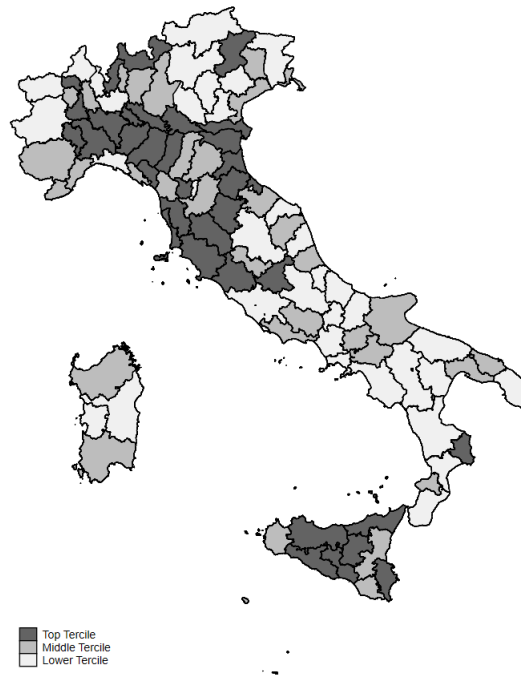
This figure displays the conceptual framework outlined in Section 3.3.1. The capitalized letter *T* proxies for the expected response of treatment group firms (those in provinces with a low unionization rate), whereas the letter *C* proxies for the expected response of control group firms (those in provinces with a high unionization rate). The red line represents the legal constraints on pay inequality before the 1997 labor reform.

Figure 4. Unionization rate across Italian provinces

Panel A. Unionization rate in 1996 (before the reform)

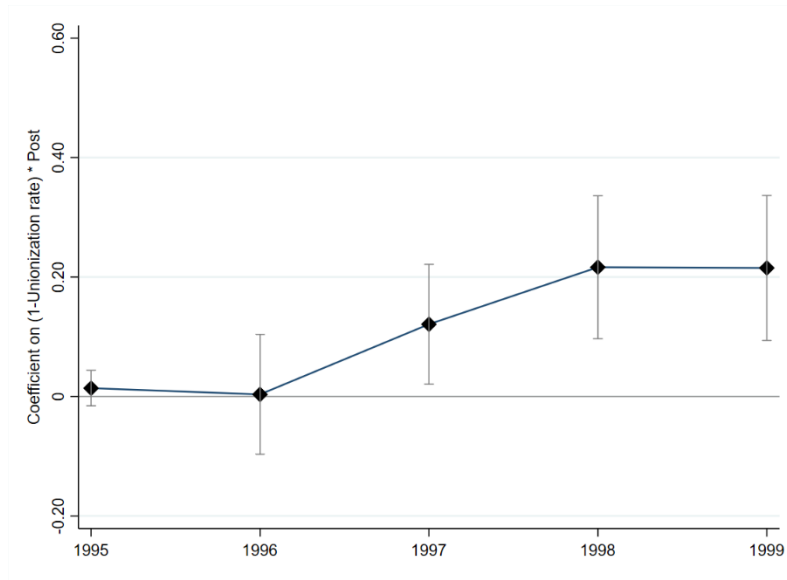


Panel B. Unionization rate in 1998 (after the reform)



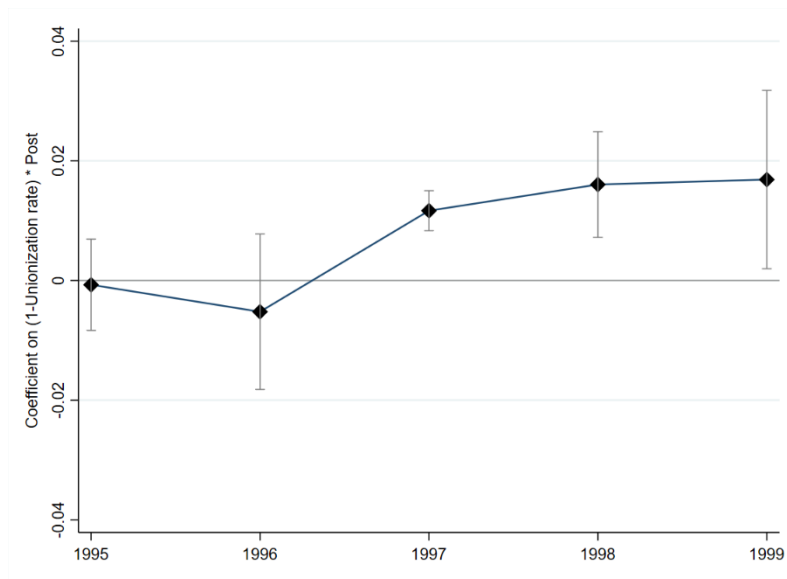
This figure displays the variation in the unionization rate across Italian provinces at two points over the sample period (i.e., in 1996 and 1998).

