Is Temporary Work a Safety Risk? Analyzing the Impact on Workplace Accidents *

PRELIMINARY: DO NOT SHARE

Lorenzo Navarini[1], Roberto Nisticò[2], and Filippo Passerini[3]

[1]University of Vienna; LEER
[2]University of Naples Federico II; CSEF; CESifo; IZA
[3]University of Milano; LaboR

January 7, 2025

Abstract This paper investigates the impact of temporary employment on work-related injuries. We leverage a 2018 Italian labor market reform that restricted temporary employment and adopt a Difference-in-Differences approach combined with a synthetic control method to address endogeneity concerns. Using granular administrative data on injuries and employment contracts, our results show no significant overall effect of the reform on injuries but reveal reductions in mild injuries, among high-risk individuals, such as men and foreign workers, and in highly concentrated local labor markets. The investigation of the potential mechanisms indicates that improved working conditions, not reporting biases, drive the reductions. Overall, our findings suggest that policymakers should prioritize enhancing working conditions over focusing solely on contract types to effectively reduce workplace accidents.

Keywords: Workplace injuries; Temporary employment; Working conditions; Reporting.
JEL Classification: J28, J41, J81, J63, J22.

*Correspondig author: Filippo Passerini; filippo.passerini@unimi.it. We thanks Filippo Ariani of INAIL Tuscany for the data, Matteo Bodini, DEMM of the University of Milan and ISTAT for the ASIA dataset, and Giuseppe Grasso for the help. We also thank Tommaso Frattini, Simone Ferro, Jacopo Bassetto, Francesco Fasani, Lia Pacelli, Massimiliano Bratti, Fabio Berton, Daniela Sonedda, and the participants of the LABOR seminar and the INSUBRIA PhD seminar for the helpful comments.

1 Introduction

Workplace accidents are a pressing global concern, with 395 million non-fatal work injuries and 2,93 million fatalities reported annually (ILO 2023). On average, every 15 seconds, approximately 151 workers worldwide experience a work-related accident (WRA), resulting in the tragic loss of one worker's life (ILO 2023). Beyond the profound human cost, workplace injuries disrupt career trajectories, severely undermining long-term employment prospects and negatively affecting short-term earnings (Boden and Galizzi 2003; Galizzi and Boden 2003; Campolieti and Krashinsky 2006; Crichton et al. 2011; Galizzi et al. 2019; Mazzolini 2020; Galizzi et al. 2023). They also disrupt productivity, often resulting in delays, reduced workforce efficiency, and increased absenteeism (Johnson and Ondrich 1990; Butler et al. 2006).

These incidents also place significant strain on healthcare systems and impose substantial financial burdens, with businesses incurring costs related to compensation claims, legal liabilities, and employee turnover, while governments bear the burden of healthcare expenses and lost tax revenue. In many industries, ensuring worker safety has become a top priority, yet accident rates remain persistently high, underscoring the urgent need to better understand the factors contributing to occupational hazards. Addressing these challenges is therefore critical not only for safeguarding workers but also for promoting sustainable economic growth.

Against this backdrop, the increasing prevalence of temporary work adds a complex dimension to the issue. Temporary work, encompassing short-term contracts, agency-based employment, and freelance arrangements, has become integral to modern labor markets. While such arrangements offer flexibility and adaptability for employers and workers alike, they may also introduce vulnerabilities that compromise workplace safety, particularly in industries that rely heavily on contingent labor. Temporary workers often face unique challenges, such as insufficient training (Booth et al. 2002), heightened pressure to work harder and longer to secure future employment (Engellandt and Riphahn 2005), and reluctance to report unsafe conditions (Leombruni et al. 2013). These factors may increase their susceptibility to accidents, potentially leading to inequalities in workplace safety.[1]

This paper explores whether temporary employment constitutes a safety risk by examining its impact on workplace accidents. We leverage the variation induced by a 2018 labor market

[1]ILO identifies the exposure to excessive working hours as the primary cause of WRAs. Anxo and Karlsson (2019) highlight that the risk of injuries is not only proportional to the number of hours worked but increases disproportionately during the final hours of a workday. Furthermore, Bannai and Tamakoshi (2014) show that extended working hours contribute to heightened levels of anxiety, sleep disorders, depressive symptoms, and an increased risk of heart disease, underscoring the broader health implications of long work schedules. Prodromidis (2024) finds that reducing daily working hours lowers workplace-related accidents (WRAs) and associated fatalities.

reform in Italy, known as the Dignity Decree, that significantly restricted the use of temporary employment across all workers and firms. Italy provides a compelling context for this study for three key reasons. First, its labor market is characterized by moderate to high risks of WRAs. In 2022, the Italian National Institute for Workplace Injury Insurance (INAIL) reported 703,500 workplace injuries – a 24.6% increase compared to the 564,000 cases recorded in 2021.[2] As of 2024, 657 individuals have already lost their lives to workplace accidents, and 230 in accidents on the way to work, highlighting persistent safety challenges across various sectors. Second, the Italian labor market relies heavily on temporary employment. Between 2005 and 2018, nearly half of all newly initiated work contracts were temporary, reflecting a systemic reliance on non-standard employment arrangements (Passerini 2024). Furthermore, there is evidence that, despite the large amount of resources allocated, on-site INAIL inspections and public subsidies to boost occupational safety are not targeted where they are most needed (Cerqua et al. 2024). Third, Italy ranks among the leading European Union countries for the prevalence of long working hours. Approximately 11% of employed individuals work overtime, and 9% report consistently working long hours, defined as 49 or more hours per week.

The empirical analysis focuses on Tuscany and combines novel and granular administrative records on WRAs from INAIL Tuscany with register micro-level data on employment contracts from ASIA ISTAT. Our identification strategy exploits over time variations in the prevalence of temporary employment - and thus the reform's impact - across Tuscany's provinces and industries, using a Difference-in-Differences approach. To address potential endogeneity between the use of temporary employment and injuries, we integrate a synthetic control method to match trends in temporary employment within Tuscany's province-industry cells to similar cells in other Italian regions, accounting therefore for industry and local labor market dynamics. This also allows to control for idiosyncratic shocks that could simultaneously influence both employment patterns and safety outcomes.

The results reveal no significant overall effect of the reform on workplace injuries; however, notable effects emerge for specific types of injuries and particular groups of workers. Specifically, reductions are observed in mild injuries and among worker categories theoretically expected to face higher risks of exploitation and injury, such as men and foreign workers, particularly in high-risk local labor markets (Razzolini et al. 2014). This evidence suggests that the observed reductions in injuries are driven by improved working and health conditions rather than changes in reporting behavior.

Our heterogeneity analysis by the degree of monopsonistic dynamics across local labor

[2]Even after excluding COVID-19-related incidents, WRAs rose by 13%

markets indicates a significant and large impact of the reform only in highly concentrated local labor markets, where workers' power is weak compared to employers' power.[3] Specifically, a 10% increase in the incidence of fixed-term contracts leads to a 20% reduction in overall injuries at the local labor market level. Overall, these findings highlight the role of labor market power in shaping working conditions and suggest that employers' power is a key factor associated with workplace safety and workplace injuries.

This study contributes to different lines of research. First, it adds to the growing literature on contract type and workplace injuries. Amuedo-Dorantes (2002) finds that, while temporary workers in Spain face poorer working conditions than permanent workers, after accounting for these conditions, temporary workers are less likely to experience workplace accidents compared to permanent workers. Similarly, García-Serrano et al. (2010) show that workers employed through temporary help agencies in Spain are less likely to sustain work-related injuries. In contrast, using Spanish data, Guadalupe (2003) shows that workers on fixed-term contracts have a 5-percentage points higher accident rate than workers on permanent contracts. Picchio and Van Ours (2017) document that, if subject to a workplace accident, temporary workers are more likely to experience severe injuries than their permanently employed counterparts. Our analysis departs from these studies in that it draws on the variation introduced by a labor market reform to identify the causal effect of temporary work on workplace accidents.

Second, this paper contributes to the extensive literature on the effects of job insecurity on workers' behavior and well-being. Previous studies show that job insecurity reduces well-being and life satisfaction (Böckerman et al. 2011; Carr and Chung 2014; De Cuyper and De Witte 2007; Drobnič et al. 2010; Origo and Pagani 2009) as well as physical and mental health (Buffel et al. 2015; Lepinteur 2021; László et al. 2010), delays long-term commitments such as getting married, having children, or buying a house (De Paola et al. 2021; Mistrulli et al. 2023; Clark and Lepinteur 2022; Clark et al. 2023), and is also associated with a large range of personal and family problems (Larson et al. 1994; Lim and Loo 2003; Mauno and Kinnunen 2002; Rook et al. 1991). Our findings complement this body of research by providing novel evidence on the causal relation between temporary employment and workplace injuries, thus extending the understanding of job insecurity's broader implications.

Third, we enrich the literature on the determinants of workplace accidents. Prior works highlight that factors such as changes in earnings inequality (Hamermesh 1999), economic downturns along the business cycle (Leombruni et al. 2019), output-based incentives (Artz and Heywood 2015), temperature variations and climate change (Filomena and Picchio 2023; Park

[3]For an extended discussion on why it is used to proxy employers' power read *e.g.,* Card (2022).

et al. 2021; Fatima et al. 2021; Heal and Park 2016; Marinaccio et al. 2019), pollution (Curci et al. 2023) and substance use, including drugs and alcohol (Bassols and Castello 2018), are significant contributors to work-related accident risks.[4] By identifying the role of fixed-term contracts in shaping workplace safety, our study adds a critical dimension to understanding the factors driving workplace injuries. Our findings offer key insights for policies aimed at enhancing occupational health as they suggest that enhancing workplace conditions can be a more effective strategy for addressing WRAs than relying solely on contract-type regulation.

Fourth, we extend the monopsony literature investigating the impact of concentration on labor market outcomes. The existing evidence relates to wages and employment (Azar et al. 2020; Marinescu et al. 2021; Azar et al. 2022a; Bassier et al. 2022; Benmelech et al. 2022; Qiu and Sojourner 2023; Dodini et al. 2024), job search (Manning and Petrongolo 2017) and gender pay gap (Hirsch et al. 2010). We advance this body of research by shedding light on an underexplored dimension: workplace injuries. Our findings reveal that labor market power is associated with significantly more injuries. This aligns with recent findings by Zheng (2024), who demonstrates that labor market power significantly contributes to workplace injuries in China by being closely linked to deteriorated working conditions.

The rest of the paper is organized as follows: Section 2 discusses the potential mechanisms; Section 3 describes the institutional setting and the *Dignity Decree*; Sections 4.1 and 4 present the data and the identification strategy, respectively. Section 5.2, 5.3, and 5.4 describe instead the baseline results, the robustness, and the mechanism investigations. Section 6 concludes.

2 Conceptual Framework

The relationship between temporary employment and injuries is more complex than it can be seen. Therefore, based on the literature cited in the previous section, we try to sketch the main mechanisms underlying this relationship:

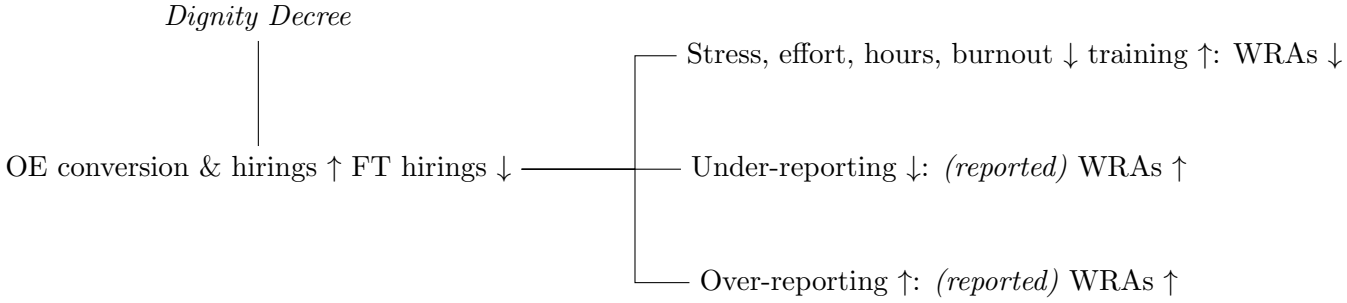


Figure 1: Sketch of the mechanisms.

