“La salute non si vende.” Workplace deaths in Post-WWII Italian industry, a provincial analysis (1951-1991).

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Abstract: This paper contributes to the occupational health and safety (OHS) historical literature by providing the first estimates of industrial fatality rates in Italy between 1951 and 1991. Moreover, by constructing provincial-level rates, it further advances the study of regional divides in OHS across highly heterogeneous labor markets and social contexts. The determinants of fatality-rate trends at both the national and provincial level are then examined using qualitative and quantitative approaches, based on a newly assembled panel dataset. The results indicate that average establishment size and, most notably, workers’ bargaining power were the primary drivers of improvements in OHS conditions during Italy’s post-war period.

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KEYWORDS: Labor history, OHS, Post-WWII Italy, Regional divides.

1. Introduction

Workplace deaths are currently at the center of political and social debate in Italy (Alberti, 2024; Gallo and Loreto, 2023). According to official statistics, more than 1000 workers regularly die in the country each year, with recurrent tragic events repeatedly shaking public opinion (INAIL, 2024). However, occupational health and safety (OHS) issues have a long history in Italy. In the immediate post-WWII period (1945-1963), when the country was experiencing abrupt and chaotic industrialization, occupational injuries and deaths reached alarmingly high levels (Carnevale and Baldasseroni, 1999; Di Martino and Vasta, 2018). Only during the late 1960s and 1970s – a period marked by high economic and social conflict – workers’ movements were able to push for improvements in workplace health and safety, launching campaigns with popular slogans such as “*La Salute non si vende*” (Health is not for sale).

The reemergence of this issue in the Italian context arises the need for a solid historical perspective. At the same time, it is worth noting that OHS has been largely overlooked in economic history. In particular, the study of historical OHS macro-trends generally remains a “*terra icognita*,” making Italy a paradigmatic case for enriching our understanding of these phenomena. A similarly neglected issue in economic history is represented by the regional dimension of OHS. Notably, regional gaps offer an ideal ground to examine whether varying characteristics in labor markets and socio-economic contexts have different impacts on OHS outcomes. Even in this case, Italy proves highly emblematic since – despite sharing same regulations and institutional framework – extremely wide regional gaps affected the country in post-WWII period (Felice, 2019; Iuzzolino et al., 2013).

This paper has two main aims. First, by using as main source *Notiziario Statistico* INAIL (National Institute for Insurance against Workplace Accidents), it reconstructs fatality rates at the country and provincial level in industry between 1951 and 1991. Fatality rates, calculated as the ratio of the number of workplace deaths to

the number of insured workers, provide a clear understanding of the workplace safety historical trajectory and highlight genuine provincial differences reflecting variations in labor conditions.

In addition, the paper seeks to analytically investigate the causes behind historical and regional fatality trends by reconstructing a novel panel dataset. According to the historical literature and the resulting theoretical framework, two major elements arise as possible explanatory variables of these trends in post-war Italy: workers' bargaining power and industrial structure. The panel dataset reconstructs at provincial level three different proxies for workers' bargaining power – precarious employment, unionization rate, and hours of strike per worker – and one variable reflecting industrial structure – average establishment size – in order to test the predicted positive impact of these factors on fatality rates.

The results show that the fatality rate in industry decreased from around 6-7 deaths per 10,000 workers in 1951 to less than 3 in 1991, with a sharp decrease concentrated in the 1960s and the 1970s. Interestingly, in the South, where the labor movement was comparatively weaker, fatality rates during this period were two or three times higher than those in the North-West. Finally, the paper shows that provinces with higher levels of workers' activism and more complex industrial structures experienced fewer deaths per worker across all periods.

The paper is structured as follows. Section 2 reviews the historical literature on OHS. Section 3 reports the evolution of OHS in post-WWII Italy. Section 4 briefly introduces the paper's theoretical framework, which formalizes the historical insights from previous sections and situates them within a broader picture. Section 5 explains the data and the methodology of the analysis. Section 6 presents national and macroregional trends in industrial fatality rates, as well as the econometric analyses on the selected variables. Section 7 concludes.

2. Literature Review and Historical Framework

Notwithstanding its relevance for labor relations, OHS has never been a major topic in economic history. The gap is particularly evident on the quantitative side, as there is a complete lack of measurement and comparison of macro-historical trends. The literature has generally privileged specific case studies or qualitative works on the evolution of distinct phenomena. Moreover, most of the research has generally concentrated on the period around the turn of the 20th century, leaving more recent developments unexplored.

One of the main themes in the literature concerns the evolution of OHS relations driven by the achievements of labor unions. In particular, many studies have focused on the mining sector, which, given the inherent dangers of the activity, was the first to develop workers' claims in the field. Reid (1981) examines the history of the struggle for better safety conditions in the mines of Decazeville (France) between 1867 and 1914, showing that workers' bargaining power and organization were essential to the creation of the safety delegate role. Derickson (1992) describes the foundation of UMWA – United Mine Workers of America – hospitals in the early 20th century, which emerged in response to the high injury rates in U.S. mines and the lack of adequate

healthcare provision by employers. Fishback (1986), and more recently Morantz (2013) and Boal (2018), provide historical and quantitative evidence that the piece-work payment system, closely linked to workers' low unionization and bargaining power, was the main cause of safety issues in mines. The gradual strengthening of unions laid the foundations for the abolition of the system and for the general decrease in fatality rates in the sector. Walters and Quinlan (2019) examine the history of OHS mining conditions in the UK and Australia around the turn of the twentieth century, arguing that collective identity, public opinion, and union-driven worker representation and consultation were essential for improving health and safety conditions.

Another important strand of research, closely linked to the previous discussion, focuses on the importance of precarious employment on OHS (Gregson and Quinlan, 2020; Belzer and Quinlan, 2024). These studies show how marginal employment historically created deplorable working conditions for poor workers, contributing to high fatality rates and increased incidence of illness among workforce and society. They provide a detailed account of these historical situations, connected to earlier phases of industrialization (late 19th to early 20th century), in order to relate them to today's changing labor market, where neoliberalism has increasingly created a system dependent on precarious and low-paid jobs.

A distinct, yet clearly related, branch of the literature examines the role of institutions in OHS. To address workers' and societal dissatisfaction arising from long working hours and new occupational hazards associated with industrialization in the early 20th century[1], governments began regulating labor markets and implementing national insurance schemes and other forms of social protection — marking the first expansion of the welfare state (Huberman and Lewchuck, 2003; Moses, 2018; Fishback, 1998). In this case as well, the push from workers' movements was essential for institutional reforms (Gregson and Quinlan, 2019; Belzer Quinlan, 2024). Tucker (1992), for instance, documents the Swedish case, where workers' actions, and sometimes collaboration with employers, were crucial to create good institutions throughout the 20th century.

Some scholars have specifically examined the historical functioning of social insurance systems against accidents to understand the factors behind their success or failure. A very interesting case is represented by Ontario, where the government was able to incentivize virtuous employer behavior through an insurance system that rewarded workplaces with lower accidents (Silvestre, 2010). However, initial attempts to establish effective new institutions were at times thwarted. Bartrip and Fenn (1988) reconstruct the history of work regulations and inspections in the UK between 1878 and 1913, and, through econometric analysis of the data, find that inspectors were unable to be effective due to a lack of political will. Spain, too, followed a more tortuous path than Sweden or other countries (Silvestre, 2008). The law on work accidents enacted at the beginning of the century (1900) was difficult to enforce, particularly in small firms. This was largely due to inspectors' lack of willingness, the absence of an effective compensation system rewarding compliant employers, and the general weakness of unions, which were more focused on other issues such as wages.

[1] For instance, Lewchuck (1992), testing French occupational mortality data between 1907 and 1908, finds that hours of work – a big share of the regulations in the "progressive era" – were particularly important for mortality, reproposing the matter of exploitation and precariousness of labor market.