Figure 5. Cumulative changes in the pay ratio



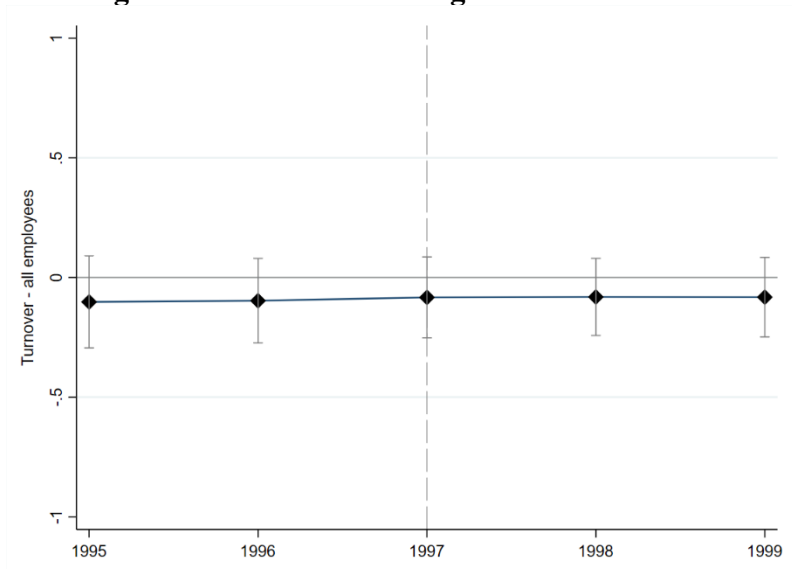
This figure plots the cumulative difference in *the pay ratio 80/20* of treated and control firms over the 1995-1999 period. Treated firms are in provinces with low unionization rates within 18 Italian regions. Control firms are in provinces with high unionization rates in the same Italian region. The model specification includes firm, industry-year, and region-year fixed effects. Heteroskedasticity-robust standard errors are clustered at the province level. The connected line indicates the 95% confidence interval.

Figure 6. Cumulative changes in performance



This figure plots the cumulative difference in *RNOA* of treated and control firms over the 1995-1999 period. Treated firms are in provinces with low unionization rates within 18 Italian regions. Control firms are in provinces with high unionization rates in the same Italian region. The model specification includes firm, industry-year, and region-year fixed effects. Heteroskedasticity-robust standard errors are clustered at the province level. The connected line indicates the 95% confidence interval.

Figure 7. Cumulative changes in turnover rate



This figure plots the cumulative difference in the *Turnover – all employees* of treated firms relative to counterfactual firms from 1995 to 1999. Treated firms are in provinces with low unionization within 18 Italian regions. Control firms are in provinces with high unionization in the same Italian region. The model specification includes firm and employee controls and firm, industry–year, and region–year fixed effects. Heteroskedasticity-robust standard errors are clustered at the province level. The connected line indicates the 95% confidence interval. The gray vertical line separates the pre-reform period from the post-reform years.

Table 1. Sample selection and composition*Panel A: Sample Selection Criteria*

Sample downloaded on July 15, 2019	445,402
- Exclude firm-year obs. with fewer than ten employees	(257,927)
- Exclude firm-year obs. with missing variables	(148,508)
Final Sample	38,967

Panel B: Firm-Year Observations by Year

<i>Year</i>	<i>Obs.</i>	<i>%</i>
1994	1,372	3.50
1995	2,169	5.60
1996	4,144	10.6
1997	7,493	19.20
1998	7,318	18.80
1999	8,050	20.70
2000	8,421	21.60
Total	38,967	100

Panel C: Firm-Year Observations by Region

<i>Category</i>	<i>Obs.</i>	<i>%</i>
Abruzzo	134	0.34
Basilicata	50	0.13
Calabria	10	0.03
Campania	117	0.3
Emilia-Romagna	1,784	4.58
Friuli-Venezia Giulia	2,123	5.45
Lazio	593	1.52
Liguria	165	0.42
Lombardia	2,615	6.71
Marche	94	0.24
Piemonte	693	1.78
Puglia	206	0.53
Sardegna	69	0.18
Sicilia	168	0.43
Toscana	362	0.93
Trentino-Alto Adige	771	1.98
Umbria	59	0.15
Veneto	28,954	74.3
Total	38,967	100

Panel D: Firm-Year Observations by Number of Employees

<i>Size</i>	<i>Obs.</i>	<i>%</i>
10 ≤ Number of employees < 15	12,085	31.01
15 ≤ Number of employees < 25	7,606	19.52
25 ≤ Number of employees < 50	9,654	24.77
50 ≤ Number of employees < 100	5,730	14.70
100 ≤ Number of employees < 250	2,851	7.32
Number of employees ≥ 250	1,041	2.68
Total	38,967	100

This table presents the sample selection procedure and the sample composition. Panel A describes the sample selection procedure. Panels B, C, and D present the sample distribution by year, region, and number of employees, respectively. All variables are defined in Appendix A.

