Within-firm Pay Inequality and Firm Performance

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ABSTRACT

We use a unique data set of over two million matched employer-employee-year observations in Italy over the 1994-2000 period to identify the causal effect of a quasi-exogenous shock to within-firm pay inequality on firm performance, investment, and payout policies. Consistent with our theoretical hypotheses, we find that pay dispersion decreases among firms whose workers show higher sensitivity to pay inequality. These firms underperform firms with less sensitive workers. These underperforming firms also invest less and pay out less dividends after the shock, consistent with their lower free cash flows. Our results unveil a shadow cost of relative wage concerns for firms and the potential adverse effects of imposing an ad hoc limit on firms' pay dispersion.

Keywords: Pay inequality, firm performance, investment, payout policy, unions

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

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1. Introduction

Income inequality has become one of the most relevant concerns in the policy agenda of governments and international institutions around the world.[1] Although the most recent evidence suggests that on a global scale, income inequality across countries has declined since the 1970s (e.g., Hammar and Waldenstrom 2020), it is widely documented that the dispersion in labor income within advanced economies has steadily increased in recent decades (e.g., Acemoglu and Autor (2011) for the United States and Hard et al. (2013) for Germany).

In recent years, the availability of firm-level micro data has enabled researchers to dissect the components of income inequality and isolate the contribution of pay inequality within firms to the overall distribution of income at the country level.[2] Meanwhile, following the growing institutional and social pressure for income equality, an increasing number of countries require that companies periodically publish different ratios of pay inequality among their workers.[3]

Despite the increased awareness and disclosure of within-firm pay inequality, there is little direct evidence on the effect of pay inequality on firm performance and corporate decisions. 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 (Mueller et al. 2017b; Rouen 2020). Thus, empirically identifying the causal effect

[1] For instance, among the Sustainable Development Goals (SDGs) adopted by the United Nations in 2015, goal number 10 seeks specifically to reduce inequality across and within countries (available at https://www.undp.org/sustainable-development-goals#reduced-inequalities, last accessed December 27, 2021). In her political guidelines as a candidate to the presidency of the European Commission in December 2019, Ursula von der Leyden claimed that, "a prosperous and social Europe depends on us all. We need equality for all and equality in all of its senses." (available at https://ec.europa.eu/info/sites/default/files/political-guidelines-next-commission_en_0.pdf, last accessed December 27, 2021).

[2] Using a comprehensive US data set of firms and employees, Song et al. (2019) document that about one-third of the rise in the dispersion of income between 1978 and 2013 in that country took place within firms, while the remaining two-thirds was explained by an increase in dispersion of average income between firms. See also Gartenberg and Wulf (2020). For evidence in other countries, see Faggio et al. (2010) and Mueller et al. (2017a) for the United Kingdom; Haakanson et al. (2015) for Sweden; and Helpman et al. (2017) and Alvarez et al. (2018) for Brazil.

[3] Since 2015, the Securities and Exchange Commission (Section 953(b) of the Dodd-Frank Act) requires companies to disclose the ratio of median employee pay to median chief executive officer (CEO) pay. As of 2020, UK companies must report annually the ratio between their CEO's pay and the median, lower quartile and upper quartile pay of their UK employees (The Companies (Miscellaneous Reporting) Regulations 2018. Statutory Instruments 2018 No. 860).

of pay inequality on firm performance is essential for academics and policy makers alike. Our main contribution in this paper lies in identifying the causal effect of a quasi-exogenous shock to within-firm pay inequality on firm performance, investment, and payout in a countrywide sample of firms and employees covering a wide range of sectors.

From a theoretical standpoint, the observed dispersion of wages 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. Firms and workers are not randomly matched.

The testable predictions are derived from the model in Charness and Kuhn (2007). A worker's effort (and, ultimately, a firm's profit) depends on her salary and her salary relative to that of her coworkers. Firms must decide the compensation and the optimal pay dispersion of salaries to maximize profits. We use a unique data set of over 2 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 country-wide labor regulation reform in 1997 as a quasi-exogenous shock to firms' flexibility to set wages and, ultimately, pay dispersion. Then, for each firm, we proxy workers' concern about pay equality through the percentage of workers with union affiliations among all workers in the province where the firm is headquartered. We then perform a difference-in-differences analysis around the 1997 labor reform (first difference) across firms in more versus less unionized provinces (second difference).

Consistent with the model predictions, we report two main findings. First, after the reform grants all firms in Italy higher flexibility for setting wages, pay dispersion increases significantly more in firms located in provinces with low unionization (treated firms) relative to firms located in provinces with high unionization (control firms). We interpret this as evidence consistent with the notion that (treated) firms internalize their workers' concern about

wage inequality when such concern is sufficiently strong. Second, return on assets (ROA) is significantly lower for treated firms than for control firms after the reform. This evidence is consistent with asymmetric relative pay concerns whereby workers exert less effort when their salaries are lower than those of their coworkers but exert no extra effort when their salary is higher. Additionally, we show that firms that refrain from increasing pay dispersion after the reform, thus optimally catering to their workers' concerns for pay equality, invest sensibly less in fixed assets, and pay out less dividends than similar firms in provinces with lower relative pay concerns. This is consistent with lower free cash flows among treated firms.

These results are not due to an increase in unionization rates (which remain unaltered after the reform), to 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). Additionally, we include a battery of standard firm and employee control variables, and the results do not change. Other robustness tests show that our findings are not explained by worker replacement after the labor reform and cannot be replicated when we randomize the treatment effect across firms.

Theoretically, the effect of within-firm pay dispersion on firm performance is ambiguous. Tournament theory (e.g., Lazear and Rosen (1981)) predicts a positive relation based on the implicit incentives for promotion or retention embedded in a more inequal pay distribution. These effects are amplified for larger firms, e.g., Gabaix and Landier (2008) and Gayle and Miller (2009). On the other hand, equity theory (e.g., Akerlof and Yellen (1990)) predicts a negative relation based on workers' demotivation induced by sentiments of unfairness. The negative relation could also be explained by rent extraction theory (e.g., Bebchuck and Fried (2004) and Bebchuck et al. (2011)), according to which overpaid, rent-seeking executives hamper firm performance while maximizing private rents and increasing pay inequality. This

ambiguity in research predictions speaks to the importance of an empirical identification strategy.

Traditionally, models of pay inequality have been tested using field experiments confined to a single firm or a reduced number of competitors, e.g., Charness and Kuhn (2007), Card et al. (2012), Cohn et al. (2014), Breza, Kaur, and Shamdasani (2018), and Dube, Giuliano, and Leonard (2019). These papers show experimental (rarely casual) evidence of a negative relationship between pay disparities in the workplace and productivity, job satisfaction, and effort, supporting the predictions of equity theory.

More recently, the literature has moved beyond experimental evidence. Mueller, Ouiment, and Semintzi (2017b) use large data sets of firm-employee matched observations. They focus on the pay gap between top-ranking executives and the rest of firm workers. They find, on average, a positive correlation between pay dispersion and firm operating performance and observe that this correlation increases with firm size. The authors interpret this finding as supportive of the incentives-driven argument of tournament theory. Rouen (2020) arrives at similar conclusions.

In practice, however, not all firms (more specifically, their workers) are expected to be equally concerned about pay inequality. In contrast to the papers mentioned before, our extensive data sample and identification strategy allow us to compare the decisions of firms whose workers have different "pay-dispersion sensitivity" and draw causal conclusions. Additionally, our firms are relatively small; thus, competition for talent is much more subdued in our study than in Mueller, Ouiment, and Semintzi (2017) or Rouen (2020). This allows us to focus on the effects of the dispersion of pay among non-executive workers.

We show that firms optimally internalize this sensitivity, forgoing the opportunity to increase salary dispersion when their workers show a stronger dislike for pay inequality, consistent with the equity theory of wages. The operating performance of these firms, however,

is affected by the relative wage concerns of their workers. These firms underperform compared to firms where such concerns are less prominent. They also have lower free cashflows to reinvest or pay out to their shareholders.

The remainder of the paper unfolds as follows. Section 2 presents the hypothesis development. Section 3 describes the data and the research design. Section 4 presents the empirical analysis. Section 5 concludes. All variables are explained in Appendix A. The Online Appendix contains additional results.

2. Theoretical framework and hypothesis development

We use the theoretical framework in Charness and Kuhn (2007) (hereafter CK) to develop testable hypotheses that will form the basis for our empirical analyses in Section 4. In this section, we summarize the main features of the model and its testable implications.

Each firm has two workers, denoted worker *1* and worker *2*. Workers are fully identical except for their marginal productivity. Firm sales depend on each worker's effort. Like Akerlof and Yellen (1990), the CK model assumes that a worker's effort is a function of her wage, denoted w, and her wage relative to her coworker's wage, denoted w_c.[4] Further, the worker's effort can take two functional forms. The first functional form is as follows:

$$E(w) = aw + b(w - w_c). \quad (1)$$

Eq. (1) assumes that each worker varies her effort by $a > 0$ for every dollar change in her own wage. Moreover, each worker increases or decreases her effort by $b \geq 0$ for every dollar of her wage that exceeds (trails) that of her coworker. Hence, Eq. (1) describes the *symmetric* case.

Each worker generates sales, S, that are increasing ($S' > 0$) and concave ($S'' < 0$) with respect to the worker's effort, E.[5] Hence, within the same firm, the sales generated by worker

[4] That is, $w_c = w_2$ for worker *1*, and $w_c = w_1$ for worker *2*.

[5] The superscripts $'$ and $''$ denote the first and the second derivatives, respectively.

1 are $S_1 = S(E_1)$. Worker *2* is more productive than worker *1*, and the sales generated by worker *2* are equal to $S_2 = \theta S(E_2)$, with $\theta > 1$. Firm profits are therefore equal to:

$$\Pi = S(aw_1 + b(w_1 - w_2)) + \theta S(aw_2 + b(w_2 - w_1)) - w_1 - w_2. \quad (2)$$

The firm must choose wages, w_1 for worker *1* and w_2 for worker *2*, that maximize its expected profits in (2).