3. Historical Framework

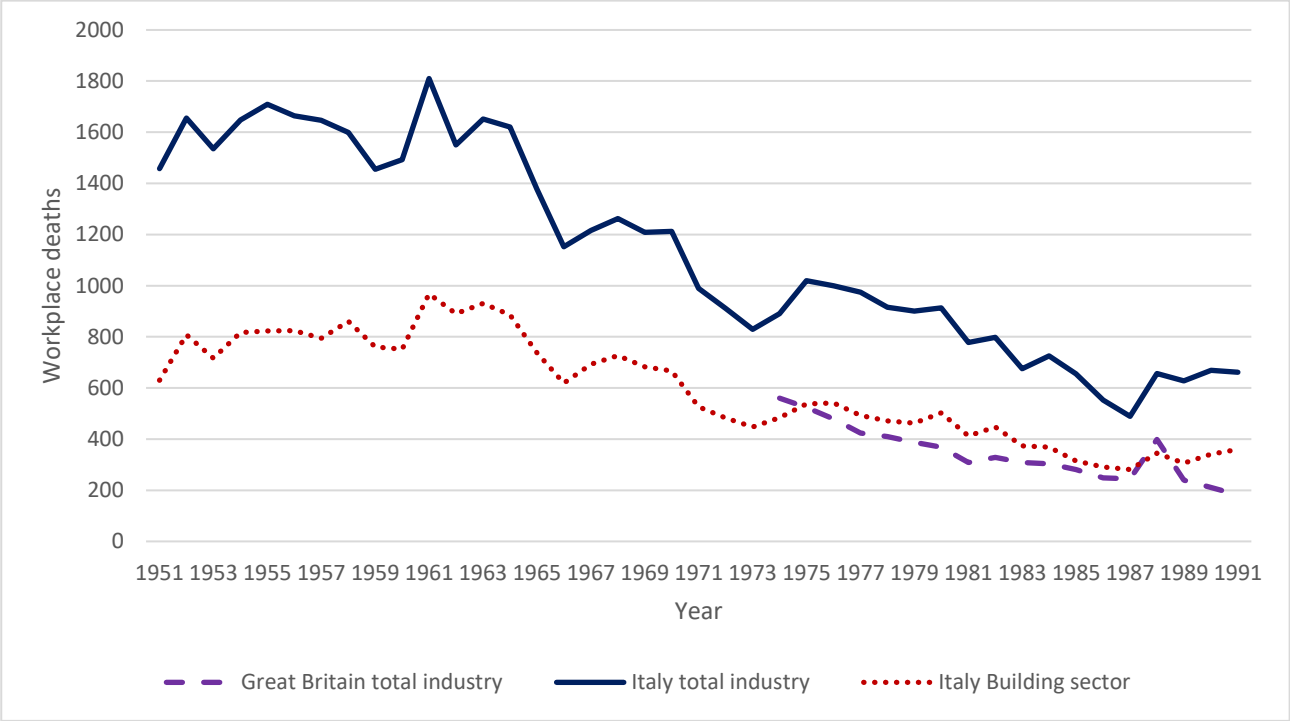
It is interesting to note that Italy's post-war experience with OHS mirrors the patterns described in the literature for other countries in earlier periods. From 1951 to 1963, the country was marked by a rapid structural transformation. Mass industrialization, based on a clear post-war political choice (de Cecco, 1971), led to particularly high growth rates during the so-called "economic miracle" (1958–1963). In the absence of widespread technologically advanced industries or flexible exchange rates[2], the Italian export-led model relied on a fundamental pillar: low labor costs. Unions, weakened by internal fragmentation and high unemployment rates (Gallo and Loreto, 2023), proved particularly ineffective during this period in promoting a balanced growth path between profits, productivity, and wages. As a result, workers' conditions did not significantly improve during the economic boom. National unemployment and poverty inquiries (1953–1954) reported that most workers lived in harsh conditions and were economically and politically marginalized in the workplace. For example, as reported for nineteenth-century England by Gregson and Quinlan (2020), the phenomenon of homeworking was widespread throughout the country. These issues were especially pronounced in peripheral areas and Southern Italy. Indeed, Italy was strongly characterized by a dualistic system, with modern industries concentrated in the North-West coexisting alongside very traditional (often family-owned) enterprises throughout the country, which survived thanks to cheap labor, low production costs, and widespread illegal practices (Lutz, 1962; Sylos Labini, 1964; 1970; Di Martino and Vasta, 2018).

Workplace safety and health were generally undervalued, both in the new taylorist factories of the North and in the small, traditional businesses of the peripheral provinces (Baldasserroni and Carnevale, 1999). Moreover, in an effort to boost productivity without making investments, average working hours increased during this period (Graziani, 1998; Gallo and Loreto, 2023). According to INAIL statistics (Figure 1), workplace deaths in industry rose alongside employment and GDP, reaching a peak in the early 1960s. Despite political interest in the issue — evidenced by the national inquiry into factory working conditions (1956) and the promulgation of new laws on occupational safety and health (1955–1956) — this trend did not change. As in earlier historical cases — such as Great Britain in the late 19th century (Bartrip and Fenn, 1988), and Ontario and Spain in the early 20th century (Silvestre, 2010; 2008) — the new legislation was widely disregarded (Carnevale and Baldasseroni, 1998). In particular, the lack of effective legal accountability for employers, the extremely vague definitions of safety standards in the regulations, and widespread non-compliance and corruption among labor inspectors hindered the enforcement of these laws (Smuraglia, 1963; 1974; Bagnara et al., 1981). For instance, until 1978, labor inspections and accident prevention were divided among three different entities (ENPI, ANCC, and the Labor Inspectorate), all of which were severely understaffed and ineffective (Bagnara et al., 1981; Carnevale and Baldasseroni, 1999; 2005). Moreover, INAIL, by failing to offer economic incentives for adopting safer practices, did not succeed in fostering a culture of workplace safety among employers

[2] The Bretton Woods international fixed exchange rate regime impeded the use of monetary policy as a tool to enhance international price competitiveness.

(Carnevale and Baldasseroni, 2005). Overall, considering the failure of post-war political reforms (Barca, 1999), it soon became clear that a legal and political top-down approach was ineffective in the Italian context.

Fig. 1. Workplace Deaths in Industry in Italy and Great Britain, 1951-1991



Note: Italian workplace deaths refer to "compensated" deaths, because the INAIL database does not provide total deaths (both compensated and non-compensated). Both Italian and British statistics are reduced by the exclusion of the "Various Industries" and "Transports" categories.
Source: Italy: INAIL, https://www.inail.it/portale/it/attivita-e-servizi/dati-e-statistiche/statistiche-storiche/casi-indennizzati.html
Great Britian: Health and Safety Executive, https://www.hse.gov.uk/statistics/history/index.htm

The early 1960s marked a resurgence of the working class in the Italian political landscape. Waves of protests in 1962 and 1963 led to a general increase in wages, partially rebalancing the income distribution derived from the economic miracle. These protests were fueled by very low unemployment and marginality rates in the north-western regions, which enabled workers and trade unions to negotiate from a stronger position. Beyond direct economic demands, a new awareness of working conditions began to emerge in the industrial cities of the North, where workers were heavily unionized and employed in modern factories. Ivar Oddone and Gastone Marri, a labor physician and a unionist respectively, and two of the main advocates for workplace safety and health during this period, launched training courses and conducted case studies in factories in Turin (Righi, 2010; Carnevale and Baldasseroni, 1999), while public opinion also began showing greater interest in OHS issues. A famous case showing this interest was the removal of Dario Fo — later awarded the Nobel Prize in Literature in 1997 — from public television in 1962, following a satirical sketch addressing workplace deaths. As a result of these initiatives, workplace safety and rights became part of collective bargaining in major firms and state-owned industries during the 1960s, with cascading positive effects to most of the firms due to the mainly centralized bargaining system (Cella and Treu, 1989; Rappa, 2025). For instance, starting from 1962-1963, sectoral and national bargaining brought to the gradual diminishment of labor hours – from 48 to 40 hours a week over a decade. Workplace fatalities (Figure 1) declined over this period, likely due to both

increased worker activism and the downturn in economic activity and employment following the 1964–1965 crisis.