Table 2. Descriptive Statistics

	<i>Obs.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>P25</i>	<i>Median</i>	<i>P75</i>
<u><i>Labor variables:</i></u>						
(1 – Unionization rate)	38,967	0.9115	0.1002	0.9275	0.9462	0.9513
<u><i>Inequality variables:</i></u>						
Pay ratio 80/20	38,967	4.6401	23.1103	1.9454	2.9849	4.7885
Pay ratio 75/25	38,967	3.2108	7.1710	1.5547	2.2055	3.4346
Pay ratio 66/33	38,967	2.0327	3.4379	1.2400	1.5302	2.1529
<u><i>Employment variables:</i></u>						
Total labor costs	38,967	6.0799	1.0718	5.3172	5.9872	6.7227
Employment growth	38,967	0.0726	0.2418	-0.0561	0.0278	0.1538
Turnover – All employees	38,967	0.1340	0.1392	0.0000	0.1034	0.2000
Turnover – P80	38,967	0.4648	0.3038	0.2500	0.5000	0.6667
Turnover – P75	38,967	0.4417	0.2836	0.2500	0.4545	0.6429
Turnover – P66	38,967	0.4003	0.2628	0.2000	0.4000	0.5758
Turnover – P33	38,967	0.0726	0.2418	-0.0561	0.0278	0.1538
Turnover – P25	38,967	0.0367	0.1031	0.0000	0.0000	0.0000
Turnover – P20	38,967	0.0341	0.1070	0.0000	0.0000	0.0000
<u><i>Operating performance variables:</i></u>						
Sales growth	38,967	0.0334	0.2994	-0.0761	0.0233	0.1272
RNOA	38,967	0.1042	0.1087	0.0450	0.0766	0.1303
ROA	38,967	0.0817	0.0750	0.0378	0.0638	0.1054
<u><i>Investment and payout variables:</i></u>						
Investment	38,967	0.0662	0.1075	0.0095	0.0365	0.0890
Payout	38,967	0.0186	0.0385	0.0000	0.0028	0.0219
<u><i>Firm controls:</i></u>						
PPE	38,967	0.2851	0.2103	0.1239	0.2395	0.3908
Leverage	38,967	0.7693	0.1831	0.6806	0.8128	0.9046
Size	38,967	8.6738	1.3964	7.6704	8.4158	9.4193
Cash holdings	38,967	0.0655	0.0970	0.0040	0.0241	0.0850
<u><i>Employee controls:</i></u>						
% Same Region Employees	38,967	0.8477	0.2601	0.8462	0.9697	1.0000
% Same Province Employees	38,967	0.7565	0.2827	0.6533	0.8710	0.9630
% Female Employees	38,967	0.2852	0.2456	0.0938	0.2105	0.4286
Avg. Tenure	38,967	5.3489	0.5673	5.0434	5.4430	5.7585

This table provides descriptive statistics for different measures of within-firm pay inequality, employment, operating performance, investment, and payout, and for firm and employee controls. The variables *Pay ratio 80/20*, *Pay ratio 75/25*, and *Pay ratio 66/33* are not on a logarithmic scale. All variables are defined in Appendix A.

Table 3. Unionization rate and within-firm pay inequality

<i>Independent variables:</i>	<i>Dependent variable:</i>					
	<i>Pay ratio 80/20</i>		<i>Pay ratio 75/25</i>		<i>Pay ratio 66/33</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Labor reform variables:</i>						
$(1 - \text{Unionization rate}) \times \text{Post}$	0.2010** (0.0928)	0.2298** (0.0946)	0.2592*** (0.0913)	0.2934*** (0.0920)	0.1669** (0.0775)	0.1852** (0.0783)
$(1 - \text{Unionization rate})$	0.0087 (0.1332)	0.0076 (0.1386)	0.1886 (0.1370)	0.1870 (0.1435)	0.0053 (0.1012)	0.0021 (0.1036)
<i>Firm controls:</i>						
<i>PPE</i>		0.0485 (0.0360)		0.0664** (0.0288)		0.0325 (0.0258)
<i>Leverage</i>		0.0047 (0.0279)		-0.0100 (0.0209)		-0.0210 (0.0232)
<i>Size</i>		-0.0489*** (0.0162)		-0.0605*** (0.0111)		0.0458*** (0.0118)
<i>Cash Holdings</i>		0.0124 (0.0443)		0.0745* (0.0439)		-0.0048 (0.0349)
<i>Employee controls:</i>						
<i>% Same Region Employees</i>		-0.2370*** (0.0856)		-0.2296** (0.0890)		-0.1382* (0.0696)
<i>% Same Province Employees</i>		0.0819 (0.0863)		0.0160 (0.0854)		-0.0036 (0.0645)
<i>% Female Employees</i>		0.0651 (0.0587)		0.0148 (0.0502)		0.0734 (0.0449)
<i>Avg. Tenure</i>		0.2103*** (0.0300)		0.2418*** (0.0262)		0.1309*** (0.0204)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	38,967	38,967	38,967	38,967	38,967	38,967
Adj. R ²	0.486	0.489	0.506	0.512	0.451	0.454

This table examines the effect of the unionization rate after the 1997 labor reform on within-firm pay inequality. The dependent variables are *Pay ratio 80/20* (Columns (1) and (2)), *Pay ratio 75/25* (Columns (3) and (4)), and *Pay ratio 66/33* (Columns (5) and (6)). The model specifications include firm, industry–year, and region–year fixed effects. The table reports (in parentheses) heteroskedasticity-robust standard errors clustered at the province level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in Appendix A.