Let us now analyze two alternative scenarios. First, let us assume that $b = 0$, which represents the *difference-neutral* case, denoted by superscript n. In the *difference-neutral* case, absent any worker's relative wage concern, it is optimal for the firm to induce higher effort from the more productive worker, that is, $E_2^n > E_1^n$. Given that $b = 0$, each worker's wage is proportional to her effort. Moreover, Eq. (1) shows that $w_2^n = \frac{E_2^n}{a} > w_1^n = \frac{E_1^n}{a}$. Hence, in the *difference-neutral* case, worker *2* will receive a higher wage than worker *1*, and the *pay ratio* will be $\frac{w_2^n}{w_1^n} > 1$.

Let us now assume that $b > 0$. In this case, wage differences affect workers' effort and their compensation. According to the symmetric effort function described in Eq. (1), it is optimal for the firm to induce the same effort as in the *difference-neutral* case, that is, $E_2 = E_2^n$ and $E_1 = E_1^n$. However, the *difference-neutral* wages, $w_2^n > w_1^n$, are suboptimal when $b > 0$. Relative to the *difference-neutral* case $(b = 0)$, worker *1* (worker *2*) exerts less (more) effort when $b > 0$. Hence, in the *difference-sensitive* case, the firm's optimal strategy will be to pay worker *1* (worker *2*) more (less), which will result in a higher compression of the firm's optimal pay ratio, $\frac{w_2}{w_1} < \frac{w_2^n}{w_1^n}$. This leads us to derive the first testable hypothesis as follows.

H1: *A firm's optimal pay ratio is lower when its workers are concerned about pay inequality* $(b > 0)$ *than when they are not* $(b = 0)$.

With respect to a firm's expected profits, it is important to note that the firm's total costs are equal to $w_1 + w_2 = (E_1 + E_2)/a$ (i.e., they are invariant when $b > 0$). Hence, when a

worker's effort provision varies *symmetrically* relative to her coworker's wage, as in Eq. (1), the firm's expected profits will not change relative to the *difference-neutral* case.

Let us now examine the second effort function corresponding to the *asymmetric* case in CK, which takes the following form:

$$E(w) = aw + b\min\{w - w_c, 0\}. \quad (3)$$

As in Eq. (1), each worker decreases her optimal effort by $b > 0$ for every dollar of her wage that trails that of her coworker's. However, unlike Eq. (1), the worker fails to increase her effort otherwise. Hence, the *asymmetric* nature of the effort function described in Eq. (3) implies that by raising the wage of the more productive worker, w_2, the firm will not change her optimal effort. In contrast, by raising the wage of the less productive worker, w_1, the firm will marginally increase the worker's effort. Put differently, when $b > 0$, it will be beneficial for the firm to increase the wage of worker *1*, w_1, relative to that of worker *2*, w_2. In this case, we then expect a higher compression of the firm's optimal pay ratio, as predicted in hypothesis 1.

In the *asymmetric* case, however, the firm's total costs will increase with b since worker's 1 salary optimally increases while worker's 2 salary does not decrease. Hence, the firm's expected profits will decrease when $b > 0$ relative to when $b = 0$. This leads us to propose the second testable hypothesis as follows.

> **H2**: *If workers are concerned about pay inequality ($b > 0$) and such concern is asymmetric, a firm's expected profits are lower than they are when workers are not concerned ($b = 0$).*

3. Research design and data

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

Until the early 1990s, Italy had long distinguished itself among OECD and EU countries for its exceptionally low employment rates. Labor force participation rates were

approximately 10 percentage points below the levels of the EU as a whole, and the unemployment rate was consistently higher than the EU average. By the mid-1990s, the youth unemployment rate stood at approximately 32 percentage points (OECD 2009), while the long-term unemployment rate was as high as 67 percentage points in 1996, which was the highest in the OECD area (see Figure 1).

[Insert Figure 1 about here]

The composition of employment in Italy was also remarkably different from that in the rest of Europe and based mostly on regular (open-ended) dependent employment. Other forms of nonstandard, more flexible, and less burdensome (for firms) employment contracts, such as apprenticeships, employment-and-training contracts, fixed-term contracts, and part-time contracts, were nonexistent until the early 1990s, despite the increasing demand for these jobs driven by technological changes and increasing international competition for firms and businesses. In this regard, the EU's call for modernizing the country and the need for Italian firms to compete in the single market also played a crucial role in the labor market reform. Specifically, the Maastricht Agreement of 1992 and the conditions imposed thereafter to join the Economic and Monetary Union (EMU) made long overdue structural reforms unavoidable. In this context, it was assumed that greater labor market flexibility could help Italy adjust to economy-wide shocks harbingered by the introduction of the euro and the consequent loss of control over monetary policy.

However, until the early 1990s, these peculiar characteristics of Italy's labor market were not widely regarded as a cause for concern among Italian policy makers. The real 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 main trade union organizations. While the smaller *Confederazione Italiana dei Sindacati dei Lavoratori* (CISL) and the *Unione Italiana del Lavoro* (UIL) always favored a labor reform and were also open to local and firm-level bargaining over employment contracts, the largest left-wing union – *Confederazione Generale Italiana del Lavoro* (CGIL) – was very critical and seriously concerned that the new employment contracts would lead to greater pay dispersion and unequal treatment of workers.[6]

Despite these resistances, the new Prime Minister Romano Prodi and his coalition were able to secure a mandate by 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 passed the Treu Package.[7] The reform relaxed the rules for the use of standard temporary contracts and introduced a wide 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 encourage the use of more flexible, less burdensome employment contracts that would make these firms more competitive than their international peers. At the same time, *inter alia*, the reform relaxed the conditions for the conversion of fixed-term contracts into open-ended contracts, thereby allowing the use of cheaper fixed-term contracts almost indefinitely.

3.2. Data

[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 December 29, 2021).

[7] The Italian Parliament's website provides an overview of the 1997 Treu Reform (available at https://www.parlamento.it/parlam/leggi/97196l.htm, last accessed December 29, 2021).

The data for our empirical analyses come from two main 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 largest employer-employee matched data available for research in Italy.[9] The sampling process starts by including employment-related information on the entire population of firms located in northeastern Italy over the 1975-2001 period, with the exception of firms operating in agriculture and public administration industries and firms with no employees. Each employee is then followed for her working life, even when she is hired by another firm operating outside northeastern Italy. For example, if a worker moves to another firm located 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 and their geographical coverage as well as the number of workers increase over time as new employer-employee matches are created. This allows us to retrieve information on a very comprehensive sample of firms and workers distributed across 18 out of 20 Italian regions.[10]

The database contains information on the total compensation of more than one million unique workers, which we use to construct our pay inequality measures. 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 mainly consists of blue-collar workers in the lowest hierarchy level, whose job requirements are basic literacy and numeracy skills and the ability to perform straightforward and short-term tasks under

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

[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 December 24, 2021).

[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.

immediate supervision. Hence, any observable difference in pay among workers across and within firms is unlikely to reflect differences in hierarchy levels across and within firms.

The second data source is the Orbis database published by BvDEP, a leading source of company financial and ownership information. Orbis provides comprehensive coverage for over 200 million publicly listed and privately held companies from around the world. BvDEP collects firm-level data 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 the identification of all companies included in the INPS database. From this initial set of firms, we exclude micro entities with fewer than ten employees as well as 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

Our objective is to study whether firms optimally internalize their workers' concern over pay inequality in their compensation policy and, if so, whether this affects firms' operating performance. We proceed sequentially. We first explain the empirical strategy to test hypothesis 1. We then discuss how we test hypothesis 2.

3.3.1 Testing hypothesis 1

The observed pay distribution across workers within a firm is the final output of a negotiation process unobserved by an econometrician. Workers are not randomly assigned to a firm; many unobserved factors determine, joint and simultaneously, the matching between a worker and a firm as well as 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

[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.

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 pay fairness. Similarly, such a research design does not exclude the possibility of reverse causality. For example, firms concerned with pay inequality are more likely to attract certain types of workers who value fairness and equal pay.

To overcome endogeneity, we conduct a difference-in-differences analysis using the 1997 labor reform described in Section 3.1 as a shock to firms' labor costs and their ability to increase or decrease pay inequality. As outlined in Section 2, absent any legal cap when setting wages, firms choose their (unconstrained) optimal level of pay inequality. We proxy for workers' concern over pay inequality (parameter b in the CK model) through the number of workers affiliated with the CGIL union relative to the workforce in the province where the firm is headquartered (*Unionization rate*). The underlying assumption is that workers from firms headquartered in provinces with low unionization rates are significantly less concerned about pay inequality (lower *b* in the model) than workers from firms headquartered in provinces with high unionization rates.

In Section 2, hypothesis 1 predicts that (*treatment group*) firms headquartered in provinces with high unionization rates optimally set a lower pay ratio than (*control group*) firms headquartered in provinces with low unionization rates. To test this prediction, we run the following regression:

$$\begin{aligned} ln(Pay\ ratio\ y/(1-y))_{\,i,p,t} \\ = \alpha + \beta_1 Unionization\ rate_{p,t} \times Post + \beta_2 Unionization\ rate_{p,t} \\ + \beta_3 X_{i,t} + \mu_i + s_{i,t} + r_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{4}$$

where $\ln(Pay\ ratio\ y/(1-y))_{i,p,t}$ 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. $Unionization\ rate_{p,t}$ is the number of 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 onwards) and zero otherwise. Following previous studies on the determinants of pay inequality (e.g., Mueller et al. 2017b), we include a vector ($X_{i,t}$) of firm-level characteristics: *Sales growth, 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. (4) controls for firm fixed effects (μ_i), industry–year fixed effects ($s_{i,t}$), and region–year fixed effects ($r_{i,t}$). The fixed effects ensure that we compare firms before and after the labor reform in the same industry and year as well as in the same region (e.g., 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). It is important to highlight that the use of region–year fixed effects is crucial in our setting because of the disparities in terms of culture, economic development, and formal and informal institutions across Italian regions. Additionally, this structure of fixed effects 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).