The Hot Autumn of 1969 marked a significant turning point in Italian economic and labor history. After several years (1965–1968) of renewed political repression and industrial restructuring (Graziani, 1998), workers' movements and trade unions launched new waves of protest that would continue throughout the following decade. According to de Cecco (1972), labor movements during this period were particularly favored by the recomposition of the labor force that followed restructuring processes, when the strong expulsion of marginal labor — women and young people — from industry gave greater bargaining power to workers. These mobilizations signaled the peak of the post-war distributive conflict and the end of the Italian Golden Age. This time, workers not only demanded higher wages but also explicitly fought for improved working and living conditions, seeking to extend these claims to the entire working population—from North to South[3]. A key feature of this period was the "institutionalization" of workers' gains through new legislation and the expansion of the welfare state, which contributed to reducing inequality, poverty, and the marginalization of the working class.

Workplace health and safety became central to these new demands. A pamphlet entitled "The Work Environment" (*L'ambiente di lavoro*), written by Oddone and Marri in 1967 and reissued in 1971, was used to raise public awareness and encourage workers to take an active role in changing work procedures and prioritizing health and safety conditions. Similarly, the alarming inquiry "The health in factories" *(La Salute nelle Fabbriche*), edited in 1969 and promoted by the Communist party under the direction of Giovanni Berlinguer – a prominent labor physician and brother of Enrico Berlinguer, the Communist party secretary from 1972 – was pivotal in advancing these objectives[4]. One of the most iconic slogans of the period was "Health is not for sale" (*La salute non si vende*), expressing the idea that health and safety at work were not negotiable parts of a wage package, but fundamental rights[5]. However, given the ineffective labor regulations, in the late 1960s and early 1970s, direct bargaining between workers and employers remained the primary mechanism for improving working conditions (Reich and Goldman, 1984), still disadvantaging those employed in small firms with low levels of unionization and limited bargaining power – the latter being, at least, useful for enforcing national contracts.

During the 1970s, two key pieces of legislation supported workers' demands for improved health and safety conditions in the workplace. In 1970, the Workers' Statute (*Statuto dei Lavoratori*) granted employees — under Article 9 — the right to actively organize and monitor workplace procedures and equipment that could pose risks of injury or occupational disease. Moreover, the Statute promoted a general increase in workers'

[3] This trend was linked to the so-called "Egalitarian" movement, which aimed to equate working rights and wages between different working positions and regions.
[4] Moreover, in popular culture, "The Working Class Goes to Heaven" (*La classe operaia va in paradiso*), a 1971 film by Elio Petri depicting workers' subjection to Taylorist production methods and the harsh realities of working conditions in Italian factories, strongly resonated with public opinion.
[5] For example, it was typical in the 1950s and 1960s to pay extras for workers subjected to high risk.

bargaining power through labor rights, thereby contributing to better health outcomes for workers, particularly in large firms[6]. Then, in 1978, the establishment of the National Health System (Servizio Sanitario Nazionale), based on 672 decentralized local health units (USL), enabled the effective enforcement of the 1955–1956 laws by consolidating all previous prevention and inspection functions under a single entity (USL). It also allowed a new generation of occupational physicians — trained during the 1970s — to enter workplaces and work directly with employees in preventive initiatives (Carnevale, 2017). However, due to the local reorganization, prevention and control were more effective in highly politically active provinces, while Southern and the more isolated parts of the country still lagged behind from this point of view (Berlinguer and Biocca, 1987).

Both laws were conceived with a bottom-up approach, grounded in workers' needs and concerns, and thus enabled meaningful improvements in workplace safety. Throughout the 1970s and early 1980s, workplace fatalities in the industrial sector declined significantly (Figure 1). Despite the concurrent structural transformation of the Italian economy — marked by deindustrialization and a shift toward the service sector after 1973 — workers' activism likely played a key role in this decline. This highlighted the importance, in the Italian context, of a bottom-up approach to the realization of workers' rights.

During the late 1980s and early 1990s, Italy began the process of convergence with European standards in various domains. European directives concerning workplace health and safety were progressively incorporated into Italian legislation. Particularly significant was the Legislative Decree 626/1994, which introduced higher standards in the field and completely overhauled the laws dating back to 1955–1956, marking an end — even in this respect — to the so-called First Republic. However, the evolution of legislation did not lead to a corresponding decline in industrial workplace fatalities, which remained stable from the late 1980s and showed no convergence with countries that had more developed standards. For instance, Great Britain — with a workforce of comparable size — experienced total industrial fatalities similar to those in Italy's construction sector only during this period (Figure 1). As noted by Baldasserroni and Carnevale (1999), drawing on their experience as occupational physicians, a bottom-up approach was gradually replaced by a top-down model — one that proved largely ineffective in curbing workplace deaths. The decline of bottom-up strategies and worker activism, which had played a central role in injury prevention following the 1978 health reform, can be attributed to a range of economic, political, and social factors. On one hand, the political defeats suffered by trade unions and left-wing parties in the 1980s undermined labor's influence[7], forcing unions to pay more attention to the employment issue rather than OHS topics (Berlinguer and Biocca, 1987). On the other hand, the growing influence of small enterprises — where union representation was weak — within the Italian industrial structure (de Cecco, 2007), alongside the renewed marginalization of workers, contributed to the dismantling of the 1970s model.

[6] For instance, article 18, concerning protection against unjustified dismissal, was applied only to firms with more than 15 employees, thereby depriving workers in smaller companies of an important legal safeguard.
[7] Particularly significant in shaping the events of the 1980s were the dissolution of the unified union confederation in the early 1980s and the defeat in the referendum on the *Scala Mobile* wage indexation mechanism.

4. Theoretical Framework

As documented in the previous sections, an enduring tension between employers and workers over OHS is historically evident. Indeed, these topics arise as a natural extension of typical labor relations, insofar as they directly affect the workplace environment. Building on these insights, the main theoretical intuition advanced in this paper is that OHS can be perfectly regarded as an additional component of wage. Similarly to wage, indeed, workers and entrepreneurs bargain due to a divergence of interests, thereby adding a further dimension to the "classic" income distribution framework. While improved OHS is a clear benefit for workers, entrepreneurs must generally augment operational costs and reduce profits to improve workplace conditions[8]. For this reason, when workers' bargaining power is high and unions are particularly strong – typically as a result of low unemployment rates – OHS is more likely to be negotiated and improved (Nichols and Armstrong, 2013). So, in this framework, workers' bargaining power is considered the main engine of OHS historical trends. However, the intermediation of broader economic and historical processes, as well as previous history of labor relations, proves pivotal for the bargaining and social acceptance of OHS levels. As shown in the previous section, significant improvements in workplace safety in Italy were achieved only after many years of high economic growth, when the purely monetary dimension of wages was superseded by other non-monetary aspects related to the overall work environment. In this regard, rising GDP and living standards – by shaping workers' awareness, public opinion, and firms' financial capacity – can contribute to increase workers' bargaining power over these issues.

Regarding the widely discussed role of precarious employment for OHS conditions (Belzer and Quinlan, 2024), this paper seeks to augment the framework proposed by the literature: the proliferation of poor-quality jobs – similarly to high unemployment – is associated with low workers' bargaining power and, consequently, worse OHS outcomes. In other words, it is not precarious employment per se that causes poor OHS standards; rather, the intermediating factor "bargaining power" limits the potential for political and labor action to improve workers' conditions.

The historical role of governments in OHS can be incorporated into this line of argument as well. Similarly to other kinds of regulations and social welfare measures involving labor markets, the government historically enters the arena of labor relations when frictions between bargaining parties show persistence or when issues such as OHS become salient in public debate[9]. When the government implements regulations or measures in favor of employers or (more often) employees, a "redistribution" is taking place: from one side there is a loss of profits, from the other an increase in "non-monetary wage" – or the opposite. However, mirroring the case

[8] In theory, the costs of improved occupational health and safety could be borne by workers if, for instance, employers withheld part of their wages. However, such an outcome is more likely in the long run; during bargaining phases, workers would be unlikely to accept such a condition.
Another "extreme case" is represented by a condition in which the lack of OHS is an effective cost for employer: for example, if workers' replacement costs given by high fatality rates are higher than expenditures for improving safety conditions. Of course, this is very improbable in real-world circumstances.