[4]See also Pouliakas and Theodossiou (2013) for an interdisciplinary review of the literature.

As Figure 1 indicates, the three effects are of different signs, and therefore we may end up estimating, in a reduced form specification, a null effect without incurring any error. However, we know from the literature that under- and over-reporting involve mainly illness and low-intensity WRAs. Furthermore, under-reporting is driven by firms' monopsonistic power, illegal practices, and by the presence of shadow economy. This happens as firms with high power feel more free to exert this power over workers and force them not to report real injuries that, because of the low severity, do not require hospitalization. Over-reporting instead is driven by workers' bargaining power: where workers have higher power over firms, they are more likely to report fake injuries.

To disentangle the three mechanisms (referred to so on as *"stress"* and *over* and *under* reporting channels) we will exploit several heterogeneities and additional outcomes, namely spillovers on (self) employment and shadow economy across industries, and heterogeneity by injury severity, along injury distribution, and across local labor markets with different concentration levels to proxy the degree of monopsonistic power.[5]

3 Institutional Setting

The main law regarding injuries in Italy is *Testo unico per la sicurezza sul lavoro* (D.Lgs. n. 81/2008), which basically says that is it mandatory for firms to train and inform all workers on the risks connected to their tasks and duties. Additionally, it warns firms to carefully evaluate the on-the-job risk for temporary workers. Following this law Art. 20, D.lgs. 2015, was promulgated. This law instead specifically informs that firms that do not provide an extensive evaluation of injury risks according to the *Testo Unico* cannot use temporary employment. Policy makers thus seem to be very worried by the spread of temporary employment regarding WRAs, although direct evidence of the causal effect does not exist.

The Dignity Decree. The reform that we exploit to identify an exogenous and strong shock in temporary employment is the *Dignity Decree* (also referred to as the *DD*). In the third quarter of 2018, the newly formed Italian government approved this largely anticipated labor market reform to address "precarious employment" (Menegotto et al. 2018). The law brought significant increased the cost of using temporary employment, as Figure 7.2.3 shows, while keeping permanent contracts' cost unchanged. The reform was the last approved and

[5]Concentration is a proxy of monopsonistic power at the local labor market level (*e.g.,* Marinescu et al. 2021; Card 2022). In the devoted section, we will explain this more in detail.

reversed in a day a whole trend of EPL decrease that has been ongoing from the '90s, as Figure 7.2.2 shows.

The reform introduced the following modifications: (1) a reduction in the maximum overall duration of temporary work relationships (from 36 to 24 months); (2) a decrease in the number of times the termination date can be extended (from 5 to 4 times); (3) an increase in the social security contribution rate for temporary contract renewals, *i.e.,* FT-to-FT transitions, from 1.4 to 1.9% of pre-tax earnings; (4) most importantly, the reintroduction of the requirement to specify a "broad" motivation for chhosing a fixed-term relationship longer than 12 months.

Evidence on the Dignity Decree. We investigate descriptively the effect of the reform exploiting two datasets drawn from *LosaI*, a random longitudinal sample of working spells' from the Italian National Institute of Social Security (INPS), from which we select permanent and temporary new hires and FT-to-OE transitions from 2016 and 2018. We estimate the following equation:

$$\mathbb{P}(Contract_{i,y}) = \delta_i + \Lambda_j + \mu_{m_{(r-s-o)}} + \theta Post_{y=2018} + \text{HHI Perc}_m + \Gamma Z_{i,y} + v_{i,y} \qquad (1)$$

where the outcome is a dummy variable that takes the value equals to 1 if the contract is a new OE, a new temporary, or a permanent transition for worker i in year y; 0 otherwise. We control for a large set of fixed effects. Results are displayed in Table 7.1.1 and Figure 7.2.4. Estimates indicate that the reform significantly and strongly reduced the incentives to hire temporarily, while increases in turn the reliance on permanent hirings and conversions: the likelihood of a permanent hire or conversion increased by approximately 2 and 3 p.p., while of the likelihood of an FT hire decreased by 2 p.p. Meanwhile, the likelihood of experiencing a layoff is unchanged.[6] Overall, the dignity decree induced a change in the employment mix that became more secure in terms of contracts while leaving employment levels unaffected (Palladino and Sartori 2021; Grasso and Tatsiramos 2023).

4 Data and Empirical Strategy

4.1 Data

In this paper, we exploit several data sources:

[6] If we instead run a market-level regression in which the dependent variable is the number of layoffs per market-year cells and the covariate is a yearly dummy we find even a decrease in the number of layoffs post *DD*.

INAIL. Our primary source is INAIL Tusany, an administrative data comprehensively documenting the universe of workplace-related accidents occurring in Tuscany between 2000 and 2021. The data set covers approximately 1.5 million records. These data are highly granular, recorded daily, and provide extensive information on the worker, the firm, and particularly on the accident, which allows us to explore further dimensions that have never been explored before and to identify the driving mechanism according to Figure 1. Particularly, we exploit information on the days assigned to recover for each injury, which we split into terciles to investigate severity heterogeneity.

We select individuals aged 16-55 between 2017 and 2019 to focus on the working population and collapse the data at the municipality-industry-month to obtain a perfectly balanced panel in the analysis period. For the baseline regression, we collapse further the data at the province-level while using the municipality-level one as robustness and for some heterogeneity by municipality characteristics. We focus on WRAs triggering at least physical damage.[7] We keep illnesses (also referred to as *"others"*), deaths and *in itinere* WRAs as alternative outcomes. We weight each outcome expressing it per 1000 employees by province-industry from ASIA.[8]

ASIA ISTAT. We then exploit ASIA, a combined administrative source (social security, tax authority, chamber of commerce) provided by the Italian Statistical Office (ISTAT) covering all Italian firms. We compute province-industry-year employment stocks by contract type that we use to compute measures of relative exposure to injuries based on the population at risk. The full dataset cannot be exploited, but it is possible to ask ISTAT for specific elaborations. We ask for the temporary employment incidence by province-industry-year, computed as the share of temporary over total employment stocks.

2001 Census ISTAT. We also rely on the ISTAT 2001 Census, executed at the municipal level at the end of the year, to obtain alternative measures of the population at risk, namely total resident population and total employed in the labor force.

4.2 Evidence on Tuscany

Tuscany is a large and rich region in the north-center of Italy. It has a population of approximately 3.66 million residents, approximately 1.4 million employed, spread across 10 provinces

[7] We specifically observe in the data an indicator of whether there have been physical damages or not.
[8] We compute the mean, rounded, in the pre-reform period, 2012-17. for each cell.

and 273 municipalities. The main cities include Florence (around 363,837 residents), Prato (198,034), and Livorno (153,186). Tuscany's international appeal is reflected in its foreign population, which makes up about 11% of the total residents. This diversity enhances its labor market and cultural dynamics.

Gross domestic production was 137.78 billion in 2019, fifth in Italy, and there were approximately 50 thousand firms in 2007 (AIDA). Tuscany exported goods worth €57.1 billion in 2023, accounting for 9.1% of Italy's total exports. The export sector is a major contributor to the regional economy, making up 42.4% of Tuscany's GDP. A significant portion of these exports targets non-EU countries, constituting 58% of the total export volume. The region is home to over 333,000 businesses, with strong representation in sectors like fashion, leather, chemicals, and high-tech manufacturing. Multinational companies contribute significantly to the industrial base, employing over 80,000 people and generating 37.2 billion of euros in turnover.

It has a sizable agricultural industry (60,000 employed) and ranked fifth in 2021 for the number of firms in the wine sector (21,708) and fourth for the surface devoted (60,000 hectares) with an overall production of 200 million liters.[9] For all these reasons, we believe Tuscany is a valuable setting to investigate our research question.

In 2018, Tuscany recorded around 50,000 workplace injury claims, representing 10.7% of Italy's total (469,008 cases). Of these, 77 were fatal, accounting for 6.8% of the country's workplace deaths (1,133). Most injuries occurred during work activities, with fewer linked to commuting incidents in the construction and agriculture industries, and mainly among men.

4.3 Identification

We exploit changes in the incidence of temporary employment across provinces, industries and time to estimate the impact of temporary employment on WRAs. The underlying mechanism that we exploit is that province-industry are heterogeneously affected by the reform since the temporary employment incidence largely varies across provinces, industries, and over time (Grasso and Tatsiramos 2023). We therefore estimate the following DiD at the province-industry-month level:

$$Y_{p(T),s,m} = \delta_{p(T),s} + \lambda_m + \sum_{q \neq q4-17} \beta_q 1_q TDS_{p(T),s} + \varepsilon_{p(T),s,m} \tag{2}$$

where Y are WRAs x 1000 employees by province-industry cells and $\delta_{p(T),s}$ and λ_m are province-

[9] 8% of the entire Italian production.

industry and month-fixed effects. $TDS_{p(T),s}$ is instead the treatment, *i.e.,* is the mode of synthetic FT incidence, expressed in deciles, computed across province-industry cells between 2012 and 2017 on ASIA data. β_qs are estimated by quarter, to increase the statistical power, avoid dropping too many zeros cells when including the fixed effects, and improve the standard error estimation. The baseline is Q4-17 due to potential anticipatory effect from the electoral campaign since the *DD* was extensively anticipated by the Five Stars Movement.[10] We always cluster standard errors at the treatment level *i.e.,* by province-industry's.

We estimate Equation 2 with a quasi-poisson fixed effect estimator (PPML) since the variable is a pure discrete count variable that only takes positive values. However, this estimator, especially with a large set of fixed effects and when the outcome tends not to vary too much, discards the extensive margin *i.e.,* the mass of zeros, and focuses on the extensive margin, those cells in which it is able to retrieve a reliable variable within the fixed effects. We don't think this is an issue; instead, it is more appropriate since PPML yields an Intention to Treament (ITT) effect that, by automatically discarding those labor markets in which there is not enough variation to compute an effect within the set of fixed effects, tends towards an Average Treatment Effect on the Treated (ATET). Since an ATET is better than an ITT in terms of causal interpretation, the PPML estimator is preferred to recover the casual effect of interest.

Threats. One concern is that the treatment intensity, TDS, may be endogenous to the outcomes, because of Omitted Variable Bias (OVB) induced by local labor markets specific shocks that we cannot observe and control for and because of the potential reverse causality induced by temporary employment being more or less used because injuries are higher as a cost-saving strategy. For the former, we may add a large set of time-varying controls at the province or municipality level, but first, it is hard to find them at the quarterly level and second we will not be sure that we can really capture them even in that case. Concerning the latter instead, we cannot rule it out even controlling.

Therefore, we follow a different approach. We rely on a synthetic control approach (Abadie 2021) to proxy the patterns and the levels of FT incidence across province-industry cells using similar cells from the rest of Italy, along many labor market dimensions.[11]

This approach relies on only one crucial underlying assumption. We assume that the real and synthetic outcome will have experienced the same changes after the reform because of

[10] Read Grasso and Tatsiramos (2023) for an extensive discussion.

[11] We draw all these dimensions from ASIA, using both additional information on province-industry labor market characteristics *i.e.,* employment levels, contract type, men share etc.. plus lagged FT incidence for the same cell to force the matching on the unoservable and improve the fit. Further details will be provided in a more updated draft.

common shocks that go through industry and similar labor market-specific channels, while they would have differed because of local labor market-specific idiosyncratic shocks that jointly influence the treatment and the outcome *i.e.,* those triggering endogeneity. Our aim is, through the SCM method approach, to capture only the former effect while getting rid of the latter.

The results from the SCM are displayed in Figure 7.2.5 and clearly indicate that the performance of the algorithm is high since the levels and the patterns of the two FT incidences are very similar and the correlation is almost the highest possible. We then compute TDS on the synthetic incidence. Table 7.1.2 displays the correspondence between FT incidence and the treatment class: one additional unit of TDS roughly translates into an increase in FT incidence at mean values of 1.5 p.p. *i.e.,* 10% of the mean value of FT incidence across province-industry's.