$Unionization\ rate_{p,t}$ is the heterogeneous treatment variable that allows us to identify the differential effect of the 1997 labor reform on pay inequality for firms headquartered in provinces with high unionization rates relative to those headquartered in provinces with low

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 define four possible cases with different predictions on the signs of coefficients $\beta_1$and β_2 in equation (4). These cases are represented in Figure 3.

[Insert Figure 3 about here]

Treatment group firms are plotted in line *T*, while control group firms are represented by line *C*. Before the 1997 labor reform, both treatment and control group firms could be constrained in their optimal pay ratio given that the set of available employment contracts was significantly smaller and fairly homogeneous within the workforce. In Figure 3, this constraint corresponds to the red line, which represents the maximum pay inequality implicitly allowed by the labor legislation in place before the reform. In Panel A, there is no difference in pay inequality between treatment and control group firms either before or after the 1997 labor reform. In this scenario, regardless of the location of the red line, we expect both coefficients β_1 and β_2 from Eq. (4) to be equal to zero. This is our null scenario that rejects hypothesis 1.

Panel B depicts the scenario in which neither treatment nor control group firms are constrained in their choice of pay inequality. In this case, hypothesis 1 predicts that β_1 is equal to zero ($\beta_1 = 0$), while β_2 is lower than zero ($\beta_2 < 0$). That is, Eq. (4) would detect a difference in the average within-firm pay inequality between firms in provinces with low versus high unionization rates before the 1997 labor reform, but this difference would be statistically the same after the reform. In Panel C, only control group firms that are headquartered in provinces with low unionization rates are constrained before the 1997 labor reform. However, after the reform, both treatment and control group firms become unconstrained.[14] Hence, in this scenario, hypothesis 1 predicts that both β_1 and β_2 are lower than zero ($\beta_1 < 0$ and $\beta_2 < 0$).

[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.
[14] The predictions are qualitatively unchanged (i.e., both coefficients would be negative) if we relax the constraint of the control group firms after the 1997 labor reform.

Finally, in Panel D, both treatment and control group firms are constrained, and neither group can attain the optimal pay ratio before the reform. Hence, there should be no difference in pay ratios between groups ($\beta_2 = 0$). However, after the reform, the coefficient for $\beta_1$is expected to be lower than zero ($\beta_1 < 0$), capturing the full sensitivity of the pay ratio with respect to the unionization rate.[15]

Before testing hypothesis 1, we run two analyses to back up two assumptions underlying our approach. First, we verify that the unionization rate across Italian provinces does not change in response to the reform. Reassuringly, Figure 4 shows that across Italian provinces, the unionization rates are unchanged before (in 1996) and after (in 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 for firms in provinces with low and high unionization rates would have been the same. To examine whether the parallel trends assumption plausibly holds in our sample, in Figure 5, we plot the average *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). In this analysis, firms belong to the treatment (control) group if they are located in provinces with unionization rates above (below) the regional average value within each of the 18 Italian regions in the years from 1994 to 1996. 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 increase their pay compression (i.e., decrease pay

[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 negative, albeit of a lower magnitude.

inequality) significantly relative to the control firms. More importantly, this increase in pay compression appears persistent and is not reversed in the following years.

[Insert Figure 5 about here]

3.3.2 Testing hypothesis 2

To test hypothesis 2, which predicts that optimally internalizing workers' concern over pay inequality negatively affects firms' operating performance when such concern is asymmetric, we replace the dependent variable in Eq. (4) with two alternative proxies for firm operating performance. Specifically, we estimate the following equation:

$$\begin{aligned} Operating\ Performance_{i,p,t} \\ = \alpha + \beta_1 Unionization\ rate_{p,t} \times Post + \beta_2 Unionization\ rate_{p,t} \\ + \beta_3 X_{i,t} + \mu_i + s_{i,t} + r_{i,t} + \varepsilon_{i,t}, \end{aligned} \quad (5)$$

where the dependent variables are two alternative operating performance metrics: *RNOA* and *ROA*. 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 portions of debt, less book value of total equity. 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. We again include the same controls and fixed effects as in Eq. (4).

Figure 3 also represents the model predictions from hypothesis 2 after replacing *Pay Ratio* with *Operating Performance* in the vertical axis. Thus, if firms internalize workers'

[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).

concern about pay inequality but workers' effort varies *symmetrically* relative to coworkers' wages, as in Eq. (1), then the firm's expected profit will not change relative to the *difference-neutral* case. In this case, we should not observe any difference in operating performance between treatment and control firms either before or after the 1997 labor reform. This scenario is depicted in Panel A, where $\beta_1 = \beta_2 = 0$ in Eq. (5).[17] In contrast, if the concern about pay inequality among workers in provinces with high unionization rates is *asymmetric*, as illustrated in Eq. (3), and firms internalize this concern as in CK, then the model predicts that (treatment) firms located in those provinces will underperform similar (control) firms in provinces with lower unionization rates. Whether the difference in performance fully accrues before (Panel B) or after (Panel D) the labor reform or is split between the two periods (Panel C) depends, respectively, on whether the pay ratio is unconstrained for both treatment and control firms before 1997 ($\beta_1 = 0$ and $\beta_2 < 0$), constrained for both ($\beta_1 < 0$ and $\beta_2 = 0$), or constrained only for control firms ($\beta_1 < 0$ and $\beta_2 < 0$).

Before testing hypothesis 2, we first examine whether the parallel trends assumption also holds for the operating performance metrics. Specifically, in Figure 6, we repeat the same exercise as in Figure 5 and find that firms in provinces with high and low unionization rates exhibit similar trends in operating performance before the 1997 labor reform. However, after the labor reform comes into effect at *t*, firms in provinces with high unionization rates significantly underperform their peers located in provinces with low unionization rates. Taken together, these preliminary findings appear to be consistent with the *asymmetric* wage *difference-sensitive* preferences.

[Insert Figure 6 about here]

4. Results

[17] Note that, we obtain the same prediction if the pay ratio between treatment and control firms is the same before and after the labor reform of 1997.

4.1 Unionization rate and within-firm pay inequality

Table 3 reports the baseline difference-in-differences estimation results based on Eq. (4). Across all specifications and pay ratios, the coefficient β_1 is negative 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, an increase of one standard deviation in the unionization rate decreases the *Pay ratio 80/20* by approximately 2.3% (=0.23×10%) after the 1997 labor reform. Relatedly, the *Pay ratio 75/25* (*Pay ratio 66/33*) decreases by approximately 2.93% (1.84%) for an increase 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 negative and 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 are constrained in their optimal pay inequality before the labor reform of 1997 (i.e., $\beta_2 = 0$). However, after the reform, control 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 ($\beta_1 < 0$). Taken together, these findings point to the existence of wage *difference-sensitive* preferences (i.e., $b > 0$) among workers of firms located in provinces with high unionization rates. These wage *difference-sensitive* preferences are internalized by firms in provinces with high unionization rates when setting optimal wage structures, as predicted in hypothesis 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 managers 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, hence increasing the gap between the compensation of the manager/owner and that of the rest of the firm's workers. Furthermore, we find that pay inequality is lower when labor mobility is lower, suggesting 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 to differences across regions or industries, since we control for both region–year and industry–year fixed effects. The coefficient on *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]

In Table 4, we decompose each pay ratio into top and bottom percentiles and re-estimate Eq. (4). Interestingly, for each of the top percentiles – *P80*, *P75*, and *P66* – we find no difference between firms in provinces with high unionization rates and firms located in provinces with low unionization rates after the 1997 labor reform. On the other hand, we find that the three bottom percentiles – *P20*, *P25*, and *P33* – of firms in provinces with high unionization rates are significantly higher than those of firms in provinces with low unionization rates after the reform. In economic terms, we find that an increase of one standard

deviation in the unionization rate increases the compensation of lower-paid employees by approximately 2.44%.[18] These findings are consistent with the scenario depicted in Panel D of Figure 3 and with the results in Table 3, and they suggest that after the 1997 labor reform, firms that internalize workers' concern for pay inequality optimally forgo the opportunity to take advantage of the labor reform to decrease the wages of lower-paid employees. Hence, these employees are optimally overpaid relative to employees of firms in provinces with low unionization rates where inequality concerns are absent.

To provide a clearer estimate of the magnitude of the pay compression in provinces with high unionization rates, we consider the region of Tuscany, which has the highest variation in unionization rates across its 10 provinces over the sample period. We take the provinces of Livorno and Prato as the two references, which have the highest and the lowest unionization rates within the region, respectively. Specifically, Livorno has a unionization rate that is 2.5 standard deviations higher than that of Prato. The coefficient β_1 in column (2) of Table 4 shows that after 1997, the average wage in *P20* across firms in Livorno is 6 percentage points higher than that in Prato. In euro terms, this implies that the average worker in the bottom 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. (5). Consistent with hypothesis 2, we find that the coefficient β_1 is negative and statistically significant at least at the 5% level 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 an increase of one standard deviation in the unionization rate leads firms' profitability to decrease by

[18] We take the average of the β_1 coefficients in columns (2), (4), and (6) of Table 4 and multiply it by the standard deviation of the unionization rate (= 0.24467 × 0.1002) to obtain 0.0244.

approximately 2.6 percentage points after the 1997 labor reform. As in the pay ratio analyses, the addition of firm-level control variables appears to have no impact on either the coefficient estimate or statistical significance. Moreover, when we replace *RNOA* with *ROA* in columns (3) and (4), these conclusions remain similar.