[9] In turn ignited by workers' bargaining power which takes shape through workers' rights relevance in public opinion.

of precarious employment, the application of rules is often disregarded if fundamental conditions in workers' bargaining power are not achieved. In many cases, indeed, the attention of the government in inspections and regulations enforcement – which requires substantial budget resources – is limited, thus favoring again the centrality of direct labor relations for such topics. Sometimes, as in post–WWII Italy, governments may enact regulations while lacking the political willingness to enforce them in order to avoid "redistribution."

Finally, also the industrial structure likely plays a significant role in shaping OHS outcomes (Nichols *et al.*, 2018). In large firms – where profits are usually higher, workers are better able to organize, and governments' presence is stronger – employers may be less resistant to implementing OHS improvements, whether these stem from union demands or government mandates. In such contexts, OHS measures require relatively smaller financial effort and help avoid greater confrontation with unions and governments. Moreover, large firms are better able to increase productivity by rationalizing production methods or by enlarging equipment stock (Braverman, 1974), thereby offsetting the costs associated with higher workplace safety. So, the local and historical context, shaping workers' bargaining power and industrial structure, has an important role in the bargaining of occupational health and safety. However, even in this case, industrial structure is not the main engine of OHS historical evolution – that remains workers' bargaining power – but it does play an important role insofar as it can mitigate the redistributive impact of OHS measures.

This theoretical framework, which fundamentally advances an extended concept of wage and income distribution, underpins the quantitative analysis conducted in the next sections. Even if other elements could be included in such framework – e.g. technological advancements and sector specificities – these basic elements remain pivotal to understand the long-term and regional evolution of safety outcomes in Italy.

5. Data and methodology

5.a Fatality rates

Provincial fatality rates for industrial workers from 1951 to 1991 are computed as the number of workplace deaths divided by the number of workers insured by INAIL. Only fatal injuries are taken into consideration, as they are the only occupational injuries not influenced by human value judgements. For instance, temporary and permanent injuries widely changed between 1951 and 1991, with a marked increase in the 1960s and 1970s, when INAIL expanded their recognition criteria. Moreover, occupational injuries are often underreported, particularly in low-paid jobs, thus configuring an important bias for our results (Boone and Van Ours, 2006). Despite their relevance, occupational diseases are similar in nature and follow a comparable pattern. Moreover, they were frequently triggered over long periods and typically manifested after many years of work.

INAIL job insurance was mandatory in Italy for certain categories of workers since 1935. Industrial fatal injuries are recovered from *Notiziario Statistico* INAIL, which gathered quarterly data on industrial accidents

from 1951 to 2009. *Notiziario Statistico* summarizes various kinds of industrial accidents for insured workers only. There are two main categories of work injuries: with compensation and without. There were different reasons to not compensate for injuries. First, some injuries were considered below the minimum severity level (*franchigia*). Second, in some cases, the circumstance of the accident was not closely related to the specific worker's task. Third, most non-compensated fatal injuries occurred among workers without a family who could receive the benefits. The paper shows statistics both with and without non-compensated deaths ("total" and "compensated" fatality rates). However, total fatality rates can be considered quite reliable if we are interested in levels and comparisons. To reinforce this claim, the data show that the percentage of deaths without compensation on total deaths did not follow regional paths in any year, suggesting that they were not influenced by INAIL's decisions. Unfortunately, hidden economy workers' fatal injuries are not included in statistics, biasing the real numbers of the phenomenon. It is likely that during the 1950s and 1960s, when big shares of the labor force were employed in the hidden economy, fatal injuries were much higher with respect to official sources.

INAIL produced statistics on injuries considering the "*esercizio*" or the "*competenza*". Accidents *per esercizio* were reported in a specific year (f.i. 1961) but could timely belong to previous years (f.i 1960). Accidents *per competenza* belonged to a specific year (f.i. 1961) but could be reported later (f.i. 1962) for different motivations. This paper uses data *per competenza* reported on the 31st December of the following year – the latest *per competenza* date usually allowed by *Notiziario Statistico*. On the 31st December of the following year the vast majority of cases were reported and closed. Open cases rarely exceeded 5% of the whole sample. Finally, INAIL grouped injuries in 10 industrial sectors, where the group "Various" represented all the Services sectors – except for transports. Moreover, from 1981, the group "Indeterminate" – representing injuries not yet assigned to a specific industry according to available information — appears in the data. So, the Various category and a share of Indeterminates computed as — $\frac{Various\ injuries}{Total\ injuries} * indeterminate\ injuries$ — are excluded from the dataset. In the case of total fatality rates, these deaths are computed as $deaths\ to\ exclude \times \frac{total\ deaths}{deaths\ with\ compensation}$. The provincial subdivision of categories is present in 1971, 1981 and 1991, but in 1961 only regional subdivision exists and in 1951 there is no subdivision at subnational level. So, considering that Various deaths are very few in 1951 and 1961, we applied the provincial ratios of 1971 to those years.

It is extremely complicated to accurately reconstruct INAIL insured workers in a specific year. INAIL did not dispose of such data, but produced an estimate called "workers-per year" (*operai-anno*) until 1980[10]. Workers-per year were computed — even at provincial level – as follows: $\frac{\text{total amount of insurance fees}}{\text{average wage}\times 300}$, where the average wage statistics were produced by INAIL itself and 300 represents the standard number of working days in a

[10] After 1980 INAIL started to provide an estimate of total working hours.

year. Even according to the introductory notes of *Notizie Statistiche* INAIL (1959-1961), this is a very rough estimate.

Instead of using indirect measures, this paper uses the industrial census figures (1951-1991) as source of insured workers. The industrial census in Italy was compiled by entrepreneurs, who were required to report various features of their enterprises and local units. It is important to highlight that there is no reason to suspect significant mismatches between census figures and actual insured workers, as entrepreneurs likely reported only legally hired employees — who were also those covered by insurance.

Not all the employees were equally insured. We know from *Notizie Statistiche* (1959-1961) that before 1965 only blue collars employed in extractive, manufacturing, building, energy and transports firms were insured. After the Presidential decree n. 1124 of 1965, which reorganized INAIL legislation, also helpers and artisans were included among them. In the early 1980s, as shown by Carnevale and Baldasseroni (1999), white collars – including those from the service sector — gradually began to be widely covered by insurance.

Among the details the industrial censuses asked for, entrepreneurs were required to report the number of helpers and employees in each local unit, categorized by type. Usually we can find such categories: White collars (managers and office workers), Special categories (blue collars with directive tasks), Blue collars (high and low skilled), Apprentices, and Others (guards, keepers etc.). This paper considers as workers insured by INAIL before 1965 all the employees belonging to special categories, blue collars, apprentices and others (guards, keepers etc.) in the sectors mentioned above. After 1965 – so with the 1971 census — the paper includes helpers and artisans among the insured categories, assuming that artisans were all the manufacturing workers employed in local units with only one employee. The inclusion of white-collar employees for 1991 would completely underestimate fatality rates, considering that it is reasonable to assume that the vast majority of fatal injuries occurred among industrial blue-collar workers. Figure 1.a in the appendix reports the reconstruction of insured workers for Italy and different macroregions between 1951 and 1991.

5.b Explanatory variables and Empirical analysis

For the empirical exercise, provincial fatality rates are adjusted to avoid yearly random variability. Indeed, in many cases small provinces experienced a high number of workplace fatalities in one year and, by chance, very few the next. The census years fatal injuries observations (1951-1991) are adjusted as a three-year average (e.g. 1950-1951-1952). The correction allows to have more readable fatality rate trends at provincial level. The same adjustment is applied to various and indeterminate deaths, which are then subtracted from the provincial fatal injury counts.

Four main variables at provincial level are reconstructed to empirically analyze the relations between fatality rates, workers' activism and industrial structure. The first three of them can be considered the "workers' bargaining power variables", replicating a similar concept and serving as cross robustness checks.