5 Preliminary Results

5.1 Descriptive Evidence

Results are shown in Table 7.1.3. They indicate that on average in Tuscany, approximately 8 injuries per 1000 workers by province-industry happen every month. Surprisingly, deaths are much lower as well as standard illness. the largest share is to be attributed to men and Italians. However, if we simply weight these numbers by the corresponding share on the total resident population, we will observe that the injury risk for foreigners becomes largely higher than those of Italians (approximately more than the double), and even more if we use the corresponding share in the working population.

Considering additionally that the data deals by definition with the formal labor market and excludes *a priori* the informal one, these numbers indicate that in the Italian labor market foreigners face a serious and additional threat posed by WRAs even when formally employed. Instead, when dealing with the informal labor market, the risks are even disproportionally higher (Dipoppa 2023, 2024). Figure 7.2.6 instead indicates that we find, even controlling for industry, province, and month fixed effects, a positive correlation between fixed-term incidence and injuries across local labor markets.

In Table 7.1.4 and Figure 7.2.9 we replicate the previous analysis at the municipality-level. We find, although with different magnitude obviously, the same evidence and the same pattern commented above, additionally with a higher significance correlation between the treatment and injuries.

5.2 Baseline Estimates

Estimates are displayed in a DiD in Table 7.1.5 and in a Event Study specification in Figures 7.2.7 and 7.2.8. Overall, results indicate that there is not significant relationship at the local labor market level between injuries and temporary employment. However, if we look at the heterogeneity by workers' characteristics and injury severity, we do observe a reduction since the annunciation of the reform for some outcomes, in particular foregiens and for injuries in the second tercile. However, the DiD are always not significant while the effects show up only in some quarters of the dynamics specification. However, these null results may hide the joint presence of the three mechanisms sketched in Figure 1. In Section 5.4, we outline how we plan to disentangle the mechanisms in several ways.

5.3 Robustness

In this section, we perform several exercises to test the validity of our main estimates. We will take into account the continuous treatment issue with a novel dynamics estimator, we will then estimate the main speciation in Equation 2 at the municipality level, additionally changing the weights, and with an OLS estimator.

Dynamics Event Study. Since our treatment is continuous and there is no real control group but only weakly treated units, our specification may suffer of the well-known issue of contamination, which may lead to bias in both estimates and inference. Therefore, we replicate our main specification with the de Chaisemartin and D'Haultfœuille 2024 estimator, which is designed specifically to take into account this threat, additionally dichotomizing the treatment on the median to maximize the statistical power as:

$$Y_{p(T),s,m} = \delta_{p(T),s} + \lambda_m + \sum_{q \neq q4-17} \beta_q 1_q 1_{p(t),s}[TDS_{p(T),s} > P(50)] + \varepsilon_{p(T),s,m} \tag{3}$$

in which $1_{p(t),s}$ is a dummy taking value 1 if TDS is above the median value; 0 otherwise. Results are displayed in Figure 7.2.10 and are virtually unchanged from the baseline ones, which suggests that the main identification strategy is robust to potential contamination threats.

Municipality-level specification, different weights, OLS. We exploit fully the granularity of the data on the outcome side by estimating the baseline specification at the municipality level. The equation is unchanged from 2 with the only differences that we have now use mu-

nicipality by industry fixed effects. Results are displayed in Table 7.1.6 and Figures 7.2.11 and 7.2.12, They are virtually unchanged, both in magnitude and significance, from the baseline. For this reason, from now on, we will use this specification to fully exploit the data granularity that allows us to investigate additional dimensions that we cannot at the province level.

First, we can rely on 2001 ISTAT census to weigh the outcomes differently, with total employed population and total resident population by municipalities. Results displayed in Figure 7.2.13, are basically unchanged from the baseline, with the only difference of mild severity injuries that become statistically significant even in the DiD specification. We then estimate the municipality-level specification with an OLS in which the outcome is still in levels. The estimates displayed in Figures 7.2.14 and 7.2.15 are again in terms of significance and pattern unchanged from those obtained with the PPML estimator.

Additional Outcomes. After validating our results, we now investigate the effect on two additional outcomes, namely workplace injuries that result in death and *in itinere* WRAs, so episodes that do not happen at the workplace but on the way to the workplace. Results are displayed in Figures 7.2.16, in a dynamic approach, and 7.2.17, in a DiD specification and split by injuries and illnesses. For deaths, there is clearly no effect at all of the reform, as predictable, since the mechanism we want to capture involve eventually lower hours worked, less stress and burnout, which therefore lead very rarely to deaths.

Regarding instead on injuries on the way to the workplace, the exercise can be seen as a placebo. Indeed, theoretically, the type of contract does not play any role in the injury risk outside the workplace. The "stress" mechanism clearly applies only at the workplace, not going to, while the opposite may apply to the *reporting* channel since more protected workers are also more likely to report injuries outside the workplace if they can. Results are again not statistically significant, but the coefficients are both positive which indicates that the previously outlined mechanism may be in place, although it does not seem to be sufficiently relevant to be precisely captured.

5.4 Mechanisms

Employment Spillovers. Such reforms may have may unintended spillovers, since, by modifying firms' incentives to hire with different contracts, they may react in many different ways trying to avoid the additional constraints posed. First, we know already that employment levels did not change because of the *DD* (Palladino and Sartori 2021). However, firms may

leverage self-employment (Amodio et al. 2024), atypical employment (Datta et al. 2019) or even shadow economy to avoid higher costs.

These potential spillovers may explain the null effect of the baseline, as injuries may not decrease since workers decrease or because they are relegated to informality. We select ISTAT municipality-by-year data on employment and self-employment across different firms to estimate the effects of the reform. Since we no longer have the industry to compute the treatment, we exploit only variations across provinces estimating this equation:

$$Log(Y_{c,y}) = \delta_c + \lambda_y + \theta Post_{y \geq 2018} * TDS_p + \varepsilon_{c,y} \tag{4}$$

, where $Y_{c,y}$ is employment and self-employment level across different dimensions in Tuscany municipalities and δ_c and λ_y are respectively municipality and year-fixed effects. We cluster standard errors at the municipality level. Results are shown in Figure 7.2.18 and indicate that there is no effect whatsoever on employment and self-employment stocks.

Labor Market Informality. We then exploit an ISTAT time series on labor market informality at the industry-by-year level to investigate the potential effect of the reform. Since we cannot rely on province variation, we only rely on industry-level variation and estimate this equation:

$$Log(\text{Labor Market Informality}_{s,y}) = \delta_s + \lambda_y + \sum_{y \neq 2017} 1_y * TDS_s + \varepsilon_{s,y} \tag{5}$$

where the outcome is the share of informal over total ULAs (*i.e.,* labor equivalent units)[12] across industries and years in Tuscany and δ_s and λ_y are respectively industry and year-fixed effects. Results are shown in Figure 7.2.19 and indicate that in 2018 there is no positive effect whatsoever of the reform on informality. To conclude, results suggest that we can exclude these confounders as an explanation of the null effects on injuries.

Heterogeneity by workers, and injury severity and risk. Heterogeneity, shown in Table 7.1.5, indicates that there is no increase at all in weak injuries and illness, if ever a not significant reduction. This suggests that the *reporting* channels are not supported in any way in the data from the beginning. We then explore further potential hidden results. Indeed, a large number of zeros may hide the effect of interest and yield a null estimate. In fact, since we

[12]More details are available in the footnotes of Table 7.2.19.

would like to capture a decrease in injuries, clearly the decrease cannot happen in those local labor markets in which, previous to the reform, already no injuries happened.

We then estimate Equation 2 across the deciles of the pre-reform injury distribution. Results are displayed in Figure 7.2.20 and indicate that overall this is the case. However, this happens only for some outcomes and not for all. Italians are not affected along the whole distribution, while women are surprisingly in the lowest deciles only. All, men, foreigners, and the first tercile in severity indeed decreased significantly only in the last deciles. Therefore, we can further exclude that we are capturing a *reporting* mechanism of any kind.

Concentration levels. There is evidence that firms use all the different tools in their possession to avoid statutory increases in costs. However, they can do it when they have the opportunity, and monopsony is one (Popp 2021). Card 2022 defines a labor market monopsony as a situation in which "*many or even most firms have some wage-setting power*". Recent literature highlighted that concentration is a good proxy for monopsonistic degree across local labor markets (Marinescu et al. 2021). Furthermore, there is large evidence that not only wages are affected by this power, but also job security and specifically contract stability (Bassanini et al. 2024; Passerini 2024). In such environments, in which temporary employment is more exploited, firms may exert their power to hinder working conditions, therefore triggering more injuries (Zheng 2024). On the contrary, where firms do not have this power, is where the over-reporting of illnesses and low-intensity injuries should be concentrated.

Therefore, we estimate separate specifications by concentration levels. We computed a measure of concentration through and Herfindhal-Hirschman Index (HHI) based on firms' employment stocks by province-industry[13] between 2017 and 2019 in Tuscany with AIDA. AIDA includes information on limited liability companies and stock companies; therefore, it does not cover the universe of all Tuscany firms but we believe it is a good proxy of those active.[14] We select approximately 132,000 active firms in Tuscany and compute according to the standard formula (*e.g.,* Azar et al. 2022b) an index from 0 to 1 in:

$$\text{HHI}_{m_{p,s},t} = \sum_{j=1}^{N_{m_{p,s}}} s^2_{j,m_{p,s},t} \tag{6}$$

[13] 1 digit as in the INAIL data.

[14] It contains balance sheet data of firms active in the Italian economy. Its coverage includes companies required by law to submit financial accounts to public authorities that are subject to corporate profit taxation and regulations. Self-employed individuals and individual partnerships, which are subject to personal income tax, are not required to submit their balance sheets to the public authority

where $N_{m_{p,s}}$ is the total number of firms within the market $m_{p,s}$, a tuple province p-industry s, and $s_{j,m_{p,s},t}$ is the labor market share of the firm j in market $m_{p,s}$ at time t *i.e.,* 2017. $s_{j,m_{p,s},t}$ is the ratio of the size of firm j in market $m_{p,s}$ in t and the total size of market $m_{p,s}$ in t *i.e.,* the sum of all firm's sizes. We then assign each local labor market to a group depending on the quintile in which each local labor market HHI falls.

Our predictions seem confirmed since Figure 7.2.21 shows that the effect is marginally significant and sizeable only in high-HHI local labor markets. This indicates that where employers' power is higher, more temporary employment is used and more injuries happen as working conditions are bad. This suggests that the reform, by forcing contact conversion, directly improves working conditions in the most injury-prone jobs. In low-HHI LLMs instead, where we could expect an increase in injuries due to less under-reporting, we find no effect, suggesting that we are capturing a working conditions effect rather than a reporting ones.

6 Conclusions

In this study, we examined whether the nature of employment contracts, particularly temporary contracts, causes workplace injuries. Temporary employment is often associated with unfavorable working conditions, such as involuntary working hours, higher stress, burnout, limited workplace training, and insufficient information on injury risks, which could contribute to a higher incidence of workplace injuries. To address this, we leveraged a 2018 labor market regulation in Italy that significantly restricted the use of temporary contracts, leading to a more stable workforce.

Our findings indicate that the reform did not lead to an overall reduction in workplace injuries. However, we observed a decline in mild injuries and a reduction in injuries among foreign workers and men in high-risk local labor markets. Notably, we find no evidence of increased illness or minor work-related accidents, if ever a reduction, in high-risk local labor markets. In contrast, we identify a reduction in all work-related injuries in more concentrated labor markets, suggesting that the reform affects working conditions where they are worse and that reporting biases such as over- or under-reporting are unlikely to drive our results. These findings allow us to disentangle the mechanisms linking temporary employment and workplace injuries, emphasizing the role of stress as a key causal factor. Nonetheless, our results suggest that addressing workplace safety challenges requires going beyond temporary employment contracts. Policymakers should also prioritize improving overall working conditions, tackling

shadow economy practices, and combating illegal labor activities to ensure safer workplaces.[15]

References

Abadie, A. (2021). Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of economic literature 59*(2), 391–425.