[Insert Table 5 about here]

With respect to the coefficient β_2, we find that it is negative and mostly insignificant across all specifications. In line with the graphical analysis in Figure 6, the *joint* evidence of the coefficients $\beta_1 < 0$ and $\beta_2 = 0$ further points to the *asymmetric* wage *difference-sensitive* preferences of workers in firms located in provinces with high unionization rates. Put differently, the negative sign of β_2 is Tables 4 and 5 along with its marginal significance in columns (1) and (2) of Table 5 suggest that the optimal pay ratio for treatment firms before the labor reform was binding on the margin, in the frontier between the scenarios depicted in Panels C and D of Figure 3.

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

To address the question, we replace in equation (5) the dependent variable $Operating\ Performance_{i,p,t}$ with $Investment_{i,p,t}$, which is defined as the (log) change in fixed assets in firm *i*, from province *p* in year *t*. The results are reported in Table 6. All specifications include firm, industry–year, and region–year fixed effects. In economic terms, in column (2), we find that a one standard deviation increase in the unionization rate decreases firm investment by about 17 percentage points after the labor reform. Importantly, the

coefficient β_2 is nonsignificant, suggesting that there were 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 (4), we find that a one-standard-deviation increase in unionization leads to a decrease of about 1.7 percentage points in the payout ratio after the labor reform. Relatedly, the coefficient β_2 is negative and statistically significant at the 1% level, suggesting that before the reform, companies whose workers showed higher concern for pay inequality already had a payout ratio approximately 5 percentage points lower than companies located in provinces with lower concern for pay inequality. Taken together, the findings reported in Table 6 suggest that internalizing workers' concern for wage inequality affects not only firms' short-term operating performance (as shown in Table 5) but also 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 high unionization rates optimally compress wages relative to similar firms in provinces with low unionization rates. Moreover, firms in provinces with high unionization rates significantly underperform those firms located in provinces with low unionization rates after the 1997 labor reform, which points to *asymmetric* wage *difference-sensitive* preferences on firms' pay ratio and operating performance.

At first sight, this evidence could look trivial because after the reform labor costs decrease and only control group firms are able to cut wages relative to treatment group firms. *Ceteris paribus,* the profitability of control (treatment) group firms increases (decreases). However, this interpretation ignores that workers' effort is endogenously determined by their compensation, as put forth by Charness and Khun (2007). According to the CK model, wages

are optimally chosen by firms after considering a worker's productivity and her optimal effort decision, which depends on both her absolute compensation and her compensation relative to that of her coworkers. 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. If this response is *asymmetric*, a worker's effort provision decreases when her wage is lower than that of her coworkers, while it fails to increase when her wage is higher. In such a case, the model predicts that profit-maximizing (treatment group) firms in provinces with high unionization rates, which internalize workers' relative wage concerns, optimally choose to pay their workers with low productivity more relative to similar control group firms in provinces with low unionization rates. This also explains why treatment firms underperform control firms after the reform. In this interpretation, it is also important to highlight that if treatment group firms had paid their workers less, as control firms did, they would have been worse off: the savings in wages would have been undone by the decrease in profits caused by the lower effort exerted by workers with relative wage concerns.

To strengthen the interpretation of our findings, we now consider some possible alternative explanations. First, it could be argued, for instance, that unions compress salaries (see, for instance, Card, Lemieux, and Riddell (2004)) and therefore that our tests are just picking a higher proportion of unionized firms in certain provinces. First, recent evidence with proper identification strategies seems to challenge this conjecture.[19] Second, the effect of unions at the firm level should be captured by the firm fixed effects in our regressions. 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. Additionally, Tables 3-5 show that unionization rates at the province level fail to explain any difference in wage

[19] 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.

inequality or firm profitability before the labor reform. Finally, there is some evidence of spillover effects of unionization on wage compression across firms within the same industry in the US (Khan and Curme (1987)). The industry × year fixed effects in our regressions address this concern.

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 in a nonrandom way after the shock. The main argument in Charness and Khun's (2007) 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 rates of unionization replace overpaid workers more than similar firms in provinces with higher unionization rates, this could explain both their higher pay inequality and productivity (through labor cost savings) after 1997, without involving any relative wage concern. To check this, we estimate employment growth and turnover in our sample, both in the aggregate and for each of the percentiles in regression (4). In particular, we run the following regression:

$$f_{i,p,t} = \alpha + \beta_1 Unionization\ rate_{p,t} \times Post + \beta_2 Unionization\ rate_{p,t} + \beta_3 Controls_{i,t} + \mu_i + s_{i,t} + r_{i,t} + \varepsilon_{i,t}. \quad (7)$$

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 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 (4).

[Insert Table 7 about here]

Employment does not grow differently across firms in provinces with higher versus lower unionization rates before or after the labor reform. Likewise, workers' 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. 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 discard the possibility that our results are driven by worker turnover.

[Insert Figure 7 about here]

4.4 Robustness tests

In this section, we test the robustness of our results to our 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 (4) removing the year of the labor reform (1997) from the sample. In specifications (4)-(6), we further remove the first and last years in 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–year fixed effects. The results are robust across all specifications. Panel B repeats the same tests replacing *Pay ratio* with *RNOA* and *ROA* to test equation (5). 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 so that the unionization rate is randomly assigned to a firm. We repeat the procedure 1,000 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) is driving the results. For this purpose, we run equation (4) 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. All of the results remain significant, and the coefficients on *Unionization rate* × *post* are of approximately equal magnitudes.

5. Conclusion

Not all firms are expected to be 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 pay-dispersion sensitivity and to draw causal conclusions.

We show that firms optimally internalize this sensitivity, forgoing the opportunity to increase salary dispersion when their workers show a stronger dislike for pay inequality, consistent with the equity theory of wages. The operating performance of these firms, however, is affected by the relative wage concerns of their workers. These firms underperform firms where such concerns are less prominent. They also have lower free cashflows to reinvest or pay out to their shareholders.

These results have policy implications. Amid the strong social and institutional pressure for reining in the growing inequality in earnings 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, investment (hence, growth), and payout before deciding their optimal social-welfare tradeoff.

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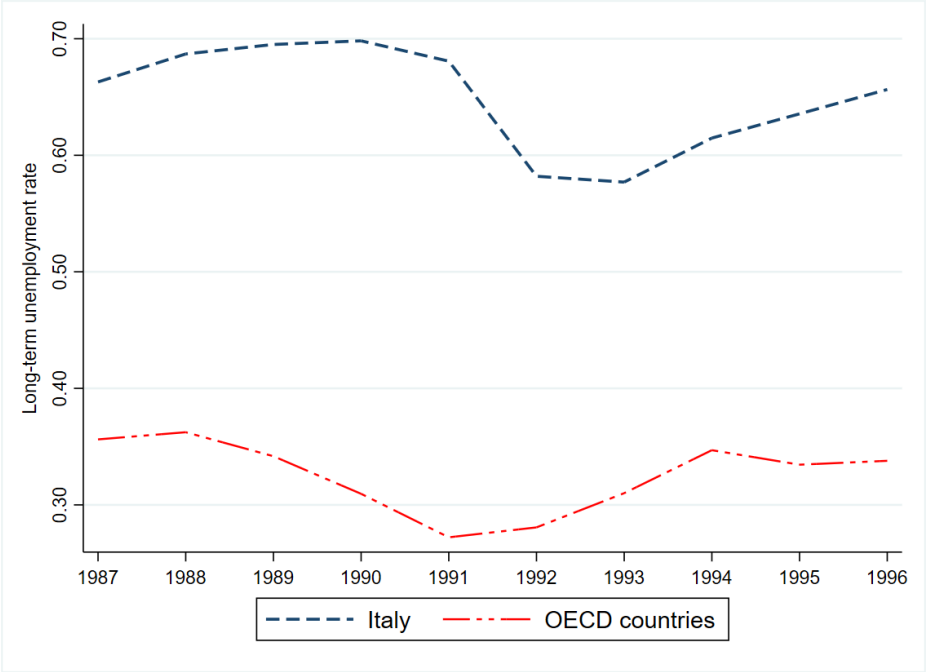
Appendix A. Variable Definitions

Variable	*Definition*
Inequality Variables	
$Pay\ Ratio\ 80/20$	Natural logarithm of the ratio of the salaries in the top quintile to the salaries in the bottom quintile (Source: VW Histories from INPS).
$Pay\ Ratio\ 75/25$	Natural logarithm of the ratio of the salaries in the top quartile to the salaries in the bottom quartile (Source: VW Histories from INPS).
$Pay\ Ratio\ 66/33$	Natural logarithm of the ratio of the salaries in the top tercile to the salaries in the bottom tercile (Source: VW Histories from INPS).
Profitability Variables	
$RNOA$	Earnings before interest and taxes (*oppl*) relative to the average net operating assets. Average net operating assets is operating assets less operating liabilities. Operating assets is total assets (*toas*) less cash (*cash*). Operating liabilities is total assets (*toas*) less the long- and short-term portions of debt (*culi* and *ltdb*) less book value of total equity (*shfd*) (Source: Orbis).
ROA	Earnings before interest and taxes (*oppl*) relative to the prior year's total assets (*toas*) (Source: Orbis).
Employment Variables	
$Employment\ Growth$	Change in the natural logarithm of employment (Source: VW Histories from INPS).
$Turnover - All\ employees$	One minus the number of workers at 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).
$Turnover - P80$	One minus the number of workers in the top quintile at both the beginning and the end of the period in the firm 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).
$Turnover - P20$	One minus the number of workers in the bottom quintile at both the beginning and the end of the period in the firm 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 at both the beginning and the end of the period in the firm 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 at both the beginning and the end of the period in the firm 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 at both the beginning and the end of the period in the firm 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 at both the beginning and the end of the period in the firm 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 the natural logarithm of fixed assets (*fias*) (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	
$Sales\ Growth$	Natural logarithm of the growth rate of sales (*turn*) from *t-1* to *t* (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	
$\%\ Same\ Region\ Employees$	Percentage of employees from the same region where a firm resides in a fiscal year (Source: VW Histories from INPS).
$\%\ Same\ Province\ Employees$	Percentage of employees from the same province where a firm resides in a fiscal year (Source: VW Histories from INPS).
$\%\ Female\ Employees$	Percentage of female employees in a fiscal year (Source: VW Histories from INPS).
$Avg.Tenure$	Total tenure (in years) of the employees scaled by the number of employees in a fiscal year (Source: VW Histories from INPS).
Labor reform Variables	
$Post$	Indicator variable equal to one in the years following the reform (from 1997 onwards) and zero otherwise.
$Unionization\ rate$	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).