The first key variable is the "Precarious Employment Rate", calculated as the difference between the total number of workers in a professional condition according to the population census and the total number of workers in the industrial census, divided by the number of workers in the population census. The population census definition of "professional condition" also includes unemployed individuals who previously worked in a specific sector, thereby significantly enhancing our estimates of "marginality". This technique, first used by Sylos Labini (1974), Paci (1973) and Meldolesi (1972), and recently mentioned in Ardeni (2024), exploits the fact that in the industrial census, entrepreneurs reported only legally hired employees working in local units, while in the population census, citizens directly reported their employment status. The difference between the two censuses signals the number of unemployed and precarious workers, who likely worked without regular contracts, either from home or in the hidden economy.

The precarious employment rate is not only a proxy for unemployment that can be applied to specific sectors, but it also reflects a broader economic and social environment that shapes workers' bargaining power and labor market outcomes. For instance, if one member of a household earns a good income due to sufficiently high wage levels in the regular economy, the other members are not forced to accept irregular jobs at any wage, thereby reducing the precarious employment rate. Otherwise, a strong social welfare system could have the same effect, increasing household income without resorting to the hidden economy. Moreover, it is highly probable that precarious employment is strongly positively correlated with average working hours per employee, a variable partly able to explain industrial fatality incidence (Gregson and Quinlan, 2020), thereby reinforcing its effect.

The second key variable is the unionization rate. Unionized people in CGIL and CISL — the two main Italian unions — at provincial level were collected from the unpublished appendix in Romagnoli (1980) for the years 1951, 1961, and 1971. For the years 1981 and 1991 unionized people were collected at regional level from CESOS yearly publications. Provincial data for 1981 and 1991 were reconstructed through the application of 1971 provincial ratios to regional data. To create the unionization rate, the number of unionized people was divided by the provincial active population reconstructed by Chiaiese and Ciriotto (2025). The main issue regarding this variable is represented by the fact that people enrolled in CGIL and CISL were not the entire unionized population. However, considering the importance of these unions in the context of the period, it is quite reasonable to assume that real total unionization should follow the same trend. Unfortunately, the unionization rate cannot be computed at sectoral and provincial level at the same time, somehow reducing the accuracy of this variable for our purposes.

The third key variable is represented by the Hours of strike per worker over the 10 previous years. Total working hours lost for labor conflicts were collected at provincial level from Annuari di Statistiche provinciali ISTAT from 1958 to 1972 and from Annuario di Statistiche del Lavoro ISTAT from 1973 to 1976 and from 1981 to 1984. In the years 1952-1957, 1977-1980 and 1985-1991 the same data at regional level from Annuari Statistici ISTAT were collected. To obtain total lost working hours at provincial level in those years, the ratio

$\frac{\text{provincial hours 1958}}{\text{regional hours 1958}}$ was applied to the data from 1952 to 1957, and the same ratio with 1981 and 1984 data was applied to the years 1977-1980 and 1985-1991 respectively. Subsequently, to obtain "per worker" data, provincial hours were divided by working age population from Chiaese and Ciriotto (2025). In the end, the data were aggregated over the previous ten years (e.g. 1952-1961) to account for the evolution and significance of the phenomenon at provincial level over the inter-census period. The aggregation, unfortunately, delete one observation per province (1951). Even in this case, the variable cannot be computed simultaneously at both the provincial and sectoral levels.

The fourth key variable is the average establishment size derived from industrial censuses. It is computed as the provincial number of employees in the industrial sectors of interest divided by the number of local units. Let us notice that the average establishment size does not only indicate the provincial industrial structure, but also the average technological degree. For example, it is highly likely that provinces with larger average establishment sizes were more developed in modern industrial sectors, where mechanical equipment and machines were commonly used.

Besides the four key variables, other four "controls" are used:

Building sector share over total industrial sectors is reconstructed as the number of employees in this sector relative to the total number of employees in industry, based on industrial censuses. In the literature, this variable, accounting for an extremely dangerous sector of employment, is considered very important in increasing fatality rates (Lanearts et al., 2020). This is consistent with Italian post-war history, considering that the building sector boom occurred from the 1950s to the 1970s, when fatalities in industry were at their highest[11].

Real GDP per capita at provincial level is recovered from Chiaiese and Ciriotto (2025). It accounts for the procyclicality of workplace injuries and incorporates the theoretical perspective that links economic (and social) modernization with improvements in OHS (Antonelli et al., 2024).

Then an "institutional" and a "technological" variable are reconstructed. The institutional variable, named "Private healthcare share", is represented by the yearly number of patients in private hospitals over the yearly number of patients in public hospitals in different Italian regions – the most fine-grained disaggregation available from the data collected in Annuari Statistici ISTAT[12]. For the exercise, only general and specialized public hospitals are considered – leaving out psychiatric hospitals and public clinics (*ambulatori*). This variable should represent the local government's effort in public healthcare, so proxying for the institutional (and societal) care for OHS issues – enacted through inspections, regulations and other measures. Given the absence

[11] Within our framework, the construction sector can be regarded as a particularly hazardous branch of employment, given the historically high prevalence of precarious work associated with it.
[12] However, it can be assumed that regional data are fairly reliable at the provincial level as well, considering that people could access healthcare facilities in neighboring provinces through short trips.

of original sources to account for the real variable – for instance number of labor inspections or inspectors — this proxy should partly serve for the aim of understanding the role of institutions in enforcing regulations.

In the end, the "pure" technological variable is represented by the provincial number of electrical engines – transforming electric energy in mechanical energy in local units — per employee in the manufacturing sector. The data are collected from 1951 to 1981 from the Industrial census. Unfortunately, the 1991 census does not register such data. So, the variable, reducing the sample, is only used in additional specifications – not in the baseline models. The relationship between technology and OHS is quite uncertain. In papers using modern data (Antonelli et al., 2024), it is theorized and tested whether technological advancements improve OHS, while the effect of machines in earlier industrialization periods is usually perceived as source of increased injury rates[13] (Lewchuck, 1991). However, this variable — along with real GDP per capita — should capture technological advancements during a transitional era, when Italy moved from early industrialization in many areas during the 1950s and 1960s to subsequent technological developments in the 1970s and 1980s. A positive impact of technology on workplace deaths could indicate a "Taylorization effect," whereby technological progress leads to an increase in risk exposure due to the intensified use of complex or hazardous machinery, without a corresponding rise in attention to OHS outcomes.

Thanks to the reconstruction of these variables, a panel dataset is assembled with provincial observations at census years over the period 1951-1991. In the econometric analysis, the relationships between the dependent variable — Total Fatality Rates — and the single key explanatory variables with controls are first tested using provincial fixed effects and, subsequently, provincial and time fixed effects together (1-4). The use of fixed effects allows us to control province-specific and time-specific characteristics. While using only province fixed effects, we still observe the impact of the historical pattern on the phenomenon, including both province and time (year) fixed effects we obscure the evolution of the process providing clearer indications of causal relationships. In other specification, two key variables – one bargaining power variable and the average establishment size (AES) — are tested together with controls (5-9). Logarithmic transformations of the variables are always applied except in the case of precarious employment rate, where some samples with negative values are present[14]. All the regressions are run with errors clustered at provincial level. An important issue arising from the regressions results, when both a bargaining power variable and AES are included, concerns the high correlation between these two main explanatory variables[15]. The correlation, arising from the historical coevolutionary process of increased industrial capacity and workers' empowerment and class consciousness, impacts on the exact estimation of the coefficients, dampening the effect of one or the other

[13] In our framework, technology can be viewed as a context-dependent factor that may influence the phenomenon. Indeed, "OHS improving elements" contained in technological advancements are adopted only when workers' bargaining power is sufficiently strong. Conversely, when unions focus on issues other than OHS, technological developments — such as new machinery — may have a neutral or even negative effect on OHS standards.
[14] Moreover, visual inspections show that a log-linear relation better fits the data.
[15] However, despite the high correlation, the variance inflation factor always remains around 2-3 in all the specifications.

variable according to the single specification. In table 3, two indexes created by merging our main variables are used to better show the final results.

To recap, according to the simple model inspired by historical evidence (in section two) and presented in section 3, a decrease in precarious employment degree — proxying for workers' bargaining power — should lead to a decrease in industrial fatality rates. Similarly, an increase in unionization rate or hours of strike per worker over the 10 previous years should decrease fatality rates. This reduction is expected to be more pronounced in provinces with larger average establishment size, as workers are more able to organize in bigger firms, and employers are less resistant to improving working conditions due to higher profit margins. The effect of other control variables is more controversial. The share of employment in building sector is expected to increase fatality rates, as is the case for private healthcare share. The technological and modernization variables – real GDP per capita and engines per worker in manufacture — should probably have beneficial effects in the long run for the reduction of the phenomenon.