Amodio, F., P. Medina, and M. Morlacco (2024). Labor market power, self-employment, and development. Technical report, RF Berlin-CReAM Discussion Paper Series.

Amuedo-Dorantes, C. (2002). Work safety in the context of temporary employment: the spanish experience. *ILR Review 55*(2), 262–285.

Anxo, D. and M. Karlsson (2019). *Overtime work: A review of literature and initial empirical analysis*. International Labour Office, Inclusive Labour Markets, Labour Relations and ....

Artz, B. and J. S. Heywood (2015). Performance pay and workplace injury: Panel evidence. *Economica 82*(s1), 1241–1260.

Azar, J., I. Marinescu, and M. Steinbaum (2022a). Labor market concentration. *Journal of Human Resources 57*(S), S167–S199.

Azar, J., I. Marinescu, and M. Steinbaum (2022b). Labor market concentration. *Journal of Human Resources 57*(S), S167–S199.

Azar, J., I. Marinescu, M. Steinbaum, and B. Taska (2020). Concentration in us labor markets: Evidence from online vacancy data. *Labour Economics 66*, 101866.

Bannai, A. and A. Tamakoshi (2014). The association between long working hours and health: a systematic review of epidemiological evidence. *Scandinavian journal of work, environment & health*, 5–18.

Bassanini, A., G. Bovini, E. Caroli, J. C. Ferrando, F. Cingano, P. Falco, F. Felgueroso, M. Jansen, P. S. Martins, A. Melo, et al. (2024). Labor market concentration, wages and job security in europe. *Journal of Human Resources*.

Bassier, I., A. Dube, and S. Naidu (2022). Monopsony in movers. *Journal of Human Resources 57*(S), S50–s86.

Bassols, N. M. and J. V. Castello (2018). Bar opening hours, alcohol consumption and workplace accidents. *Labour Economics 53*, 172–181.

Benmelech, E., N. K. Bergman, and H. Kim (2022). Strong employers and weak employees. *Journal of Human Resources 57*(S), S200–S250.

Böckerman, P., P. Ilmakunnas, and E. Johansson (2011). Job security and employee well-being: Evidence from matched survey and register data. *Labour Economics 18*(4), 547–554.

[15]Note, for instance, the ongoing works by Mastrobuoni *et al.* (2024) and Principe *et al.* (2024) that investigate the relationship between shadow economy and criminal infiltrations and workplace injuries.

Boden, L. I. and M. Galizzi (2003). Income losses of women and men injured at work. *Journal of Human Resources 38*(3), 722–757.

Booth, A. L., M. Francesconi, and J. Frank (2002). Temporary jobs: stepping stones or dead ends? *The Economic Journal 112*(480), F189–F213.

Buffel, V., R. Dereuddre, and P. Bracke (2015). Medicalization of the uncertainty? an empirical study of the relationships between unemployment or job insecurity, professional care seeking, and the consumption of antidepressants. *European Sociological Review 31*(4), 446–459.

Butler, R. J., M. L. Baldwin, and W. G. Johnson (2006). The effects of occupational injuries after returns to work: Work absences and losses of on-the-job productivity. *Journal of Risk and Insurance 73*(2), 309–334.

Campolieti, M. and H. Krashinsky (2006). Disabled workers and wage losses: Some evidence from workers with occupational injuries. *ILR Review 60*(1), 120–138.

Card, D. (2022). Who set your wage? *American Economic Review 112*(4), 1075–1090.

Carr, E. and H. Chung (2014). Employment insecurity and life satisfaction: The moderating influence of labour market policies across europe. *Journal of European Social Policy 24*(4), 383–399.

Cerqua, A., C. Giannantoni, M. Letta, and G. Pinto (2024). 'dead man working': A place-based approach to workplace fatalities. *SSRN*.

Clark, A., C. D'Ambrosio, and A. Lepinteur (2023). Marriage as insurance: job protection and job insecurity in france. *Review of Economics of the Household 21*, 1157–1190.

Clark, A. E. and A. Lepinteur (2022). A Natural Experiment on Job Insecurity and Fertility in France. *The Review of Economics and Statistics 104*(2), 386–398.

Crichton, S., S. Stillman, and D. Hyslop (2011). Returning to work from injury: Longitudinal evidence on employment and earnings. *ILR Review 64*(4), 765–785.

Curci, G., D. Depalo, and A. Palma (2023). The dirtier you breathe, the less safe you are. the effect of air pollution on work accidents.

Datta, N., G. Giupponi, and S. Machin (2019). Zero-hours contracts and labour market policy. *Economic Policy 34*(99), 369–427.

de Chaisemartin, C. and X. D'Haultfœuille (2024, 02). Difference-in-Differences Estimators of Intertemporal Treatment Effects. *The Review of Economics and Statistics*, 1–45.

De Cuyper, N. and H. De Witte (2007). Job insecurity in temporary versus permanent workers: Associations with attitudes, well-being, and behaviour. *Work & Stress 21*(1), 65–84.

De Paola, M., R. Nisticò, and V. Scoppa (2021). Employment protection and fertility decisions: The unintended consequences of the italian jobs act. *Economic Policy 36*(108), 735–773.

Dipoppa, G. (2023). How criminal organizations expand to strong states: Local agreements and migrant exploitation in northern italy. *The Journal of Politics*.

Dipoppa, G. (2024). When migrants mobilize against exploitation: Evidence from italian farmlands. *Accepted at American Political Science Review*.

Dodini, S., M. Lovenheim, K. Salvanes, and A. Willén (2024). Monopsony, job tasks and labour market concentration. *The Economic Journal 134*(661), 1914–1949.

Drobnič, S., B. Beham, and P. Präg (2010). Good job, good life? working conditions and quality of life in europe. *Social indicators research 99*, 205–225.

Engellandt, A. and R. T. Riphahn (2005). Temporary contracts and employee effort. *Labour economics 12*(3), 281–299.

Fatima, S. H., P. Rothmore, L. C. Giles, B. M. Varghese, and P. Bi (2021). Extreme heat and occupational injuries in different climate zones: A systematic review and meta-analysis of epidemiological evidence. *Environment international 148*, 106384.

Filomena, M. and M. Picchio (2023). Unsafe temperatures, unsafe jobs: The impact of weather conditions on work-related injuries.

Galizzi, M. and L. I. Boden (2003). The return to work of injured workers: evidence from matched unemployment insurance and workers' compensation data. *Labour Economics 10*(3), 311–337.

Galizzi, M., R. Leombruni, and L. Pacelli (2019). Successful return to work during labor market liberalization: the case of italian injured workers. *Journal for Labour Market Research 53*, 1–24.

Galizzi, M., R. Leombruni, and L. Pacelli (2023). Severe work disabilities and long-lasting losses. *Labour Economics 85*, 102432.

García-Serrano, C., V. Hernanz, and L. Toharia (2010). Mind the gap, please! the effect of temporary help agencies on the consequences of work accidents. *Journal of Labor Research 31*, 162–182.

Grasso, G. and K. Tatsiramos (2023). The impact of restricting fixed-term contracts on labor and skill demand.

Guadalupe, M. (2003). The hidden costs of fixed term contracts: the impact on work accidents. *Labour economics 10*(3), 339–357.

Hamermesh, D. S. (1999). Changing inequality in markets for workplace amenities*. *The Quarterly Journal of Economics 114*(4), 1085–1123.

Heal, G. and J. Park (2016). Reflections—temperature stress and the direct impact of climate change: a review of an emerging literature. *Review of Environmental Economics and Policy*.

Hirsch, B., T. Schank, and C. Schnabel (2010). Differences in labor supply to monopsonistic firms and the gender pay gap: An empirical analysis using linked employer-employee data from germany. *Journal of Labor Economics 28*(2), 291–330.

ILO (2023). *Occupational safety and health in Europe – State and trends 2023 – Summary*. Publications Office of the European Union.

Johnson, W. G. and J. Ondrich (1990). The duration of post-injury absences from work. *The Review of Economics and Statistics 72*(4), 578–586.

Larson, J. H., S. M. Wilson, and R. Beley (1994). The impact of job insecurity on marital and family relationships. *Family relations*, 138–143.

László, K. D., H. Pikhart, M. S. Kopp, M. Bobak, A. Pajak, S. Malyutina, G. Salavecz, and M. Marmot (2010). Job insecurity and health: A study of 16 european countries. *Social science & medicine 70*(6), 867–874.

Leombruni, R., T. Razzolini, and F. Serti (2013). The pecuniary and non-pecuniary costs of job displacement—the risky job of being back to work. *European Economic Review 61*, 205–216.

Leombruni, R., T. Razzolini, and F. Serti (2019). Macroeconomic conditions at entry and injury risk in the workplace. *The Scandinavian Journal of Economics 121*(2), 783–807.

Lepinteur, A. (2021). The asymmetric experience of gains and losses in job security on health. *Health Economics 30*(9), 2217–2229.

Lim, V. K. and G. L. Loo (2003). Effects of parental job insecurity and parenting behaviors on youth's self-efficacy and work attitudes. *Journal of Vocational Behavior 63*(1), 86–98.

Manning, A. and B. Petrongolo (2017). How local are labor markets? evidence from a spatial job search model. *American Economic Review 107*(10), 2877–2907.

Marinaccio, A., M. Scortichini, C. Gariazzo, A. Leva, M. Bonafede, F. K. De'Donato, M. Stafoggia, G. Viegi, P. Michelozzi, A. Carla, et al. (2019). Nationwide epidemiological study for estimating the effect of extreme outdoor temperature on occupational injuries in italy. *Environment international 133*, 105176.

Marinescu, I., I. Ouss, and L.-D. Pape (2021). Wages, hires, and labor market concentration. *Journal of Economic Behavior & Organization 184*, 506–605.

Mauno, S. and U. Kinnunen (2002). Perceived job insecurity among dual-earner couples: Do its antecedents vary according to gender, economic sector and the measure used? *Journal of Occupational and Organizational Psychology 75*(3), 295–314.

Mazzolini, G. (2020). The economic consequences of accidents at work. *Oxford Bulletin of Economics and Statistics 82*(5), 1068–1093.

Menegotto, M., F. Seghezzi, and S. Spattini (2018). Misure per il contrasto al precariato: primo commento al decreto-legge n. 87/2018 (cd decreto dignità). *Adapt Labour Studies e-Book series 73*.

Mistrulli, P. E., T. Oliviero, Z. Rotondi, and A. Zazzaro (2023). Job protection and mortgage conditions: Evidence from italian administrative data. *Oxford Bulletin of Econommics and Statistics 85*, 1211–1237.

Origo, F. and L. Pagani (2009). Flexicurity and job satisfaction in europe: The importance of perceived and actual job stability for well-being at work. *Labour economics 16*(5), 547–555.

Palladino, M. G. and M. Sartori (2021). Dignity by decree: The occupational effects of temporary jobs regulation in italy. Technical report, mimeo.

Park, J., N. Pankratz, and A. Behrer (2021). Temperature, workplace safety, and labor market inequality.

Passerini, F. (2024). Concentration and mergers: Evidence from italian labor markets. *Under revision at OEP*.

Picchio, M. and J. C. Van Ours (2017). Temporary jobs and the severity of workplace accidents. *Journal of safety research 61*, 41–51.

Popp, M. (2021). Minimum wages in concentrated labor markets. *arXiv preprint arXiv:2111.13692*.

Pouliakas, K. and I. Theodossiou (2013). The economics of health and safety at work: an interdiciplinary review of the theory and policy. *Journal of Economic Surveys 27*(1), 167–208.

Prodromidis, N. (2024). Working hours and workers' health: Evidence from a national experiment in sweden. *ongoing*.

Qiu, Y. and A. Sojourner (2023). Labor-market concentration and labor compensation. *ILR Review 76*(3), 475–503.