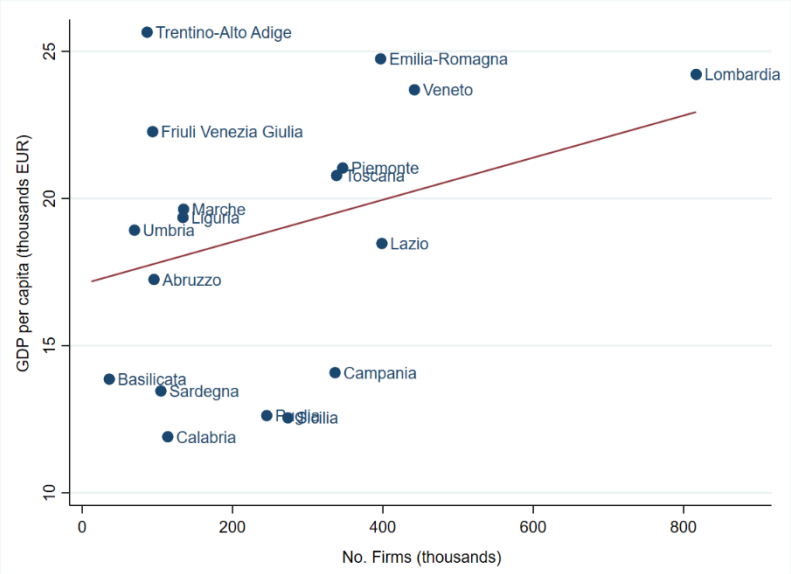
Figure 1. Long-term unemployment rate in Italy relative to OECD countries before the 1997 Treu Reform



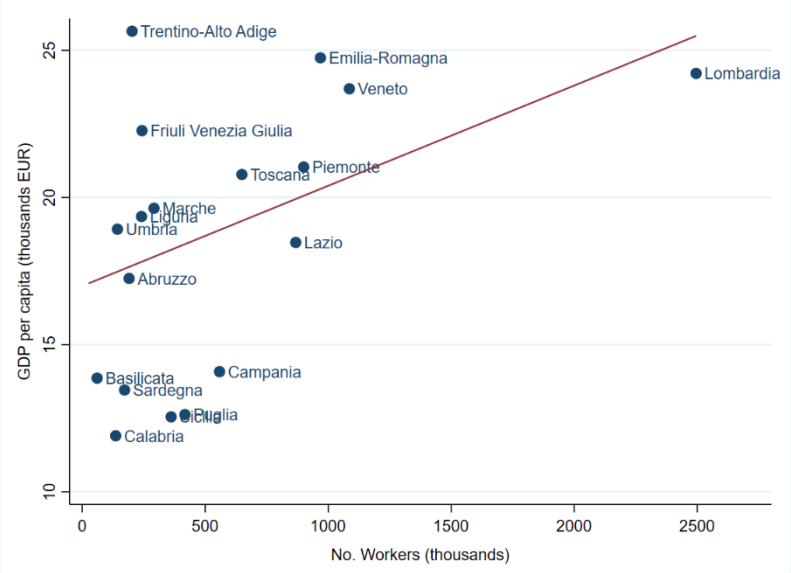
This figure displays the variation in the long-term unemployment rate in Italy relative to the average long-term unemployment rate of OECD countries from 1987 to 1996.

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

Panel A: Population of firms and economic development

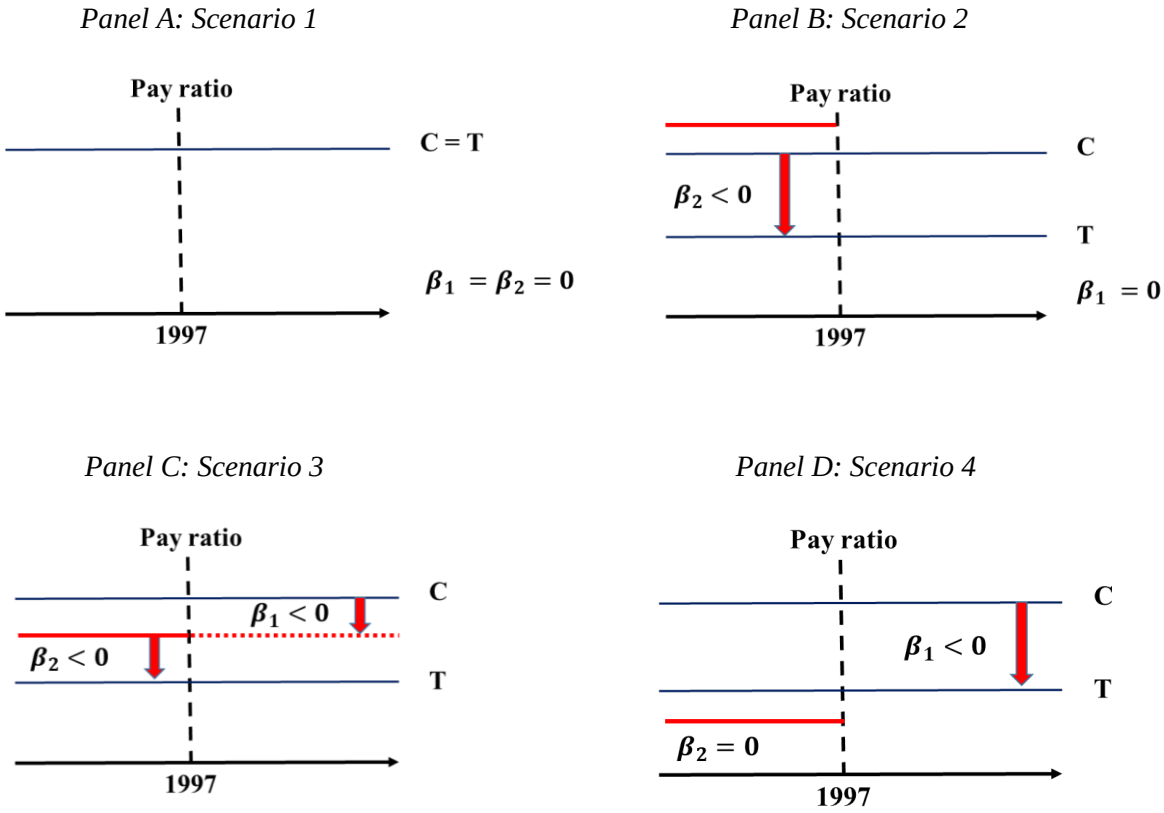


Panel B: Population of workers and economic development



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.

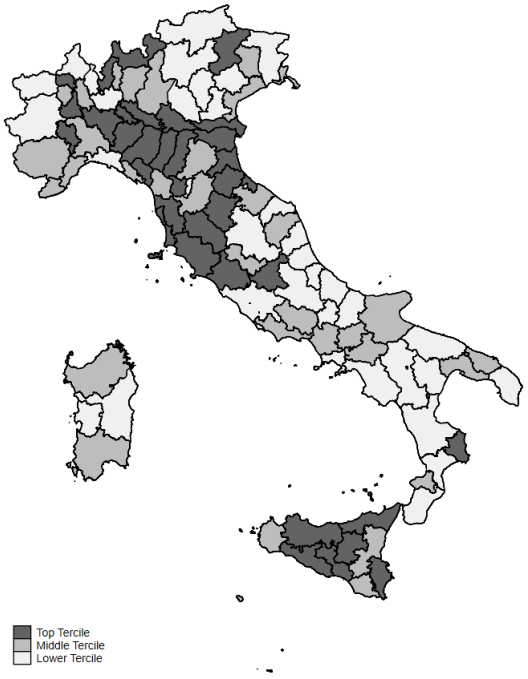
Figure 3. Conceptual framework of our study



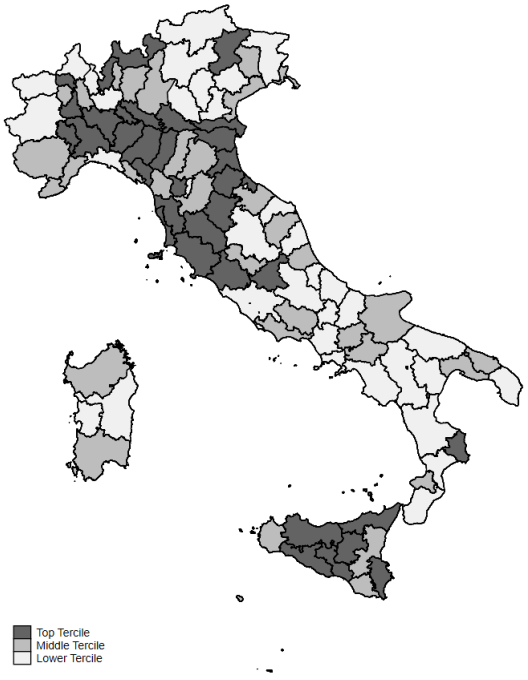
This figure displays the conceptual framework outlined in Section 3.3.1. The capitalized letter *C* proxies for the expected response of control group firms, whereas the letter *T* proxies for the expected response of treatment group firms. The red line represents the legal constraints on pay inequality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