6. Results

6.a Fatal Injury rates in post-WWII Italian industry (1951-1991)

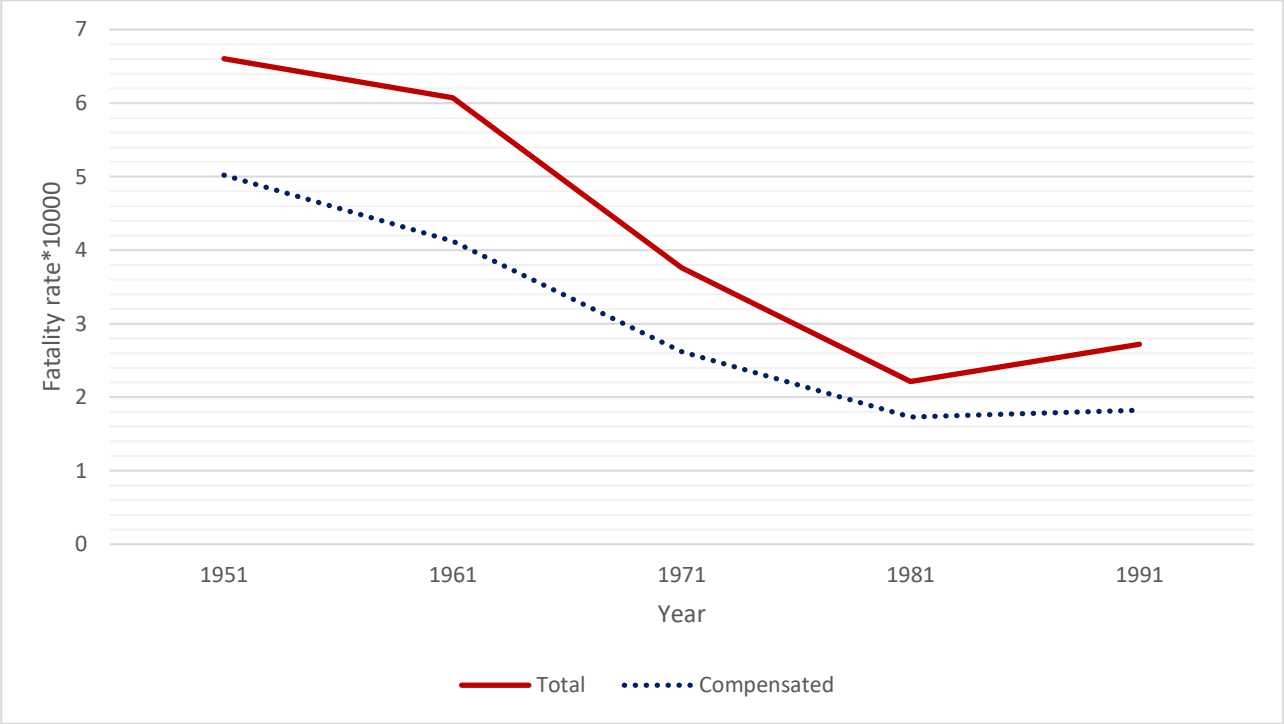
Figure 2 shows Total — including compensated and non-compensated injuries — and Compensated fatality rates in industry for post-war Italy (1951-1991). During the economic boom (1950s–early 1960s), total fatality rates did not decrease significantly, while compensated fatality rates fell by 0.9. This discrepancy was likely due to the overly strict definitions of injury circumstances provided by INAIL[16]. However, as highlighted in the historical section, despite the introduction of new laws on OHS (1955-1956), the economic growth of the 1950s was clearly disconnected by a corresponding improvement in working-class rights, resulting in the lack of a steep decrease in workplace fatalities. By contrast, the 1960s and 1970s were key years for the reduction of fatal injury rates. Considering that workplace safety and health were largely negotiated at the firm level during this period, the reduction in fatalities likely began in large firms in the 1960s, producing cascading effects on smaller firms as workers' struggles became institutionalized through national contracts and regulations, especially after 1969[17]. In particular, the effects of working-hour regulations negotiated through sectoral contracts, along with the labor rights gained following the introduction of the Workers' Statute (1970), were likely highly beneficial for the phenomenon. At the same time, Figures 2.a, 3.a, and 4.a in the appendix, showing the precarious employment rate, unionization, and cumulative hours of strikes per worker over the previous ten years, clearly indicate that the 1960s and 1970s were periods of intense labor conflict. Marginality

[16] Moreover, as discussed in Section 4.a, workers who died without heirs were not included among compensated fatalities. Since this group was predominantly composed of young individuals, it is likely that the economic boom of those years drew a large number of young workers into employment, thereby contributing to the observed discrepancy in fatality rates.

[17] Rappa (2025) refers to this process as the "conflict trickle-down mechanism", as during this period highly unionized provinces transferred the gains of workers' struggles to less unionized provinces through collective bargaining agreements.

— and unemployment — decreased due to the economic boom, the regularization of workers' rights, and the displacement of marginal workers following restructuring processes of the 1960s (de Cecco, 1972). As highlighted by the literature (Graziani, 1998; Felice, 2015), these events led to a clear increase in labor conflict, as reflected in unionization and strikes activity. After 1981, the reduction process slowed significantly, and the trend in total fatality rates reversed. A renewed increase in precarious employment, combined with the weakening of labor movements, shifted labor unions' attention to other issues, such as employment, thereby contributing to a further deterioration of workers' conditions.[18] The phenomenon was also linked to the reduction in average establishment size in industry (Figure 5.a). If in the 1960s a growing industrial structure facilitated workers' claims on various issues, including occupational health and safety — albeit with evident moments of friction (Graziani, 1998) — in the 1970s and 1980s, economic crises and restructuring processes imposed a new industrial paradigm, in which industrial districts composed of medium- and small-sized firms operating in light sectors flourished (de Cecco, 2004; 2007; Brusco, 1982).

Fig. 2. Total and Compensated fatal injury rates in industry for Italy, 1951-1991