Razzolini, T., R. Leombruni, G. Mastrobuoni, and M. Pagliero (2014). Beneath the surface: The decline in gender injury gap. *Labour Economics 30*, 282–288.

Rook, K., D. Dooley, and R. Catalano (1991). Stress transmission: The effects of husbands' job stressors on the emotional health of their wives. *Journal of Marriage and the Family*, 165–177.

Zheng, H. (2024). Death by market power and the production-safety tradeoff in the coal mining industry.

7 Appendix

7.1 Tables

	(1) FT-to-OE Transition	(2) OE Hirings	(3) FT Hirings
$\widehat{\theta}$	0.0338***	0.0186***	-0.0195***
	(0.00716)	(0.00447)	(0.00471)
Observations	28,660	163,265	163,265
R2	0.517	0.895	0.894
(Spell length; Age)^2	✓	✓	✓
Worker FE	✓	✓	✓
Market FE	✓	✓	✓
Industry FE	✓	✓	✓
Job title FE	✓	✓	✓
Region FE	✓	✓	✓
HHI perc. FE	✓	✓	✓
Firm FE	✓	✓	✓

Table 7.1.1: Eq. (1) is an LPM on renewals, workers with 2 consecutive spells in 2y in the same firm and the first is FT, and new hires. Post=1 if year=2018, 0 if '16-17. SE clustered at the market level. *** p<0.01, ** p<0.05, * p<0.1. *Source:* LoSaI.

Table 7.1.2: Mean, SD and median of FT incidence by treatment cells in deciles.

TDS	**Mean**	**SD**	**Median**
1	.0359764	.0151565	.0340823
2	.0606455	.0032391	.0602527
3	.0725304	.0054092	.070022
4	.087471	.0078778	.0885799
5	.1052923	.0060899	.1027041
6	.1204762	.0066583	.122067
7	.1362758	.0085603	.1369787
8	.1748219	.0091332	.1735055
9	.2607254	.0498748	.2443099
10	.4804752	.0981442	.4739985
Total	.1521574	.1290461	.1097459

WRAs x 1000 employees	*Obs.*	*SD*	*Mean*	*Median*	*p5*	*p95*
All	5,508	12.5853	8.063725	3	0	35
Men	5,508	10.53191	5.902505	2	0	27
Women	5,508	3.852954	2.16122	1	0	10
Italians	5,508	10.1056	6.601852	2	0	27
Foreigners	5,508	3.081573	1.461874	0	0	7
Severity tercile						
First	5,508	4.330816	2.481481	1	0	12
Second	5,508	4.697692	2.753086	1	0	13
Third	5,508	4.36546	2.829158	1	0	12
Deaths	5,508	.0839137	.0063544	0	0	0
Others	5,508	3.084003	1.798112	1	0	8

Table 7.1.3: Summary statistics of WRAs x 1000 employees by types and severity in '17-19. Records are province-industry-month tuples. Outcomes are weighted by ASIA province-industry employment, measured as the average in '12-17.

WRAs x 1000 employees	*Obs.*	*SD*	*Mean*	*Median*	*p5*	*p95*
All	100,404	1.669635	.4423629	0	0	2
Men	100,404	1.286804	.3238018	0	0	2
Women	100,404	.653228	.118561	0	0	1
Italians	100,404	1.325028	.3621668	0	0	2
Foreigners	100,404	.5025582	.080196	0	0	1
Severity tercile						
First	100,404	.6246131	.13613	0	0	1
Second	100,404	.6837498	.1510298	0	0	1
Third	100,404	.634431	.155203	0	0	1
Deaths	100,404	.0191936	.0003486	0	0	0
Others	100,404	.5244826	.0986415	0	0	1

Table 7.1.4: Summary statistics of WRAs x 1000 employees by types and severity in '17-19. Records are municipality-industry-month tuples. Outcomes are weighted by ASIA province-industry employment, measured as the average in 2012-17.

	Workers' characteristics:					Injury severity tercile:			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
WRAs per 1000 employees	All	Men	Women	Italians	Foreigners	Others	1^{st}	2^{nd}	3^{rd}
Post*TDS	0.000375	0.00829	-0.0189	0.00435	-0.0462	-0.0813	-0.00289	-0.0242	0.0163
	(0.0134)	(0.0162)	(0.0186)	(0.0159)	(0.0405)	(0.0848)	(0.0299)	(0.0218)	(0.0280)
Observations	5,436	5,364	4,356	5,436	4,140	5,072	5,395	5,215	5,179
Province x industry FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Month FE	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 7.1.5: PPML DiDs by injury type and severity, weighted by province-industry employment. SE clustered by province-industry's. *** p<0.01, ** p<0.05, * p<0.1.

	Workers' characteristics:						Injury severity tercile:		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
WRAs per 1000 employees	All	Men	Women	Italians	Foreigners	Others	1^{st}	2^{nd}	3^{rd}
Post*TDS	-0.00578	0.00335	-0.0205	-0.00265	-0.0243	-0.0803	-0.0155	-0.0256	0.0178
	(0.0203)	(0.0281)	(0.0258)	(0.0229)	(0.0407)	(0.0623)	(0.0300)	(0.0477)	(0.0240)
Observations	44,496	36,180	20,988	40,824	13,428	19,579	23,572	23,822	27,386
Municipality x industry FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Month FE	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 7.1.6: PPML DiDs on WRAs, by type, weighted by province-industry employment. SE clustered at the province-industry level. *** p<0.01, ** p<0.05, * p<0.1.

7.2 Figures

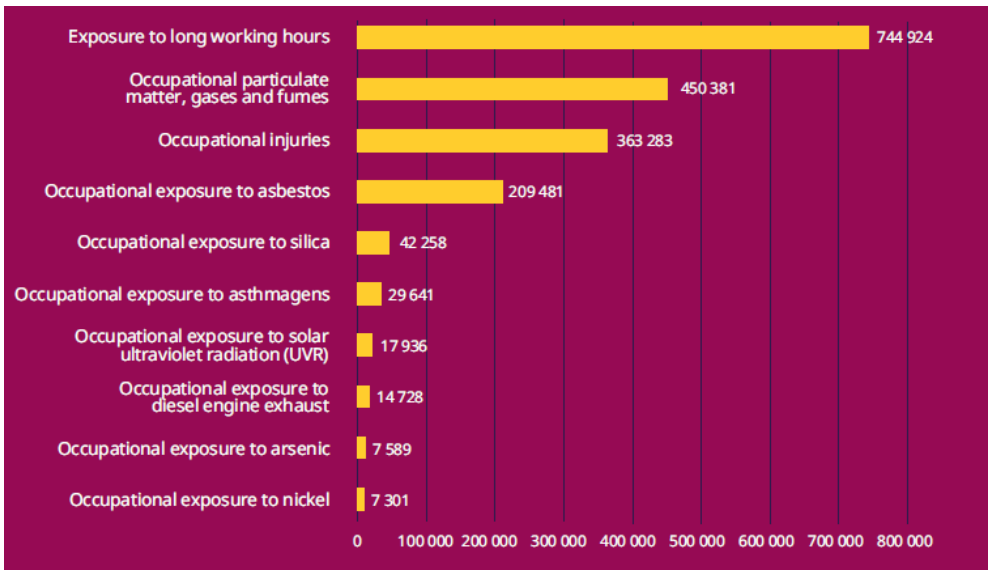


Figure 7.2.1: Main causes for deaths at the workplace. *Source:* ILO (2023).

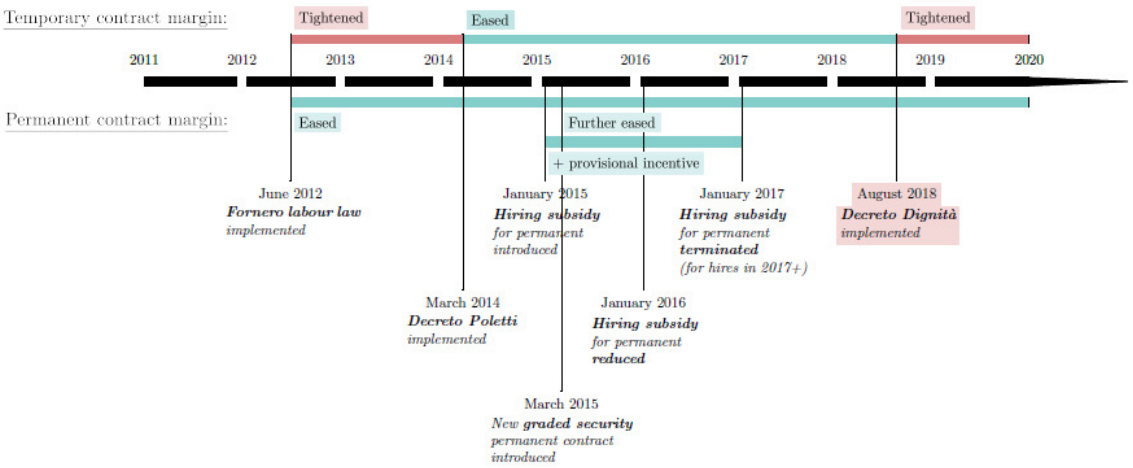


Figure 7.2.2: Timeline of EPL policies for temporary and permanent contracts. *Source:* Grasso and Tatsiramos 2023 .

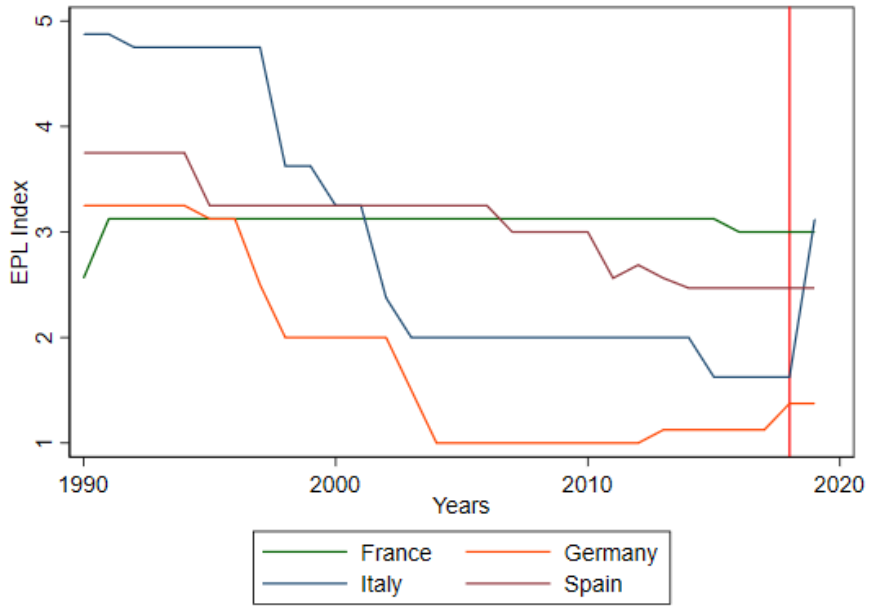


Figure 7.2.3: EPL strictness on temporary contracts over time. *Notes:* The red line is the *Dignity Decree*. *Source:* OECD.