Figure 4. Unionization rate across Italian provinces

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

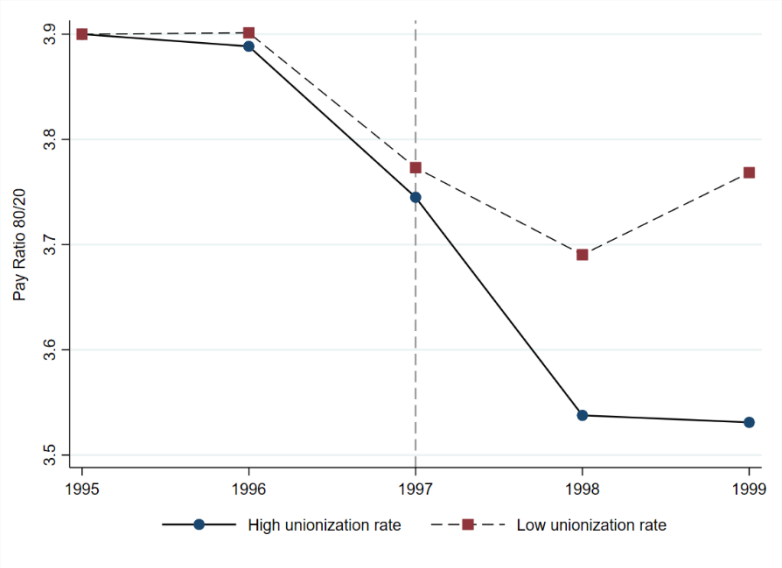


Panel B. Unionization rate in 1998 (after the reform)



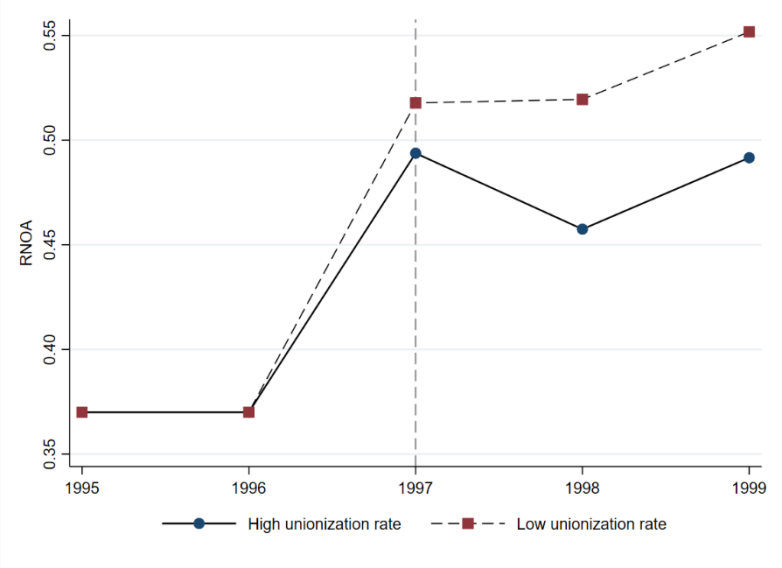
This figure displays the variation in the unionization rate across Italian provinces at two points in time over the sample period (i.e., in 1996 and 1998).

Figure 5. Difference in pay ratio between firms in high-unionization-rate and firms in low-unionization-rate provinces



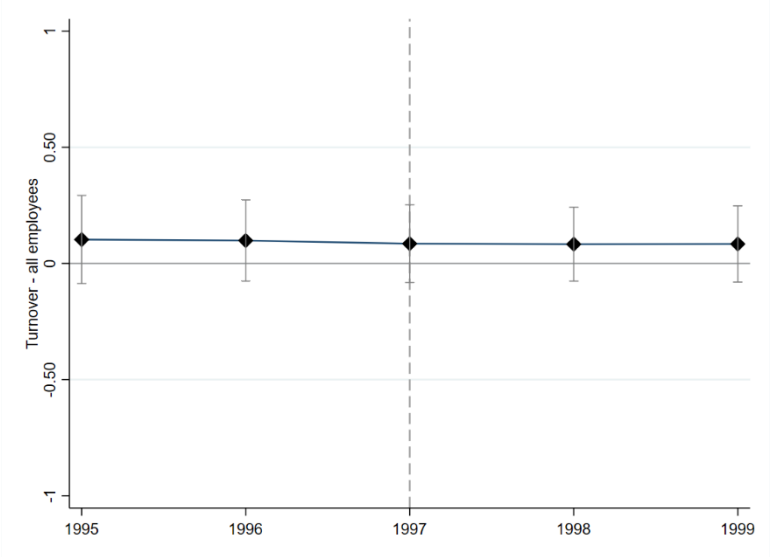
This figure plots the average *Pay ratio 80/20* of treated and control firms over the 1995-1999 period. Treated firms are located in provinces with high unionization rates within each of the 18 Italian regions. Control firms are located in provinces with low unionization rates in the same Italian region. The model specification includes firm and employee controls and firm and region–year fixed effects. Heteroskedasticity-robust standard errors are clustered at the province level. The gray vertical line separates the pre-reform period from the post-reform years.

Figure 6. Difference in performance between firms in high-unionization-rate and firms in low-unionization-rate provinces



This figure plots the average *RNOA* of treated and control firms over the 1995-1999 period. Treated firms are located in provinces with high unionization rates within each of the 18 Italian regions. Control firms are located in provinces with low unionization rates in the same Italian region. The model specification includes firm and employee controls and firm and region–year fixed effects. Heteroskedasticity-robust standard errors are clustered at the province level. The gray vertical line separates the pre-reform period from the post-reform years.

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 located in provinces with high unionization within each of the 18 Italian regions. Control firms are located in provinces with low 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 10 employees	(257,927)
- Exclude firm-year obs. with missing variables	(148,508)
Final Sample	38,967

Panel B: Firm-Year Observations by Year

Year	*Obs.*	*%*
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

Category	*Obs.*	*%*
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

Size	*Obs.*	*%*
$10 \leq$ Number of employees < 15	12,085	31.01
$15 \leq$ Number of employees < 25	7,606	19.52
$25 \leq$ Number of employees < 50	9,654	24.77
$50 \leq$ Number of employees < 100	5,730	14.70
$100 \leq$ 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 distribution of the sample by year, region, and number of employees, respectively. All variables are defined in Appendix A.

Table 2. Descriptive Statistics

	Obs.	*Mean*	*Std. Dev.*	*P25*	*Median*	*P75*
Labor variables:						
$Unionization\ rate$	38,967	0.0885	0.1002	0.0487	0.0538	0.0725
Inequality variables:						
$Pay\ ratio\ 80/20$	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
Employment variables:						
$Employment\ growth$	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
Operating performance variables:						
$RNOA$	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
Investment and payout variables:						
$Investment$	38,967	0.0461	0.4637	-0.1374	-0.0188	0.1529
$Payout$	38,967	0.0186	0.0385	0.0000	0.0028	0.0219
Firm controls:						
$Sales\ growth$	38,967	0.0334	0.2994	-0.0761	0.0233	0.1272
$Leverage$	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
Employee controls:						
$\%\ Same\ Region\ Employees$	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 in logarithmic scale. All variables are defined in Appendix A.

Table 3. Unionization rate and within-firm pay inequality

	Dependent variable:					
	Pay ratio 80/20		*Pay ratio 75/25*		*Pay ratio 66/33*	
Independent variables:	(1)	(2)	(3)	(4)	(5)	(6)
Labor reform variables:						
$Unionization\ rate \times Post$	-0.2009**	-0.2301**	-0.2592***	-0.2932***	-0.1669**	-0.1844**
	(0.0928)	(0.0944)	(0.0913)	(0.0916)	(0.0775)	(0.0779)
$Unionization\ rate$	-0.0087	-0.0092	-0.1886	-0.1892	-0.0053	-0.0033
	(0.1332)	(0.1388)	(0.1370)	(0.1433)	(0.1012)	(0.1031)
Firm controls:						
$Sales\ Growth$		0.0124		0.0107		-0.0005
		(0.0093)		(0.0081)		(0.0053)
$Leverage$		0.0034		-0.0115		-0.0214
		(0.0277)		(0.0209)		(0.0231)
$Size$		-0.0469***		-0.0553***		-0.0411***
		(0.0147)		(0.0109)		(0.0115)
$Cash\ Holdings$		0.0033		0.0662		-0.0051
		(0.0455)		(0.0455)		(0.0346)
Employee controls:						
$\%\ Same\ Region\ Employees$		-0.2382***		-0.2307**		-0.1382**
		(0.0856)		(0.0890)		(0.0695)
$\%\ Same\ Province\ Employees$		0.0840		0.0188		-0.0023
		(0.0859)		(0.0854)		(0.0645)
$\%\ Female\ Employees$		0.0642		0.0136		0.0729
		(0.0587)		(0.0501)		(0.0448)
$Avg.Tenure$		0.2116***		0.2426***		0.1303***
		(0.0311)		(0.0270)		(0.0206)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region × 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

	Dependent variable:					
	P80	*P20*	*P75*	*P25*	*P66*	*P33*
Independent variables:	(1)	(2)	(3)	(4)	(5)	(6)
Labor reform variables:						
Unionization rate × *Post*	0.0117	0.2418**	0.0144	0.2613**	0.0466	0.2309**
	(0.0427)	(0.1107)	(0.0480)	(0.1142)	(0.0492)	(0.1091)
Unionization rate	0.0068	0.0160	0.0047	0.0793	0.0019	0.0050
	(0.0689)	(0.1282)	(0.0727)	(0.1323)	(0.0703)	(0.1221)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region × 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	0.821	0.618	0.810	0.646	0.777	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