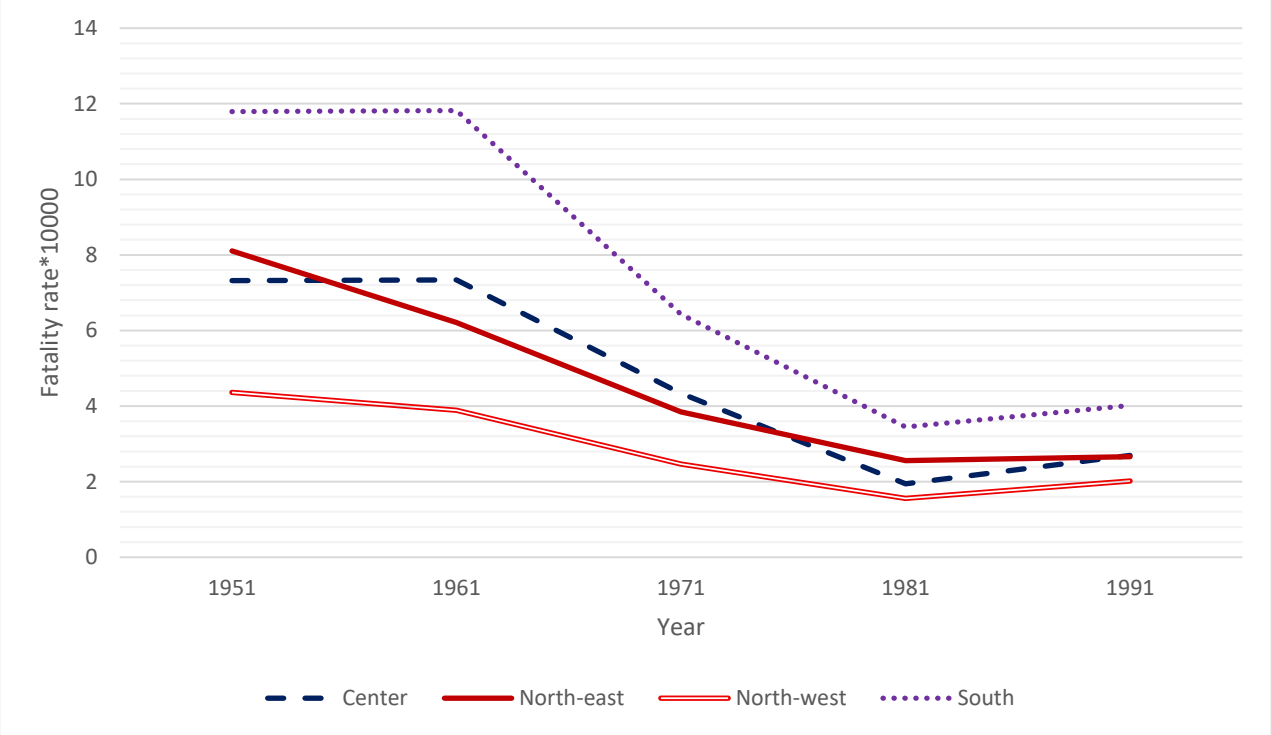


Source: own elaborations. Look at section 3.
Note: the industrial sectors included are: extractive, manufacturing, utilities, construction and transport sectors. Total fatal injury rates include compensated and non-compensated injuries.

[18] The decrease in workers' activism is not apparent from unionization — which actually increased during the 1980s as effect of the "conflict years" (CESOS, 1991) — but is evident in strikes per worker, which plummeted during the decade. Moreover, in line with the explanation, it is interesting to notice that the new increase in fatality rates of the 1980s positively correlates with increasing inequality measured by the top 1% income trend (Guzzardi and Morelli, 2024).

Figure 3 and Figure 6.a in the appendix show Total and Compensated macroregional fatality rates in industry for the period 1951-1991[19]. During the 1950s, fatality rates remained relatively stable across all regions, except in the North-East, where a decrease occurred. It is likely that the strong increase in average establishment size in this region could explain the observed outcome. Between 1961 and 1971, fatality rates decreased across all Italian regions, with reductions of almost 40% in northern and central regions and almost 50% In the South. In the North, the reductions were likely favored by negotiations between workers' movements and employers, while in the South, the decline was probably driven by the establishment of State-owned and large industries during the period (Graziani, 1998), where labor force was more organized and national labor contracts were more easily applied. During the 1970s, with the institutionalization of workers' struggles and the birth of social welfare, greater reductions in fatality rates occurred in the South and the Center (around 50%). It is also possible that the end of the building sector boom of the 1950s and 1960s, along with the concurrent decrease in precarious employment typical of the sector, could contribute to this outcome. In the 1980s, the rates stopped decreasing – or even increased – in the North-west, Central Italy and the South, while they stagnated in the North-east. While the stagnation in the North-East may have been driven by its industrial dimensional growth and the political activism within new local health units (USL), the increase in fatalities in other regions was likely due to the decline in economic conflict and the dismantling of the industrial structure, particularly in the South, where the State and large industries were most affected by the phenomenon.

Fig. 3. Total fatal injury rates in Industry for Macroregions, 1951-1991



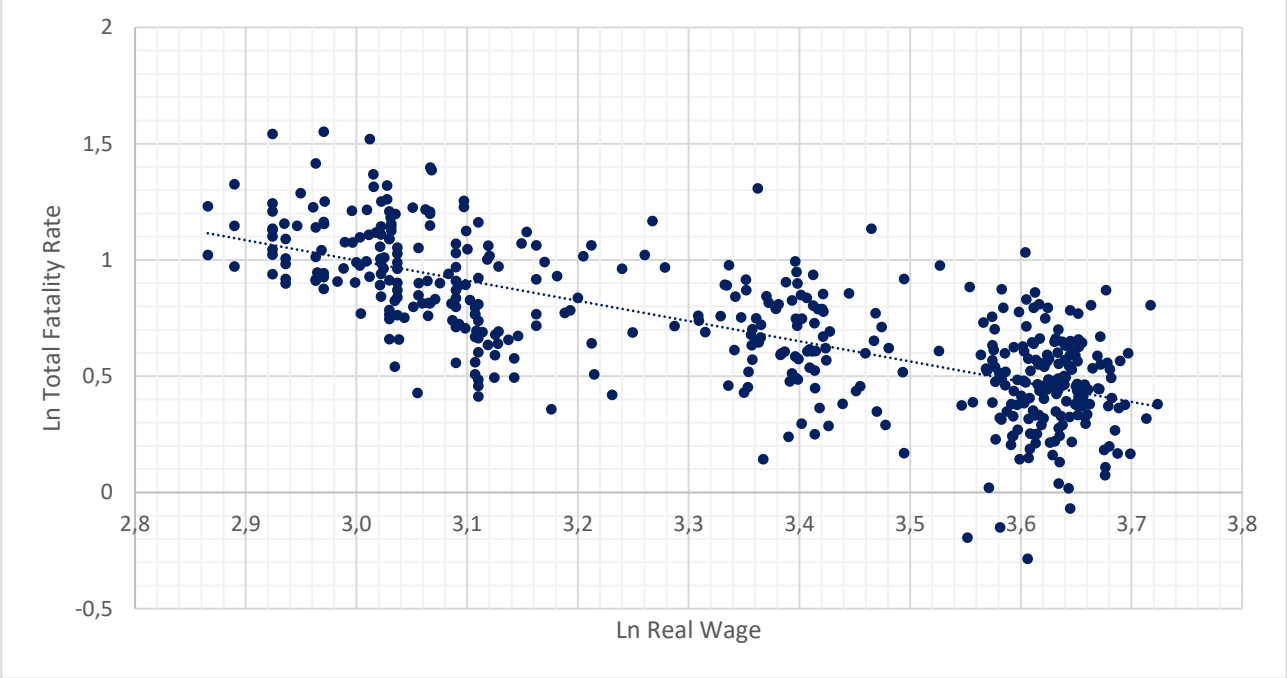
Source: own elaborations. Look at section 3.
Note: the industrial sectors included are: extractive, manufacturing, utilities, construction and transport sectors.

[19] North-west includes Piedmont, Valle D'Aosta, Lombardy and Liguria. North-east includes Veneto, Trentino-Alto Adige, Friuli-Venezia-Giulia and Emilia-Romagna. Center includes Tuscany, Umbria, Marche and Latium. South includes Campania, Abruzzo, Molise, Apulia, Basilicata, Calabria, Sicily and Sardinia.

Observing the long-time macroregional trends, we can notice an overall convergence across regions between 1951 and 1991. In 1951, the Center and North-East had fatality rates approximately 70-80% higher than those in the North-West, while the rate in the South was 180% higher, widening to 220% in 1961. By 1991, the Center and North-east had reduced their gap to 30%, and the South had reduced to 130%. These results highlight historical regional development in our key variables. In particular, marginal labor force, unionization, and average establishment size in the South significantly converged to the national average during the period. Concurrently, the institutional framework and the centralized bargaining system likely also contributed to this convergence.

To conclude this section, Figure 4 shows the correlation (in logarithmic terms) between fatality rates and real wages at provincial level in census years[20]. The picture, encompassing both the historical and regional dimensions, confirms the theoretical framework, which seeks to extend the concept of wage to include OHS standards[21].

Fig 4. Correlation of Real wages and Total Fatal injury rates in industry, 1951-1991



Source: Nominal wages at provincial level in industry are recovered from *Annuario Statistico* INAIL for all census years. They are then converted into real values using the Consumer price index (CPI) provided by ISTAT (2011). For a detailed review of the strengths and weaknesses of the source, see Rappa (2025) and Ramazzotti (2023). For Fatality rates sources and reconstruction look at section 3.
Note: The points represent provincial observations in censuses years (1951-1991). The correlation is shown in logarithmic terms.