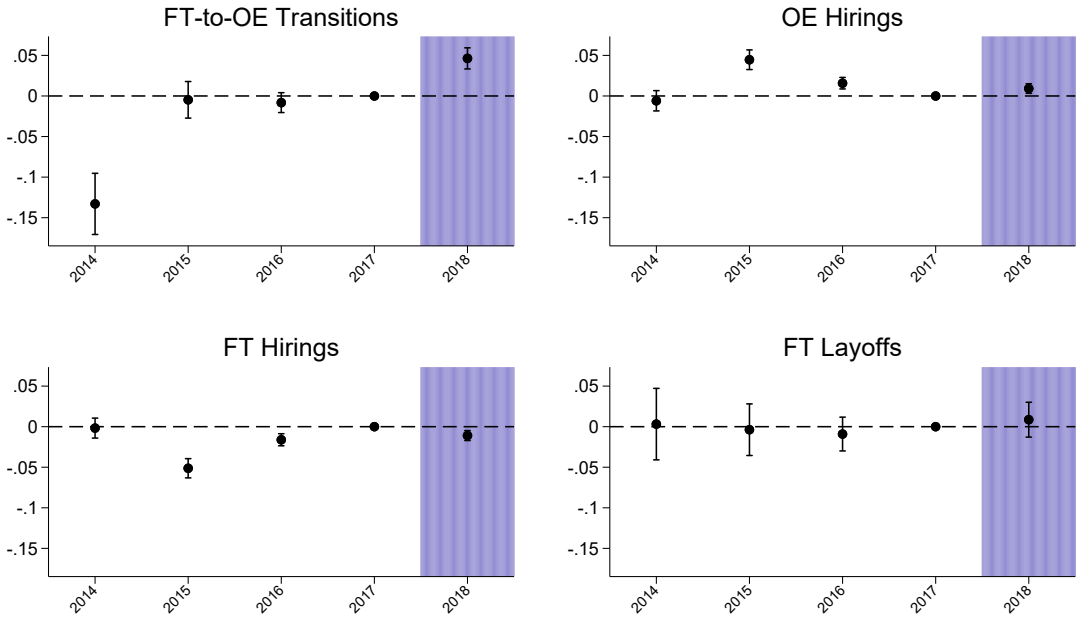
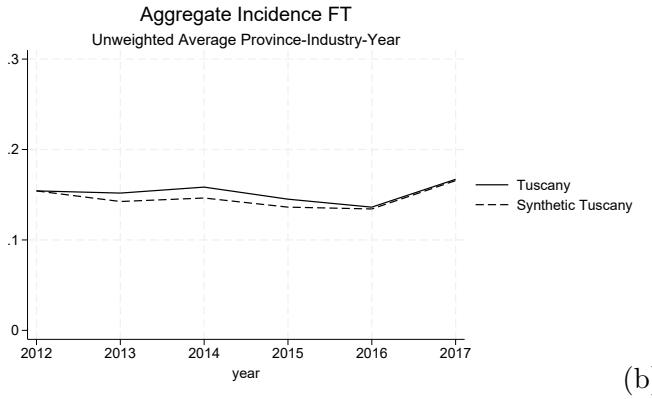
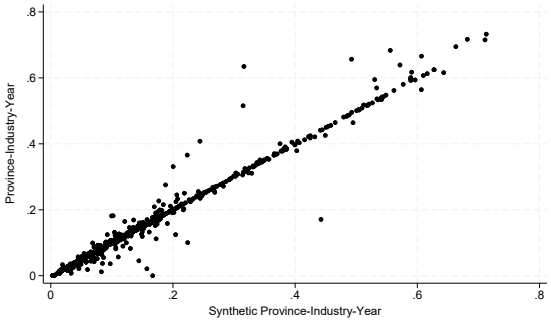


Figure 7.2.4: Likelihood of hirings, conversions, and firings by contracts over time. *Notes:* 2017 is the baseline; 2015 is the year of the *Jobs Act*; 2018 is the year of the *Dignity Decree*.



(a) SCM fit.



(b) Correlation between real and synthetic outcomes.

Figure 7.2.5: Synthetic and real FT incidences in panel (a) and correlation between the outcomes in (b).

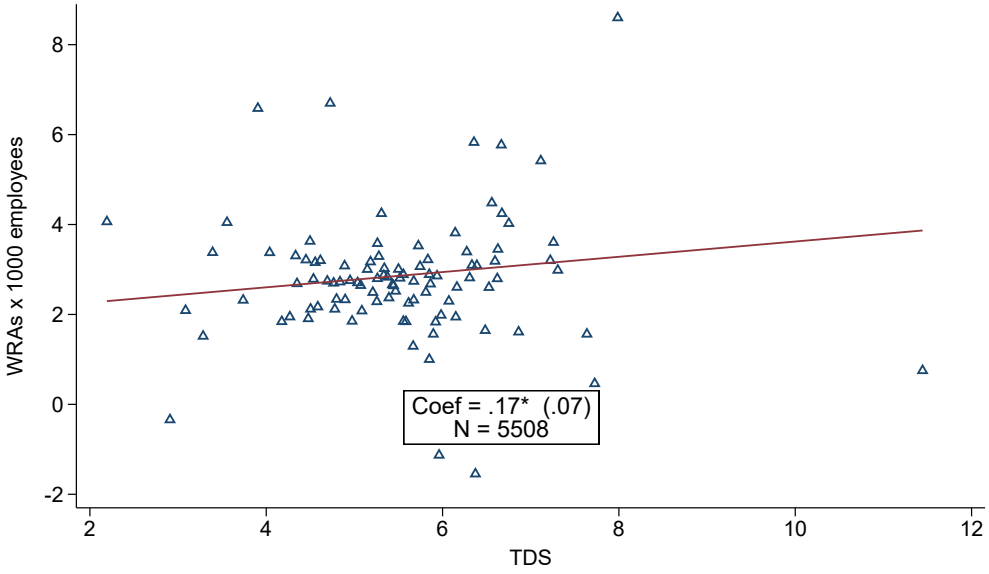


Figure 7.2.6: Binscatter between injuries and the treatment. *Notes:* Month, industry, and province FE included. *** p<0.01, ** p<0.05, * p<0.1.

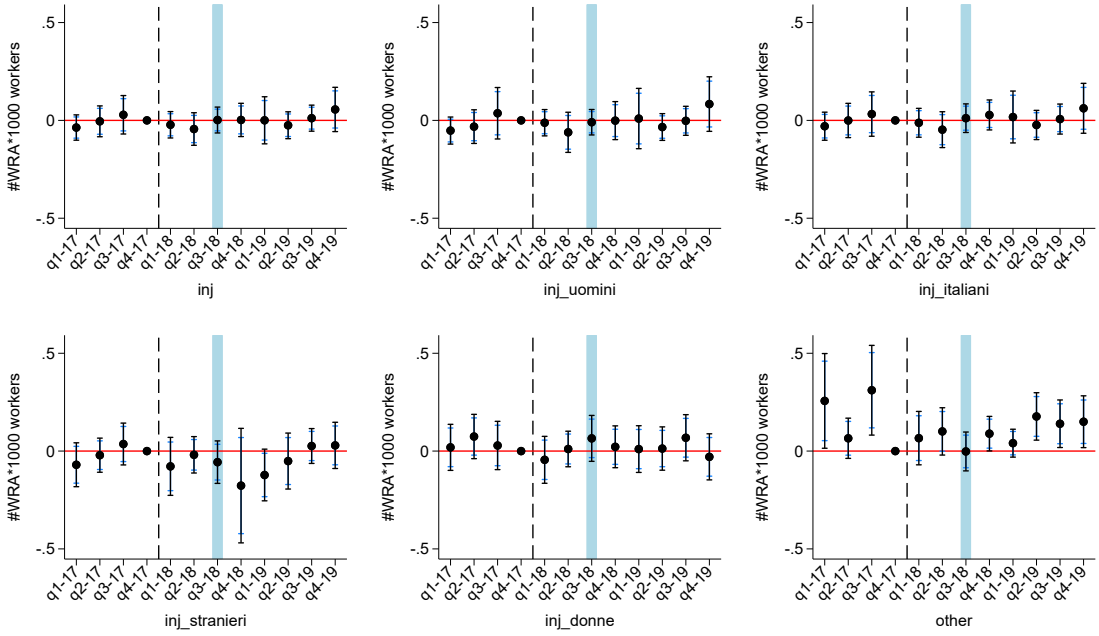


Figure 7.2.7: PPML province-level event studies by workers' characteristics. *Notes:* Weighted by province-industry employment. SE clustered by province-industry's. 95 and 90% CI.

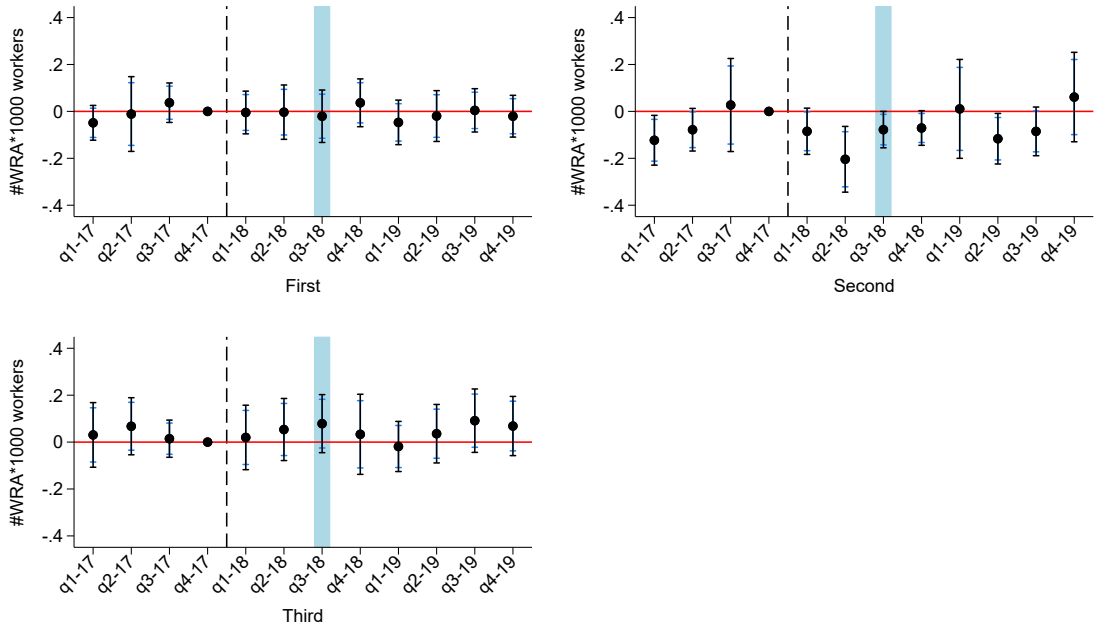


Figure 7.2.8: PPML province-level event studies by WRAs severity *Notes:* Weighted by province-industry employment. SE clustered by province-industry's. 95 and 90% CI.

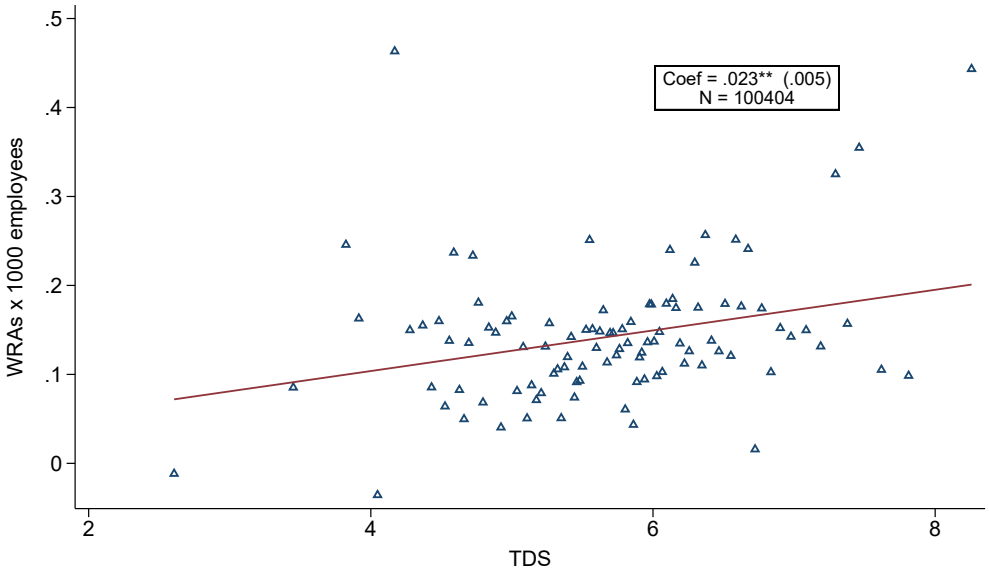
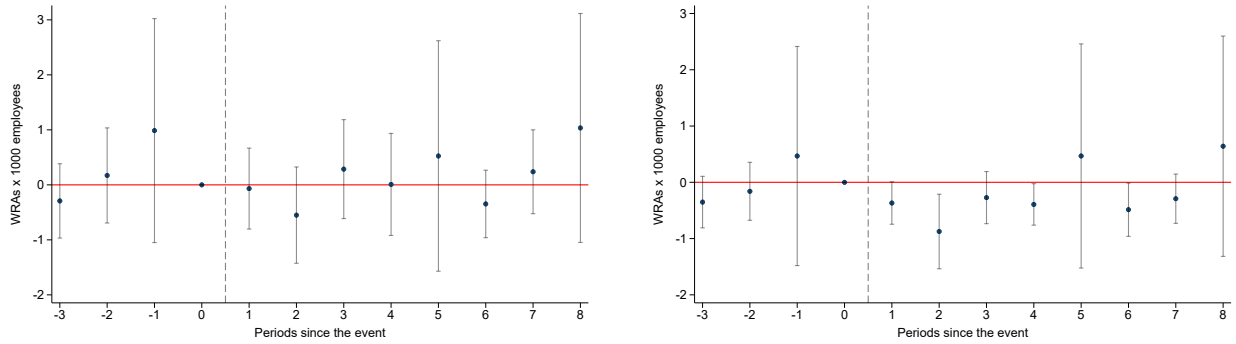