Table 4. Unionization rate and within-firm pay inequality: Decomposing the pay ratio

<i>Independent variables:</i>	<i>Dependent variable:</i>					
	<i>P80</i>	<i>P20</i>	<i>P75</i>	<i>P25</i>	<i>P66</i>	<i>P33</i>
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Labor reform variables:</i>						
$(1 - \text{Unionization rate}) \times \text{Post}$	0.0692* (0.0359)	-0.2418** (0.1110)	0.0585* (0.0342)	-0.2617** (0.1147)	0.0516* (0.0302)	-0.2323** (0.1096)
$(1 - \text{Unionization rate})$	0.0519 (0.0810)	-0.0138 (0.1283)	0.0149 (0.0810)	-0.0771 (0.1326)	0.1324* (0.0671)	-0.0027 (0.1228)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	38,967	38,967	38,967	38,967	38,967	38,967
Adj. R ²	0.189	0.618	0.192	0.646	0.199	0.677

This table examines the effect of the unionization rate after the 1997 labor reform on within-firm pay inequality. The dependent variables are *P80* (Column (1)), *P20* (Column (2)), *P75* (Column (3)), *P25* (Column (4)), *P66* (Column (5)), and *P33* (Column (6)). The model specifications include firm, industry–year, and region–year fixed effects. The controls are the same as in Table 3. The table reports (in parentheses) heteroskedasticity-robust standard errors clustered at the province level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in Appendix A.

Table 5. Unionization rate and operating performance

<i>Independent variables:</i>	<i>Dependent variable:</i>					
	<i>RNOA</i>		<i>ROA</i>		<i>Sales growth</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Labor reform variables:</i>						
$(1 - \text{Unionization rate}) \times \text{Post}$	0.0227*** (0.0064)	0.0260*** (0.0068)	0.0200** (0.0078)	0.0244*** (0.0070)	0.0589* (0.0350)	0.0940** (0.0415)
$(1 - \text{Unionization rate})$	0.0096 (0.0110)	0.0080 (0.0133)	0.0242* (0.0127)	0.0257* (0.0138)	0.1271 (0.1045)	0.0998 (0.1218)
<i>Firm controls:</i>						
<i>PPE</i>		-0.0241*** (0.0030)		-0.0332*** (0.0043)		0.3309*** (0.0397)
<i>Leverage</i>		0.0262*** (0.0032)		-0.0422*** (0.0101)		0.1248*** (0.0306)
<i>Size</i>		-0.0514*** (0.0018)		-0.0336*** (0.0028)		-0.4291*** (0.0728)
<i>Cash Holdings</i>		0.0050 (0.0036)		0.0918*** (0.0099)		-0.0502 (0.0420)
<i>Employee controls:</i>						
<i>% Same Region Employees</i>		-0.0038 (0.0080)		0.0009 (0.0085)		-0.0145 (0.0675)
<i>% Same Province Employees</i>		0.0006 (0.0064)		-0.0058 (0.0080)		0.0255 (0.0609)
<i>% Female Employees</i>		-0.0040 (0.0044)		-0.0051 (0.0070)		0.0050 (0.0252)
<i>Avg. Tenure</i>		-0.0017 (0.0016)		-0.0003 (0.0024)		0.0075 (0.0210)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	38,967	38,967	38,967	38,967	38,967	38,967
Adj. R ²	0.648	0.673	0.653	0.663	0.261	0.0433

This table examines the effect of the unionization rate after the 1997 labor reform on operating performance. The dependent variables are *RNOA* (Columns (1) and (2)), *ROA* (Columns (3) and (4)), and *sales growth* (Columns (5) and (6)). The model specifications include firm, industry–year, and region–year fixed effects. The table reports (in parentheses) heteroskedasticity-robust standard errors clustered at the province level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in Appendix A.

Table 6. Additional evidence: Unionization rate, investment, and payout

<i>Independent variables:</i>	<i>Dependent variable:</i>	
	<i>Investment</i>	<i>Payout</i>
	(1)	(2)
<i>Labor reform variables:</i>		
$(1 - \text{Unionization rate}) \times \text{Post}$	0.0288* (0.0164)	0.0170*** (0.0058)
$(1 - \text{Unionization rate})$	0.0222 (0.0393)	0.0487*** (0.0112)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Industry \times Year fixed effects	Yes	Yes
Region \times Year fixed effects	Yes	Yes
Obs.	38,967	38,967
Adj. R ²	0.240	0.452

This table examines the effect of the unionization rate after the 1997 labor reform on investment and payout. The dependent variables are *Investment* (Column (1)) and *Payout* (Column (2)). The model specifications include firm, industry–year, and region–year fixed effects. The controls are the same as in Table 3. The table reports (in parentheses) heteroskedasticity-robust standard errors clustered at the province level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in Appendix A.

Table 7. Unionization rate, total labor costs, and within-firm employee turnover

	<i>Dependent variable:</i>								
	<i>Total labor costs</i>	<i>Employment growth</i>	<i>Turnover All employees</i>	<i>Turnover P80</i>	<i>Turnover P20</i>	<i>Turnover P75</i>	<i>Turnover P25</i>	<i>Turnover P66</i>	<i>Turnover P33</i>
<i>Independent variables:</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Labor reform variables:</i>									
$(1 - \text{Unionization rate}) \times \text{Post}$	0.0116 (0.0552)	0.0588 (0.0564)	0.0194 (0.0146)	-0.0139 (0.0227)	0.0901 (0.0677)	-0.0109 (0.0199)	0.0388 (0.0520)	0.0070 (0.0122)	0.0648 (0.0446)
$(1 - \text{Unionization rate})$	0.0774 (0.1316)	0.0020 (0.1101)	-0.0005 (0.0251)	0.0023 (0.0307)	-0.0967 (0.0804)	-0.0013 (0.0283)	-0.0949 (0.0660)	0.0176 (0.0219)	-0.0412 (0.0525)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	38,967	38,967	38,967	38,967	38,967	38,967	38,967	38,967	38,967
Adj. R ²	0.965	0.149	0.520	0.241	0.253	0.276	0.290	0.354	0.346