	Dependent variable:			
	RNOA		*ROA*	
Independent variables:	(1)	(2)	(3)	(4)
Labor reform variables:				
$Unionization\ rate \times Post$	-0.0200**	-0.0258***	-0.0227***	-0.0272***
	(0.0078)	(0.0074)	(0.0064)	(0.0071)
$Unionization\ rate$	-0.0242*	-0.0245*	-0.0096	-0.0071
	(0.0127)	(0.0142)	(0.0110)	(0.0137)
Firm controls:				
$Sales\ Growth$		0.0059***		0.0058***
		(0.0016)		(0.0014)
$Leverage$		-0.0421***		0.0262***
		(0.0101)		(0.0032)
$Size$		-0.0406***		-0.0570***
		(0.0029)		(0.0015)
$Cash\ Holdings$		0.0886***		0.0017
		(0.0103)		(0.0035)
Employee controls:				
$\%\ Same\ Region\ Employees$		0.0003		-0.0044
		(0.0085)		(0.0081)
$\%\ Same\ Province\ Employees$		-0.0070		-0.0003
		(0.0080)		(0.0063)
$\%\ Female\ Employees$		-0.0047		-0.0038
		(0.0067)		(0.0043)
$Avg.Tenure$		0.0011		-0.0004
		(0.0025)		(0.0016)
Firm fixed effects	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
Region × Year fixed effects	Yes	Yes	Yes	Yes
Obs.	38,967	38,967	38,967	38,967
Adj. R^2	0.653	0.662	0.648	0.673

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)) and *ROA* (Columns (3) and (4)). 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

	Dependent variable:			
	Investment		*Payout*	
Independent variables:	(1)	(2)	(3)	(4)
Labor reform variables:				
Unionization rate × Post	-0.1350*	-0.1700**	-0.0157***	-0.0172***
	(0.0805)	(0.0763)	(0.0060)	(0.0058)
Unionization rate	-0.1574	-0.1466	-0.0467***	-0.0488***
	(0.1232)	(0.1205)	(0.0118)	(0.0113)
Controls	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
Region × Year fixed effects	Yes	Yes	Yes	Yes
Obs.	38,967	38,967	38,967	38,967
Adj. R^2	0.021	0.030	0.429	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* (Columns (1) and (2)) and *Payout* (Columns (3) and (4)). 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 and within-firm employee turnover

	Dependent variable:							
	Employment growth	*Turnover All employees*	*Turnover P80*	*Turnover P20*	*Turnover P75*	*Turnover P25*	*Turnover P66*	*Turnover P33*
Independent variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Labor reform variables:								
$Unionization\ rate \times Post$	-0.0606	-0.0187	0.0143	-0.0900	0.0111	-0.0389	-0.0066	-0.0641
	(0.0569)	(0.0147)	(0.0228)	(0.0681)	(0.0200)	(0.0523)	(0.0122)	(0.0447)
$Unionization\ rate$	-0.0068	0.0000	-0.0024	0.0942	0.0011	0.0927	-0.0179	0.0386
	(0.1107)	(0.0251)	(0.0307)	(0.0803)	(0.0283)	(0.0659)	(0.0219)	(0.0522)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region × Year fixed effects	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
Adj. R^2	0.149	0.520	0.241	0.253	0.276	0.290	0.354	0.345

This table examines the effect of the unionization rate after the 1997 labor reform on employment growth and employee turnover. The dependent variables are *Employment growth* (Column (1)), *Turnover – All employees* (Column (2)), Turnover – *P80* (Column (3)), Turnover – *P20* (Column (4)), Turnover – *P75* (Column (5)), Turnover – *P25* (Column (6)), Turnover – *P66* (Column (7)), and Turnover – *P33* (Column (8)). 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

	Dependent variable:								
	1994-1996 vs. 1998-2000			*1995-1996 vs. 1998-1999*			*No gaps in the sample*		
	Pay ratio 80/20	*Pay ratio 75/25*	*Pay ratio 66/33*	*Pay ratio 80/20*	*Pay ratio 75/25*	*Pay ratio 66/33*	*Pay ratio 80/20*	*Pay ratio 75/25*	*Pay ratio 66/33*
Independent variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Labor reform variables:									
Unionization rate × Post	-0.2401**	-0.2866***	-0.1719**	-0.1965*	-0.2452***	-0.1291*	-0.1870*	-0.2555***	-0.1561**
	(0.1115)	(0.0929)	(0.0807)	(0.1065)	(0.0836)	(0.0744)	(0.1020)	(0.0742)	(0.0773)
Unionization rate	-0.0406	-0.1371	0.0454	0.1203	-0.0012	0.2058**	0.0529	0.0591	0.0922
	(0.1483)	(0.1380)	(0.1096)	(0.1451)	(0.1163)	(0.0987)	(0.1383)	(0.1025)	(0.0923)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region × 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

	Dependent variable:					
	1994-1996 vs. 1998-2000		*1995-1996 vs. 1998-1999*		*No gaps in the sample*	
	RNOA	*ROA*	*RNOA*	*ROA*	*RNOA*	*ROA*
Independent variables:	(1)	(2)	(3)	(4)	(5)	(6)
Labor reform variables:						
Unionization rate × Post	-0.0288***	-0.0288***	-0.0228***	-0.0208***	-0.0187**	-0.0205***
	(0.0061)	(0.0063)	(0.0072)	(0.0065)	(0.0082)	(0.0062)
Unionization rate	-0.0185	-0.0056	-0.0022	0.0159	-0.0404**	-0.0146
	(0.0147)	(0.0143)	(0.0134)	(0.0140)	(0.0155)	(0.0118)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	31,072	31,072	20,655	20,655	12,702	12,702
Adj. R^2	0.661	0.667	0.691	0.690	0.666	0.642

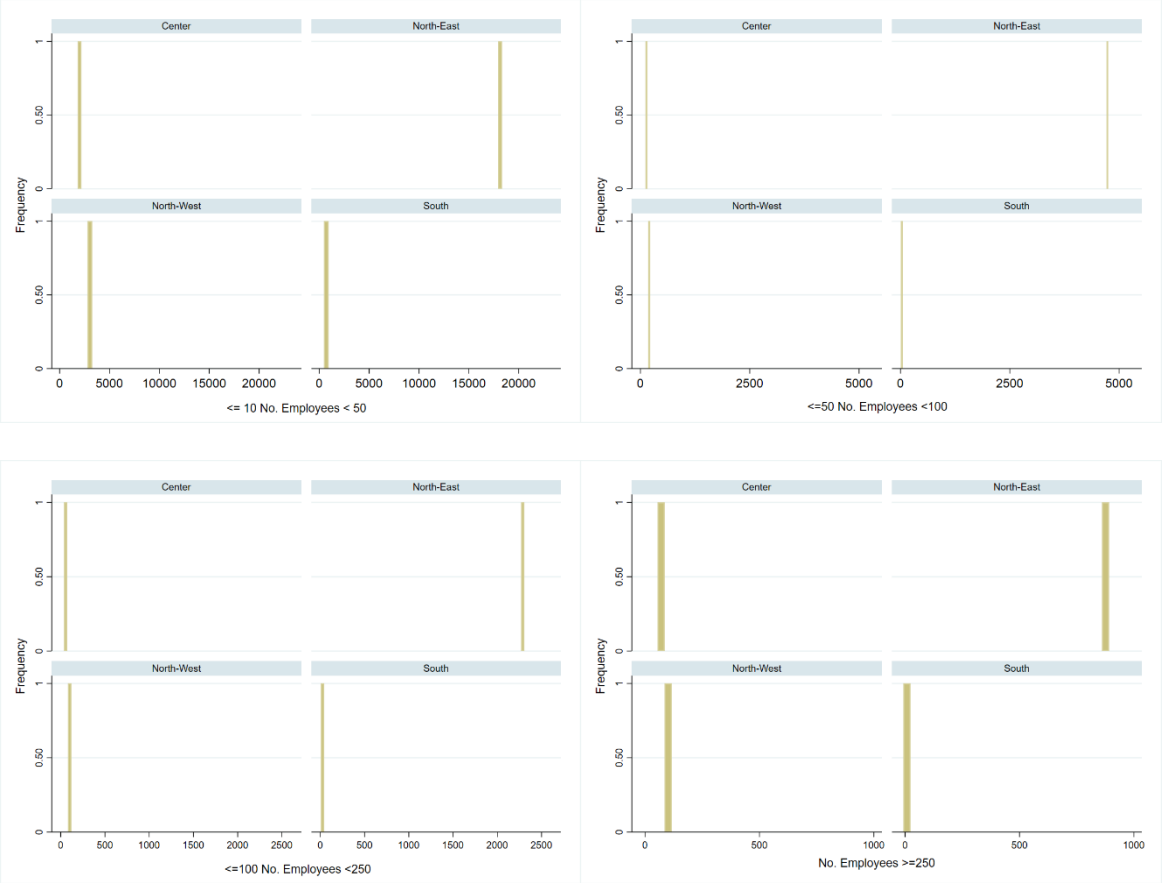
This table examines the effect of the unionization rate after the 1997 labor reform on within-firm pay inequality and operating performance over different sample periods. In Panel A, the dependent variables are *Pay ratio 80/20* (Columns (1), (4), and (7)), *Pay ratio 75/25* (Columns (2), (5), and (8)), 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 Operating Performance

Antonio De Vito and Juan-Pedro Gómez

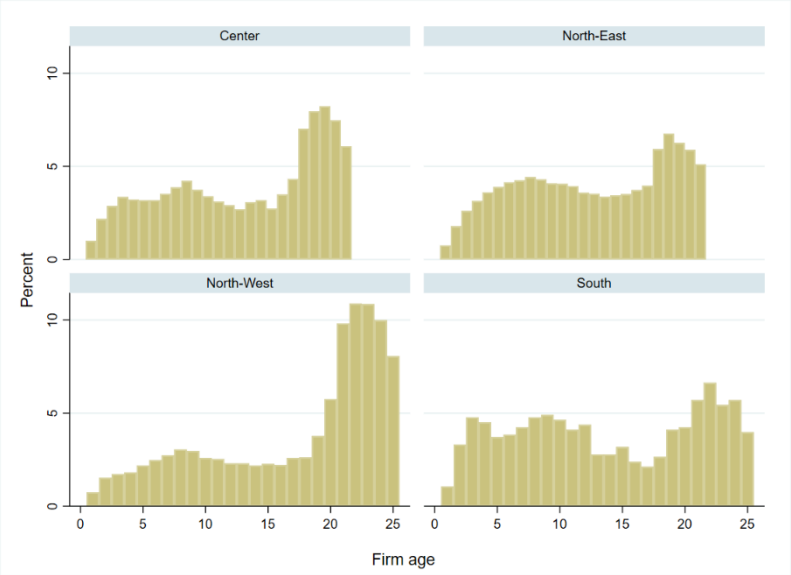
Online Appendix

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.