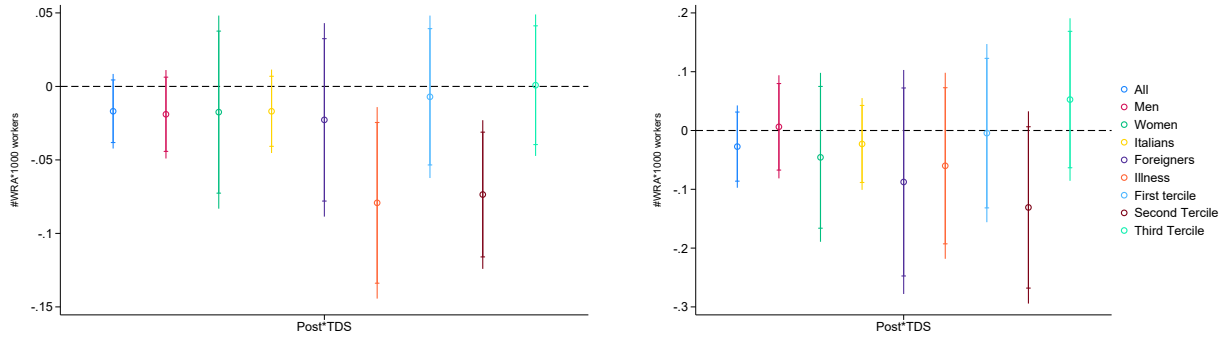
Figure 7.2.9: Binscatter between WRAs x 1,000 employees and the treatment. *Notes:* Month, industry, and municipality FE included. *** p<0.01, ** p<0.05, * p<0.1.



(a) All WRAs.

(b) 2^{nd} severity tercile.

Figure 7.2.10: de Chaisemartin and D'Haultfœuille (2024) estimates on all and mild-severity WRAs. *Notes:* Obs. are 3,672 province-industry-month tuples; treatment is dichotomous. t=0 is q4-17. SE clustered by province-industry's. 95% CI.



(a) Labor Force - Employed.

(b) Resident Population.

Figure 7.2.13: PPML DiDs by WRAs type and severity terciles. *Notes:* Weighted by '01 ISTAT Census municipality (a) Employed; (b) Resident population. Mean & P50: (a) 6,705 & 3,224; (b) 16,562 & 7,907. SE clustered by province-industry's. 95% CI.

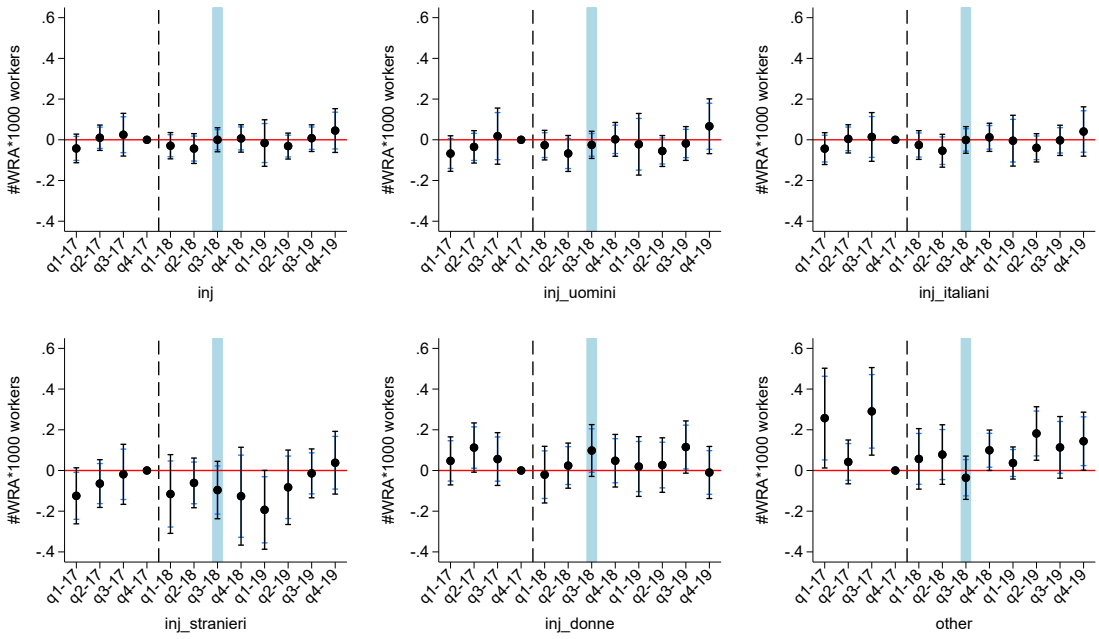


Figure 7.2.11: PPML event studies on WRAs, by type, weighted by province-industry employment. *Notes:* SE clustered by province-industry's.

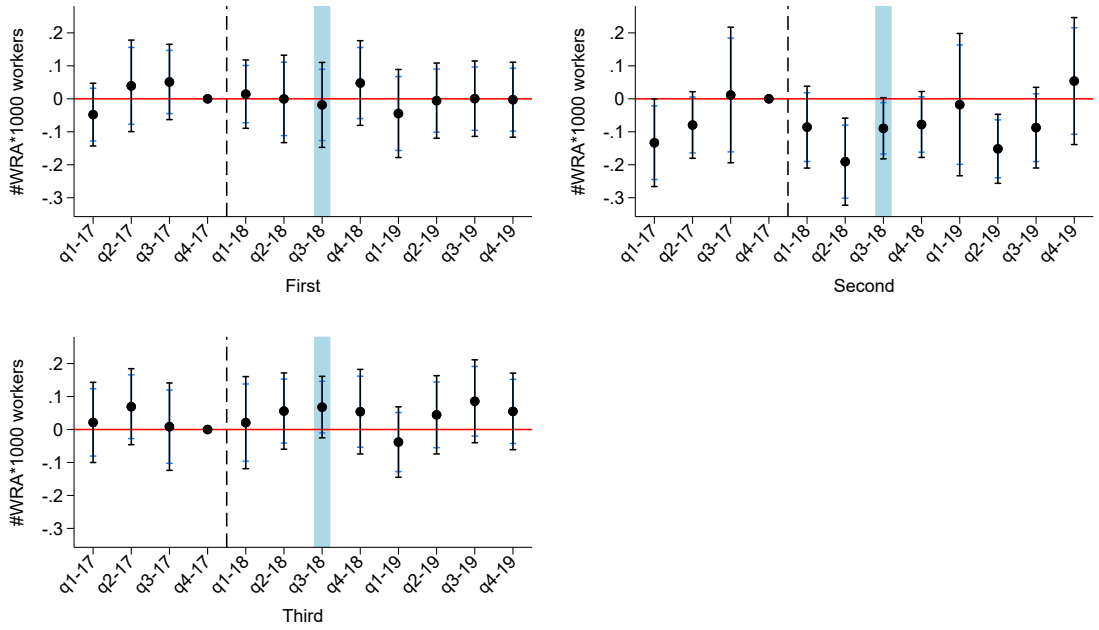


Figure 7.2.12: PPML event studies by severity terciles. *Notes:* Weighted by province-industry employment. SE clustered by province-industry's. 95 and 90% CI.

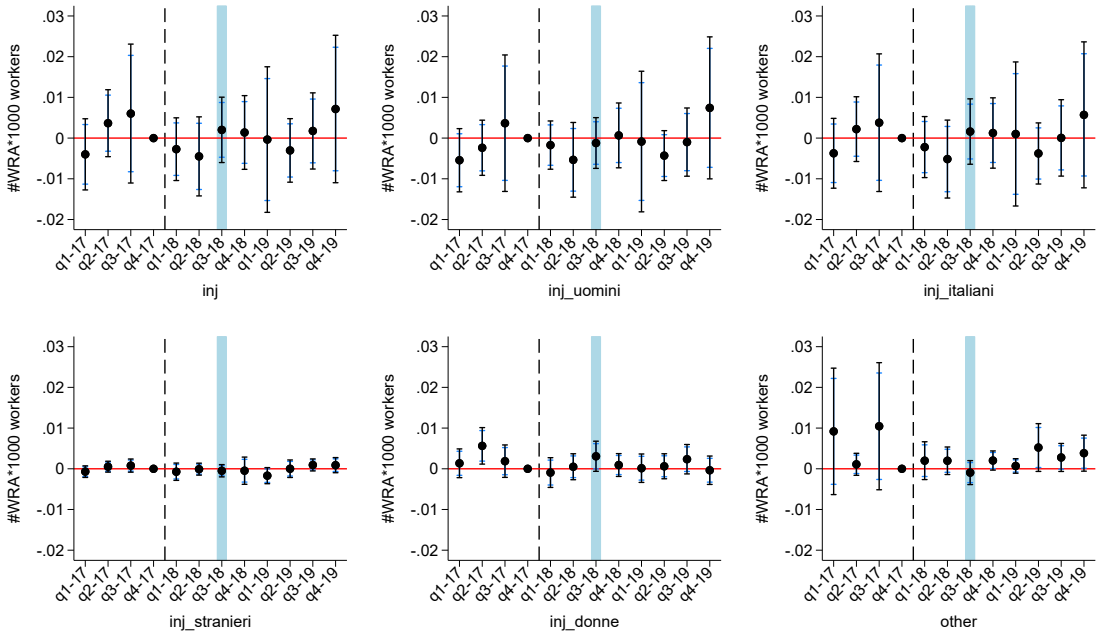


Figure 7.2.14: OLS event study on WRAs, by type. *Notes:* Weighted by province-industry employment. SE clustered by province-industry's. 95 and 90% CI.