This table examines the effect of the unionization rate after the 1997 labor reform on total labor costs, employment growth, and employee turnover. The dependent variables are *Total labor costs* (Column (1)), *Employment growth* (Column (2)), *Turnover – All employees* (Column (3)), *Turnover – P80* (Column (4)), *Turnover – P20* (Column (5)), *Turnover – P75* (Column (6)), *Turnover – P25* (Column (7)), *Turnover – P66* (Column (8)), and *Turnover – P33* (Column (9)). The model specifications include firm, industry–year, and region–year fixed effects. The controls are the same as in Table 3. The table reports (in parentheses) heteroskedasticity-robust standard errors clustered at the province level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in Appendix A.

Table 8. Unionization rate, within-firm pay inequality, and operating performance: Robustness tests

Panel A. Unionization rate and within-firm pay inequality

	<i>Dependent variable:</i>								
	<i>1994-1996 vs. 1998-2000</i>			<i>1995-1996 vs. 1998-1999</i>			<i>No gaps in the sample</i>		
	<i>Pay ratio</i> <i>80/20</i>	<i>Pay ratio</i> <i>75/25</i>	<i>Pay ratio</i> <i>66/33</i>	<i>Pay ratio</i> <i>80/20</i>	<i>Pay ratio</i> <i>75/25</i>	<i>Pay ratio</i> <i>66/33</i>	<i>Pay ratio</i> <i>80/20</i>	<i>Pay ratio</i> <i>75/25</i>	<i>Pay ratio</i> <i>66/33</i>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Independent variables:</i>									
<i>Labor reform variables:</i>									
$(1 - \text{Unionization rate}) \times \text{Post}$	0.2412** (0.1123)	0.2881*** (0.0938)	0.1738** (0.0814)	0.1996* (0.1074)	0.2477*** (0.0839)	0.1316* (0.0748)	0.1861* (0.1021)	0.2561*** (0.0746)	0.1566** (0.0775)
$(1 - \text{Unionization rate})$	0.0386 (0.1485)	0.1346 (0.1384)	-0.0471 (0.1103)	-0.1218 (0.1464)	0.0006 (0.1165)	-0.2062** (0.0994)	-0.0509 (0.1382)	-0.0591 (0.1026)	-0.0926 (0.0922)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	31,067	31,070	31,070	20,651	20,653	20,653	12,702	12,702	12,702
Adj. R ²	0.488	0.512	0.453	0.501	0.539	0.472	0.510	0.529	0.470

Panel B. Unionization rate and operating performance

	<i>Dependent variable:</i>								
	<i>1994-1996 vs. 1998-2000</i>			<i>1995-1996 vs. 1998-1999</i>			<i>No gaps in the sample</i>		
	<i>Sales growth</i>	<i>RNOA</i>	<i>ROA</i>	<i>Sales growth</i>	<i>RNOA</i>	<i>ROA</i>	<i>Sales growth</i>	<i>RNOA</i>	<i>ROA</i>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Independent variables:</i>									
<i>Labor reform variables:</i>									
$(1 - \text{Unionization rate}) \times \text{Post}$	0.0766* (0.0406)	0.0274*** (0.0061)	0.0273*** (0.0060)	0.0194*** (0.0067)	0.0217*** (0.0073)	0.0187*** (0.0066)	0.0163* (0.0086)	0.0766* (0.0406)	0.0274*** (0.0061)
$(1 - \text{Unionization rate})$	0.0529 (0.1373)	0.0067 (0.0137)	0.0198 (0.0142)	-0.0157 (0.0140)	0.0024 (0.0136)	0.0184 (0.0120)	0.0452*** (0.0158)	0.0529 (0.1373)	0.0067 (0.0137)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region \times Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	31,072	31,072	31,072	20,655	20,655	20,655	12,702	12,702	12,702
Adj. R ²	0.387	0.667	0.661	0.689	0.691	0.642	0.667	0.387	0.667

This table examines the effect of the unionization rate after the 1997 labor reform on within-firm pay inequality and operating performance over different sample periods. In Panel A, the dependent variables are *Pay ratio 80/20* (Columns (1), (4), and (7)), *Pay ratio 75/25* (Columns (2), (5), and (8)), and *Pay ratio 66/33* (Columns (3), (6), and (9)). In Panel B, the dependent variables are *RNOA* (Columns (1), (3), and (5)) and *ROA* (Columns (2), (4), and (6)). The model specifications include firm, industry-year, and region-year fixed effects. The controls are the same as in Table 3. The table reports (in parentheses) heteroskedasticity-robust standard errors clustered at the province level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in Appendix A.