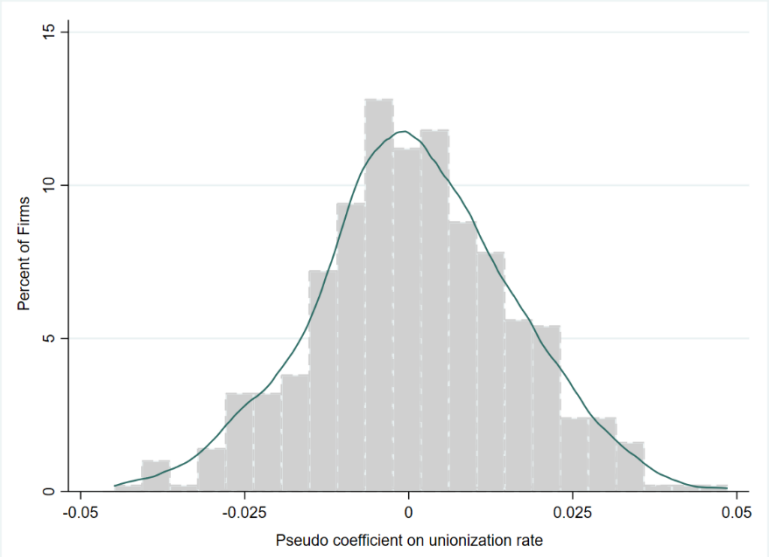
Figure A2. Distribution of firm-year observations by age and geographic area



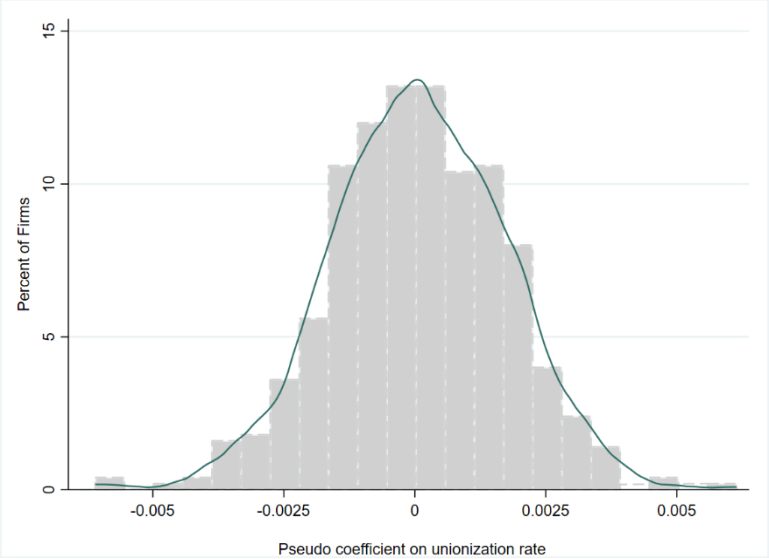
This figure displays the distribution of the sample firms by age and geographic area.

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

Panel A: Pay ratio 80/20



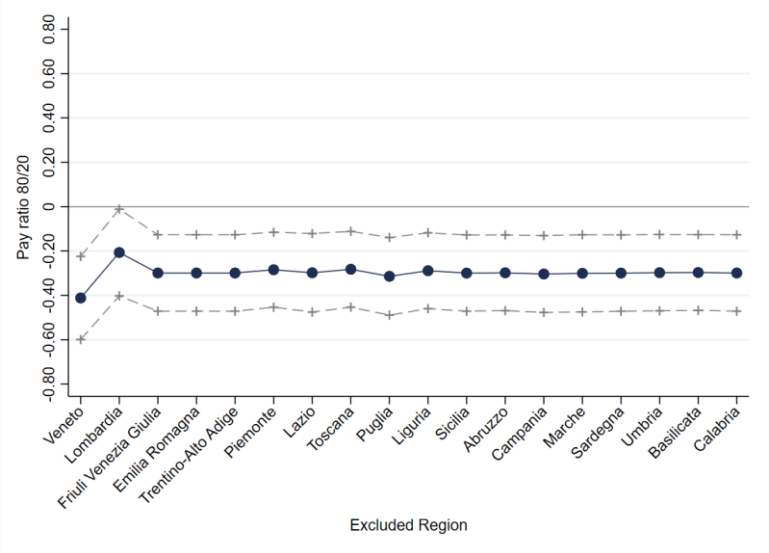
Panel B: RNOA 80/20



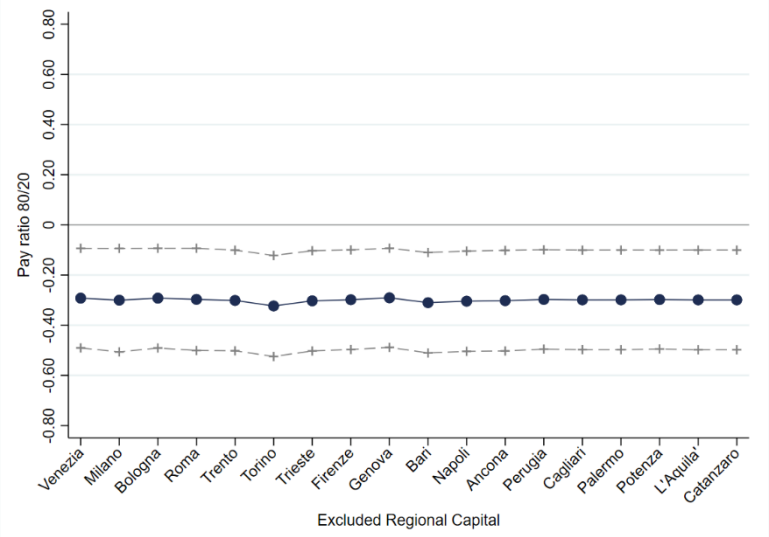
This figure constructs pseudo-treatment groups to which the treatment, *Unionization rate*, is randomly assigned. The dependent variables are *Pay ratio 80/20* and *RNOA*. The random assignment and estimation are repeated 500 times. The model specification includes firm and employee controls and firm, 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

Panel A: Excluding one region at a time



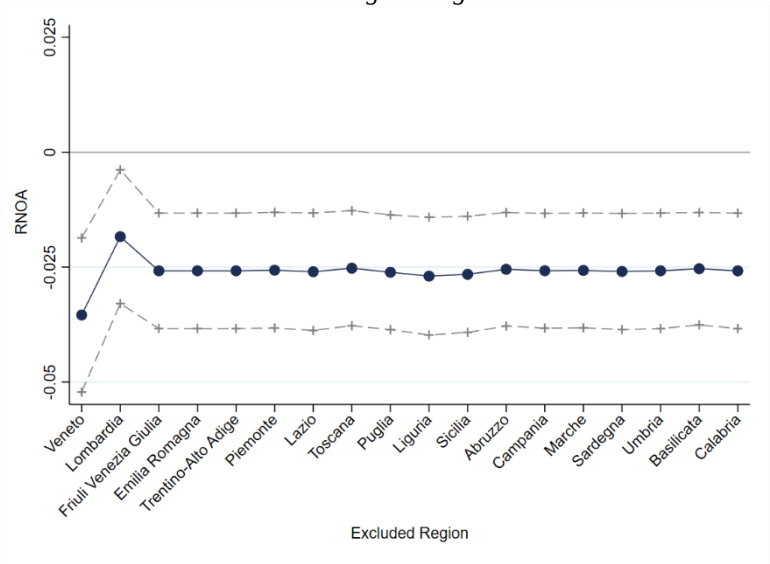
Panel B: Excluding one regional capital at a time



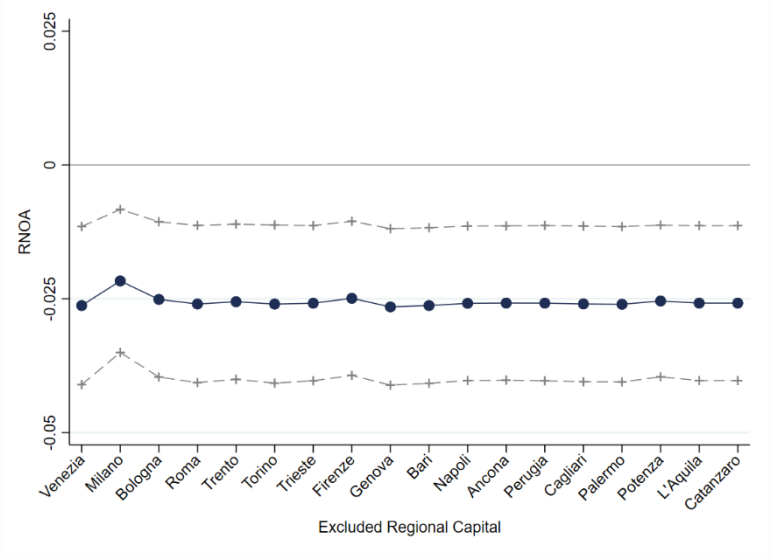
This figure displays the coefficients on *Unionization rate* × *post* from the regression in equation (1), excluding one region (Panel A) or regional capital (Panel B) at a time. The dependent variable is the *Pay ratio 80/20*. The model specification includes firm and employee controls and firm, industry–year, 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

Panel A: Excluding one region at a time



Panel B: Excluding one regional capital at a time



This figure displays the coefficients on *Unionization rate* × *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.