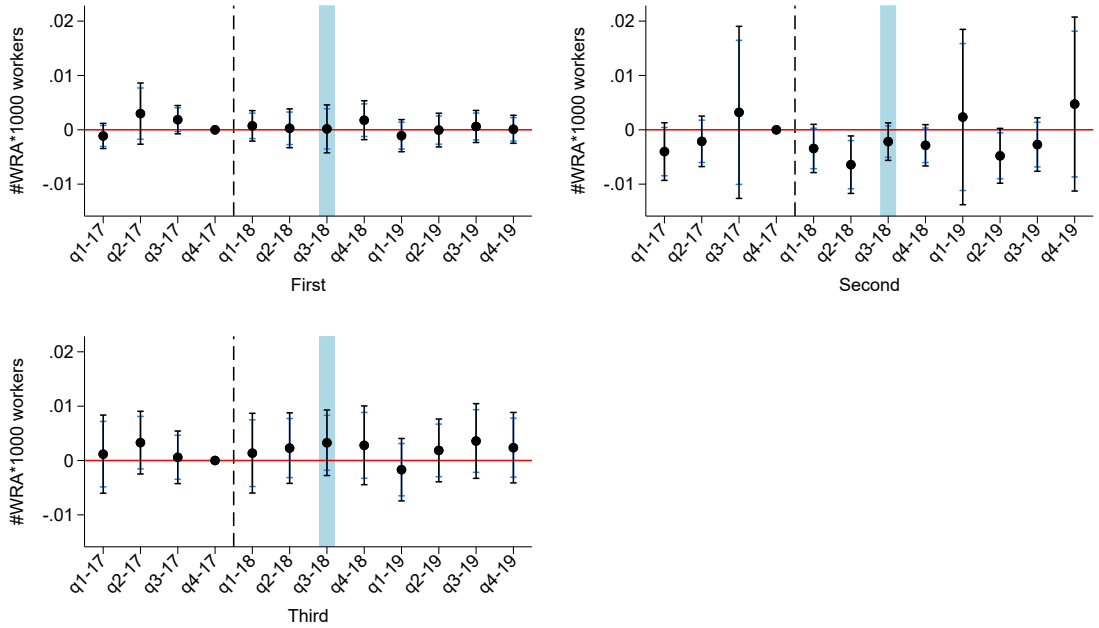


Figure 7.2.15: OLS event study on WRAs, by severity. *Notes:* Weighted by province-industry employment. SE clustered by province-industry's. 95 and 90% CI.

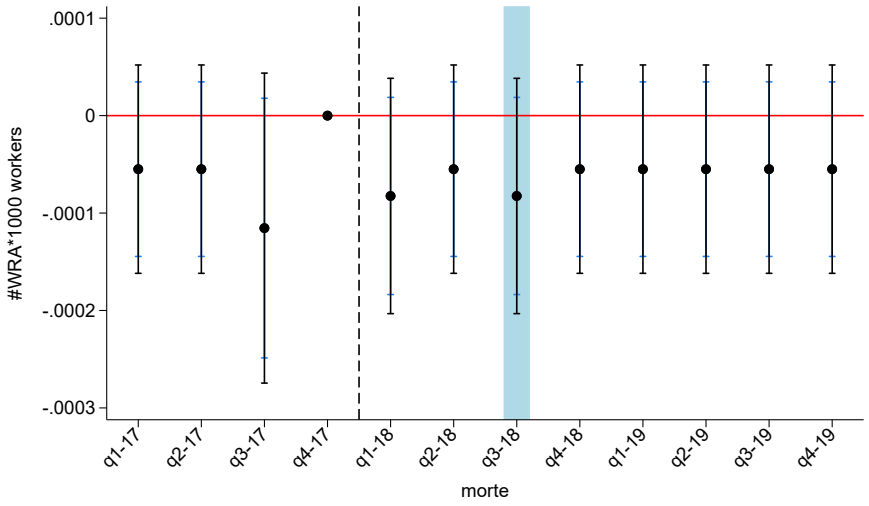


Figure 7.2.16: OLS event study on deaths x 1000 employees. *Notes:* SE clustered by province-industry's. 95 and 90% CI.

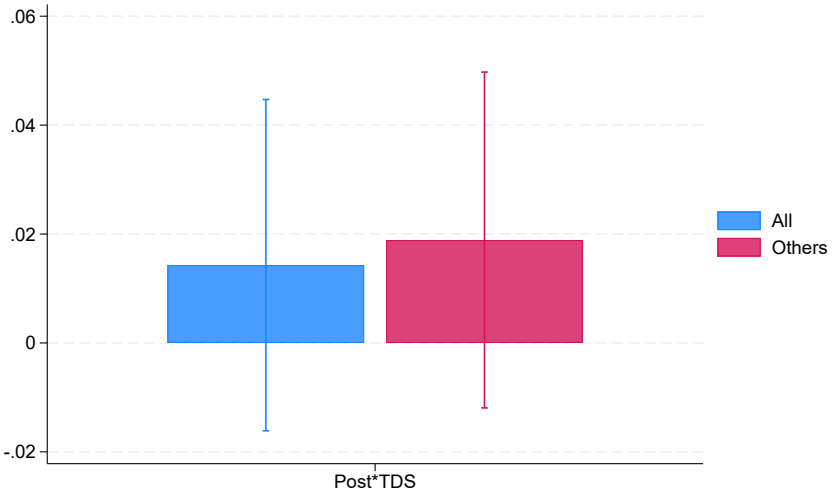


Figure 7.2.17: PPML DiDs on injuries on the way to work x 1000 employees, by type. *Notes:* SE clustered by province-industry's. 95% CI.

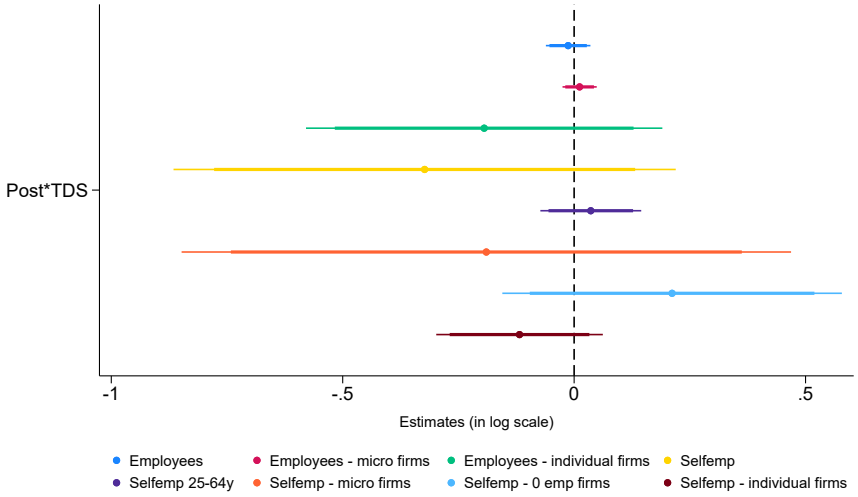


Figure 7.2.18: DiDs on ISTAT employment (in log) across Tuscany municipality-year. *Notes:* Period covers '17-19. SE clustered by municipality. 95% CI.

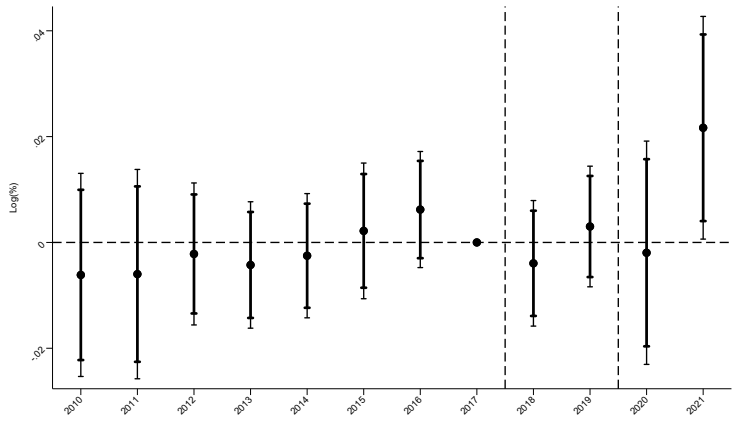


Figure 7.2.19: Event study of industry-level treatment on labor market informality across industries and years. *Notes:* Y is the % of non-regular full-time equivalent labor units over the total #ULAs by industry (1d)-year. Obs are 240 Tuscany industry-year cells. Non-regular work is computed as the sum of ULA-equivalent full-time and part-time working positions for which no fiscal or pension contribution was recorded. Robust SE estimated. 99 and 95% CI.

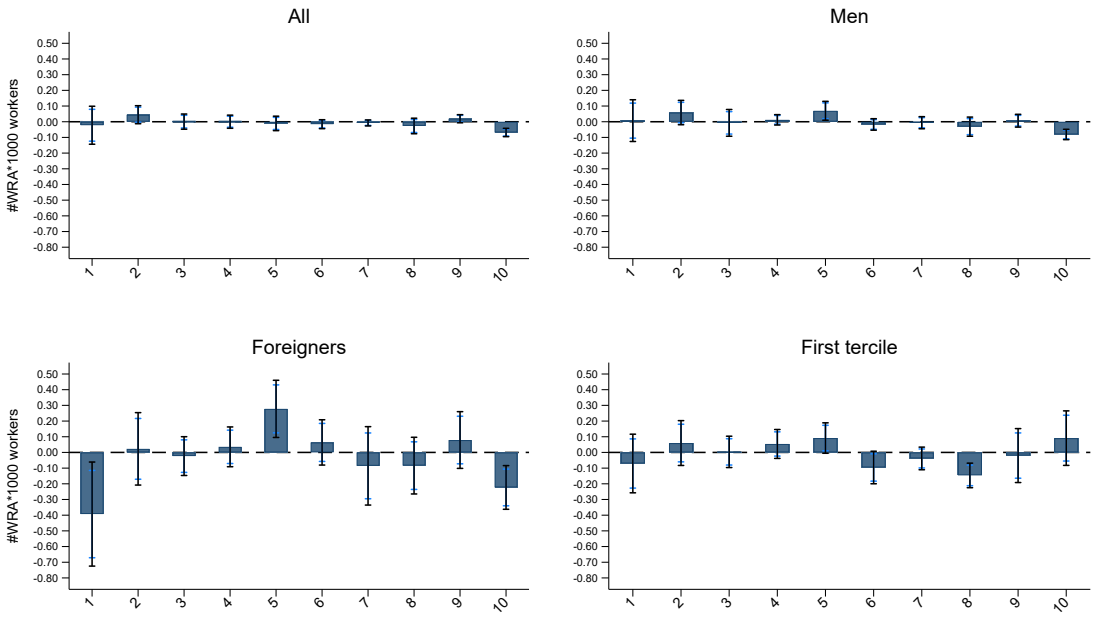


Figure 7.2.20: PPML DiDs on WRAs x 1000 employees, by WRAs deciles. *Notes:* SE clustered by province-industry's. 95 and 90% CI.

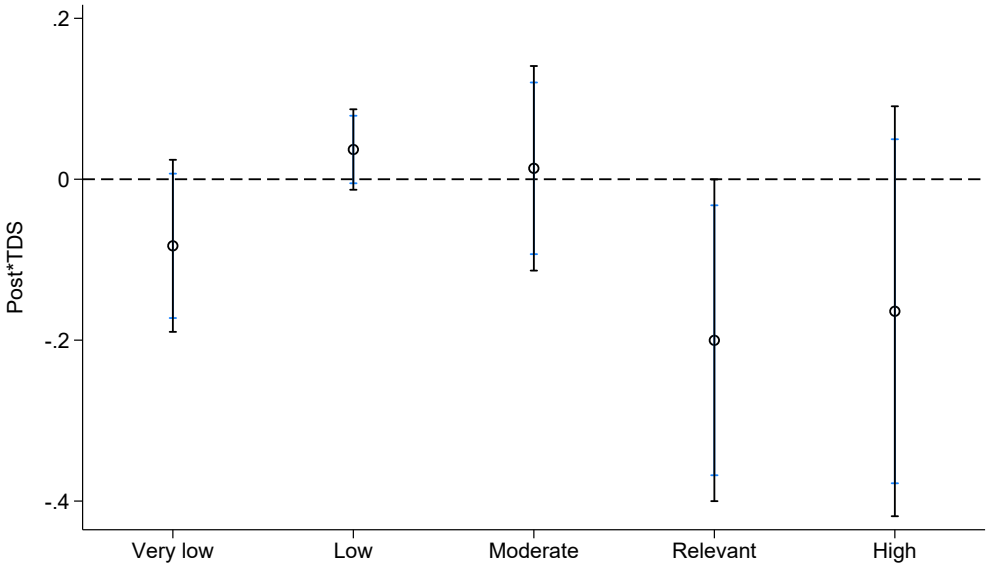


Figure 7.2.21: PPML DiDs on all WRAs by concentration quintiles *i.e.*, '17 province-industry employment stock HHI computed on AIDA. SE clustered by province-industry's. 90 and 95% CI.