Within-firm Pay Inequality and Firm Performance

Online Appendix

Table of contents

Figure A1. Distribution of firm-year observations by number of employees and geographic area

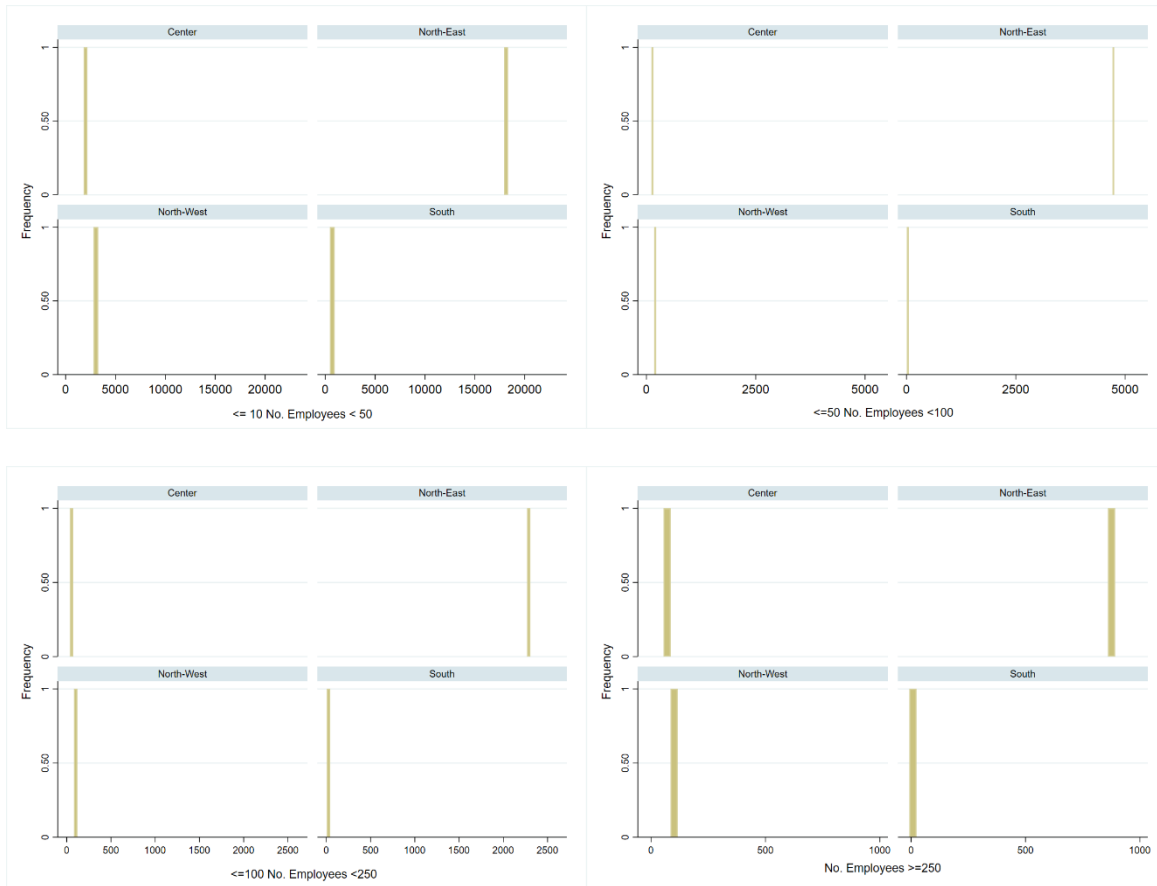
Figure A2. Distribution of firm-year observations by age and geographic area

Figure A3. Distribution of pseudo-treatment effects from randomized runs

Figure A4. Unionization rate and within-firm pay inequality: Excluding one region or regional capital at a time

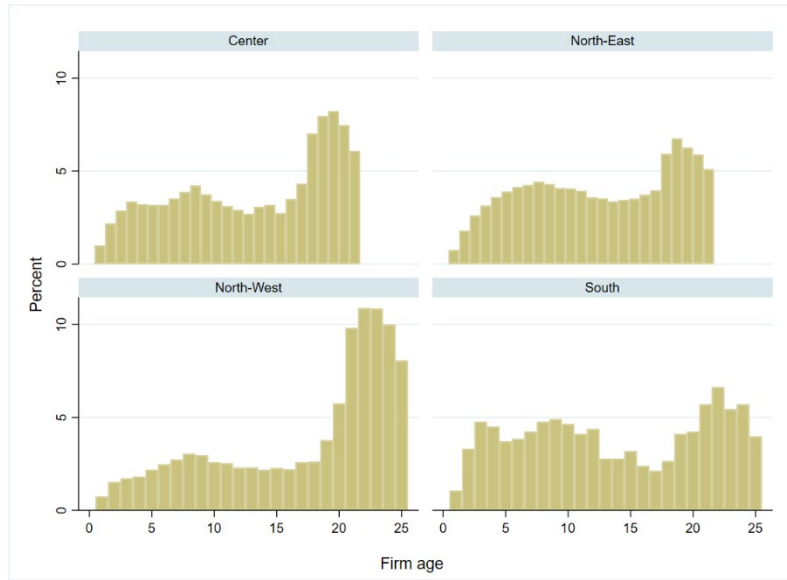
Figure A5. Unionization rate and operating performance: Excluding one region or capital at a time

Figure A1. Distribution of firm-year observations by number of employees and geographic area



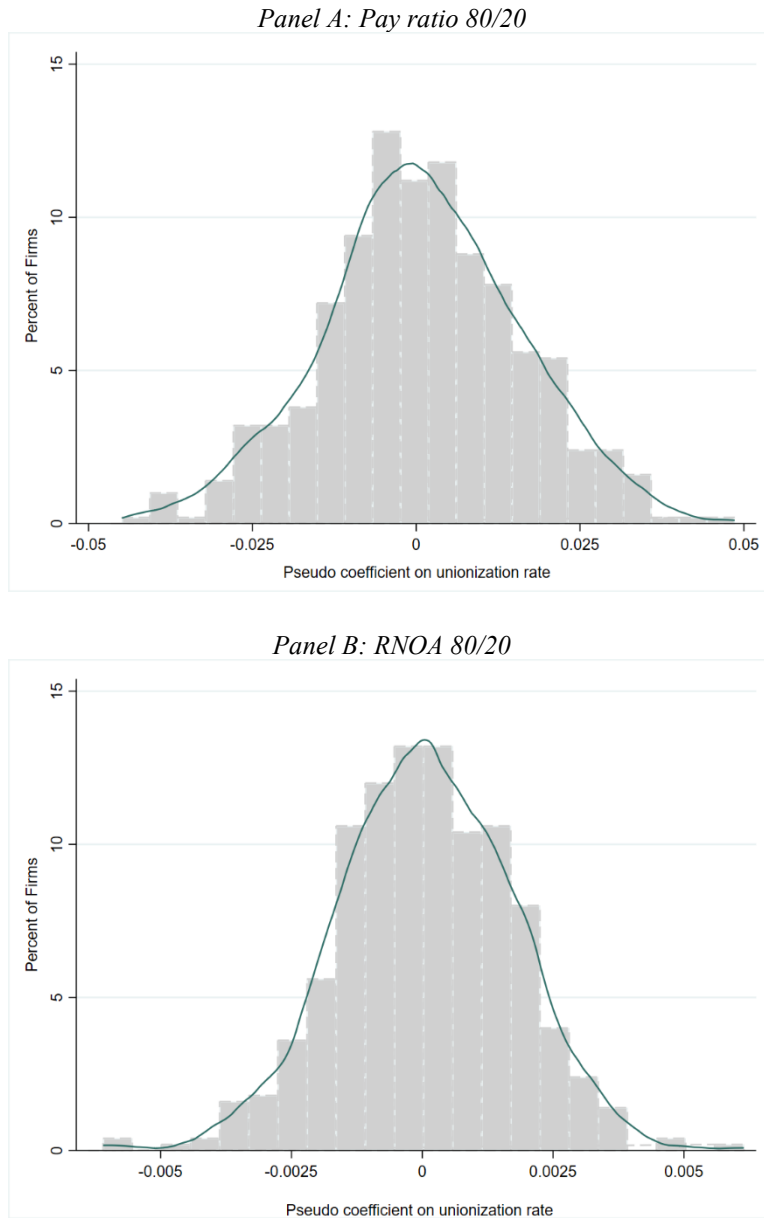
This figure displays the distribution of the sample firms by number of employees and geographic area.

Figure A2. Distribution of firm-year observations by age and geographic area



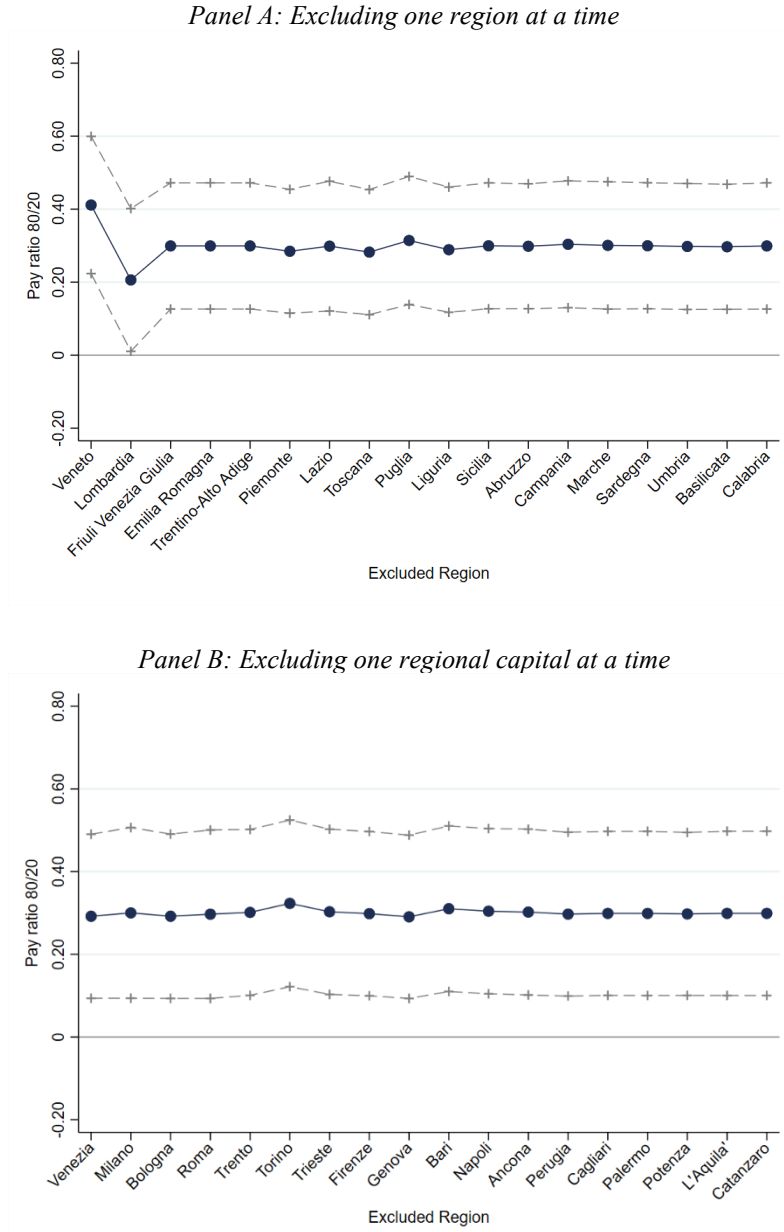
This figure displays the distribution of the sample firms by age and geographic area.

Figure A3. Distribution of pseudo-treatment effects from randomized runs



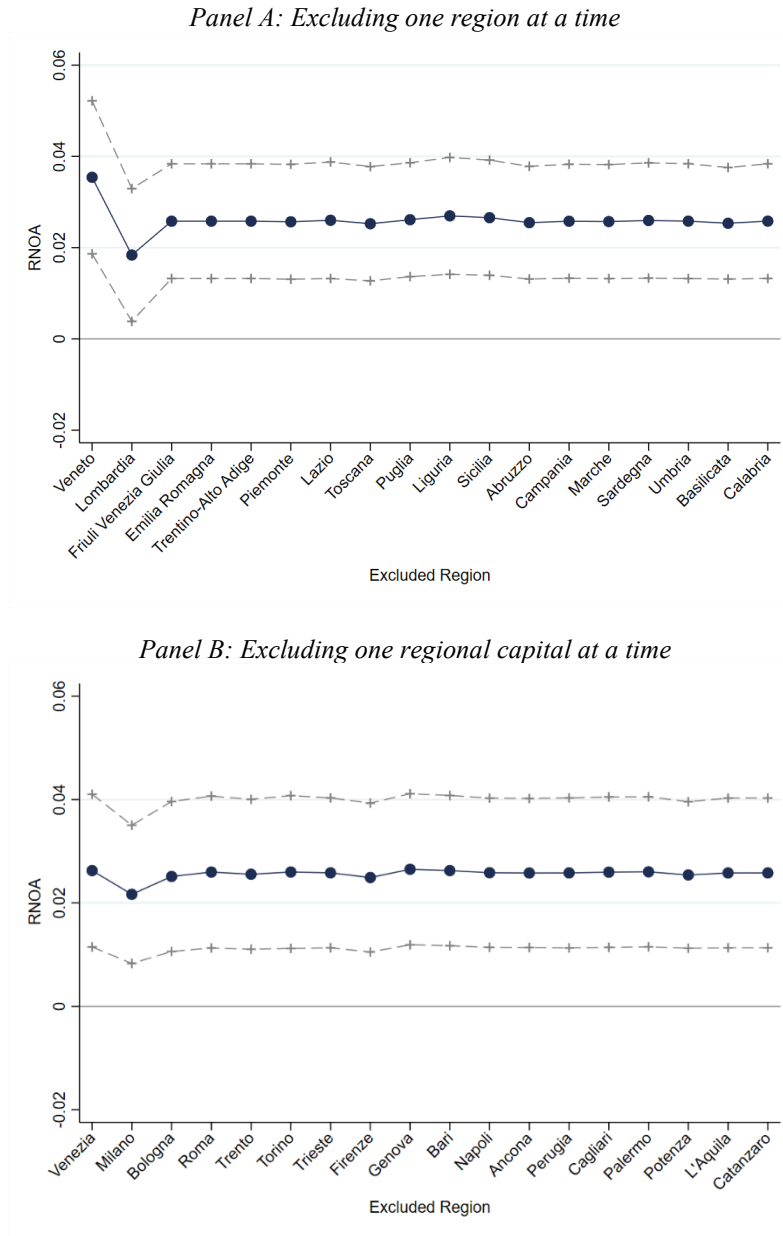
This figure constructs pseudotreatment groups to which the treatment, $(1 - \text{Unionization rate})$, is randomly assigned. The dependent variables are *Pay ratio 80/20* and *RNOA*. The random assignment and estimation are repeated 500 times. The model specification includes firm and employee controls and firm, industry-year, and region-year fixed effects. Heteroskedasticity-robust standard errors are clustered at the province level.

Figure A4. Unionization rate and within-firm pay inequality: Excluding one region or regional capital at a time



This figure displays the coefficients on $(1 - \text{Unionization rate}) \times \text{post}$ from the regression in equation (1), excluding one region (Panel A) or regional capital (Panel B) at a time. The dependent variable is the *Pay ratio 80/20*. The model specification includes firm and employee controls and firm, industry-year, and region-year fixed effects. Heteroskedasticity-robust standard errors are clustered at the province level. The dashed line indicates the 90% confidence interval.

Figure A5. Unionization rate and operating performance: Excluding one region or capital at a time



This figure displays the coefficients on $(1 - \text{Unionization rate}) \times \text{post}$ from the regression in equation (1), excluding one region (Panel A) or regional capital (Panel B) at a time. The dependent variable is the *RNOA*. The model specification includes firm and employee controls and firm, industry-year, and region-year fixed effects. Heteroskedasticity-robust standard errors are clustered at the province level. The dashed line indicates the 90% confidence interval.