[20] Figure 7.a. in the appendix shows the same scatterplot with different colors for specific census years.
[21]However, it is worth noting that the correlation is stronger during periods of high real wage growth. By contrast, when unions are weak — before 1961 and after 1981 — OHS standards tend to stagnate or decline. From this perspective, a correlation with income distribution variables, such as the labor share, would likely yield even stronger results.

5.b Empirical results

Table 1 shows, through different specifications, the results of the regressions with province fixed effects between our dependent variable – total fatal injury rate in industry – and different independent variables[22].

Table 1. Regression results with province fixed effects, dependent variable = Log total fatality rate in industry, provincial data (1951-1991)

Ln Total Fatality Rate (%)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Ln AES	-0.23**				-0.11	-0.15	-0.39***
	(0.09)				(.08)	(.09)	(.09)
Precarious employment (%)		0.65***			.62***		
		(0.11)			(0.11)		
Ln Unionization (%)			-0.33***			-0.32***	
			(0.06)			(0.06)	
Ln Strikes pw				-0.16***			-0.14***
				(0.02)			(0.02)
Ln Building Sector (%)	0.32***	0.23***	0.33***	0.06	0.24***	0.34***	0.12
	(0.08)	(0.07)	(0.08)	(0.11)	(0.07)	(0.08)	(0.11)
Ln Real GDP pc	-0.79***	-0.56***	-0.70***	-0.91***	-0.56***	-0.69***	-0.92***
	(0.03)	(0.05)	(0.03)	(0.04)	(0.05)	(0.03)	(0.03)
Ln Private healthcare (%)	0.32***	0.19***	0.19***	0.18**	0.20***	0.20***	0.14**
	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)	(0.07)
Observations	452	452	435	360	452	435	360
R^2 adjusted	0.6470	0.6731	0.6536	0.6319	0.6739	0.6648	0.6678
Province FE	yes	yes	yes	yes	yes	yes	yes
Time (year) FE	no	no	no	no	no	no	no

Notes: All regressions are run with robust standard errors clustered at provincial level; Standard errors are in parentheses below the results; ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively. Engines per worker are not included due to the high correlation with real GDP per worker which, particularly in this specification, captures similar underlying factors.

Source: own elaborations. Look at section 3.

All our main explanatory variables, average establishment size (AES) and the bargaining power variables – precarious employment rate, unionization and hours of strike per worker over the 10 previous years – are significant and impact with a considerable effect the dependent variable. Controlling for provincial characteristics while preserving the historical pattern, we find that a 10% increase in AES reduces the fatality rate by more than 2% (1). By contrast, a similar increase in marginal employment raises the fatality rate by nearly 7% (2), while a 10% increase in unionization (3) and in strikes per worker (4) lowers the rate by 3.3% and 1.6%, respectively. However, when we include AES and a bargaining power variable in the same regression (5-7), we find that, in most cases, AES loses consistency and explanatory power due to the high correlation between these regressors. The share of the building sector within the overall industry also appears to be highly correlated with the historical evolution of the phenomenon. In most specifications, a 10% increase in the sectoral share is associated with a 2–3% rise in the fatality rate[23]. This is not surprising, given that the building sector was a relatively "poor" segment of the economy, characterized by a high share of marginal

[22] Table 1.a in the appendix shows the same specifications with compensated fatality rates as dependent variable.

[23] Let us notice that the insignificant results of specifications 4 and 7 are probably given by the exclusion of observations from year 1951.

workers, very small average establishment size, and limited financial capacity among employers. Real GDP per capita is strongly negatively correlated with fatality rates, reflecting the concurrent historical patterns of socio-economic "modernization" and reduction of workplace deaths. The share of private healthcare, the "institutional variable", is positively correlated to the regressand: a 10% increase in private healthcare share is associated with an approximately 2% rise in fatality rates. This finding is particularly interesting, as it suggests that the impact of governmental policies — both in the form of improved social protection measures and as a proxy for institutional presence in a province — has historically been positive with respect to the phenomenon. In summary, from a historical perspective, increases in workers' bargaining power, along with the role of the building sector and modernization, appear to be the most important factors explaining the decline in fatality rates, consistent with the historical evidence and our theoretical framework.

Table 2. Regression results with province and time fixed effects, dependent variable = Log total fatality rate in industry, provincial data (1951-1991)

Ln Total Fatality Rate (%)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Ln AES	-0.54*** (0.07)				-0.46*** (0.08)	-0.61*** (0.10)	-0.53*** (0.09)	-0.58*** (0.10)	-0.66*** (0.09)
Precarious employment (%)		0.48*** (0.11)			0.27** (0.11)	0.17 (0.12)			
Ln Unionization (%)			-0.22*** (0.08)				-0.00 (0.09)	-0.11 (0.10)	
Ln Strikes pw				-0.11*** (0.04)					-0.05* (0.03)
Ln Building Sector (%)	0.18** (0.07)	0.13* (0.07)	0.20*** (0.07)	0.00 (0.10)	0.16** (0.07)	0.14 (0.09)	0.18** (0.07)	0.14 (0.08)	0.08 (0.10)
Ln Real GDP pc	-0.12 (0.12)	-0.18 (0.13)	-0.34*** (0.12)	-.054*** (0.19)	-0.03 (0.12)	-0.10 (0.16)	-0.12 (0.12)	-0.16 (0.16)	-0.18 (0.17)
Ln Private healthcare share (%)	0.02 (0.06)	0.00 (0.07)	0.00 (0.07)	0.00 (0.08)	0.00 (0.06)	0.00 (0.08)	0.02 (0.06)	0.00 (0.08)	-0.09 (0.06)
Ln Engines pw						0.12*** (0.03)		0.15*** (0.04)	
Observations	452	452	435	360	452	361	435	347	360
R^2 adjusted	0.7592	0.7375	0.6864	0.6543	0.7757	0.7568	0.7636	0.7286	0.7144
Province FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time (year) FE	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes: All regressions are run with robust standard errors clustered at provincial level; Standard errors are in parentheses below the results; ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.
Source: own elaborations. Look at section 3.

Table 2 presents the results of the same model specifications exposed in table 1, now including both province and time fixed effects and adding two new specifications with engines per worker as explanatory variable[24]. Excluding time-specific characteristics allows us to assess whether an "unexpected" increase in the explanatory

[24] Table 2.a. in the appendix show the same specifications with Compensated fatality rates as dependent variable.

variables — relative to the historical pattern — was associated with fatality rates, providing a clearer view of potential causal relationships. All our main explanatory variables are highly correlated with the dependent variable, exhibiting the expected signs and statistical significance (1–4). It is noteworthy that establishment size, in particular, gains explanatory power, indicating that the industrial structure played a crucial role in shaping provincial disparities in fatality rates. Including both bargaining power variables and AES in the regressions (5–9) results in a weakening of the significance of the former, reflecting again the high correlation between these variables[25]. The technological variable – engines per worker – is clearly positively correlated with the dependent variable, suggesting that the use of machinery can increase fatalities in manufacturing, thereby confirming a "Taylorization effect" on the phenomenon. A 10% increase in the number of engines per worker is estimated to raise workplace fatality rates by approximately 1.2% to 1.5%. The other controls, instead, show less clear results in this case. Real GDP per capita and building sector exert, respectively, negative and positive influence on fatality rates, although the magnitude of their effects and significance varies across specifications. However, let us notice that, in this case, GDP per capita is shadowed by AES, which better describes sectoral fluctuations than GDP. In the end, the institutional variable shows no significant correlation with the dependent variable.

Table 3. Regression results with province and time fixed effects, dependent variable = Log total fatality rate in industry (1951-1991)

Ln Total Fatality rate (%)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Activism index A	-0.82***		-0.76***	-0.98***	
	(0.13)		(0.11)	(0.15)	
Activism index B		-1.12***			-0.95***
		(0.17)			(0.14)
Ln Building Sector (%)	0.28***	0.23**	0.16**	0.10	0.048
	(0.07)	(0.10)	(0.07)	(0.09)	(0.10)
Ln Real GDP pc	-0.60***	-0.66***	-0.13	-0.12	-0.37***
	(0.04)	(0.05)	(0.12)	(0.15)	(0.17)
Ln Private healthcare share (%)	0.18***	0.10	-0.04	-0.04	-0.17**
	(0.05)	(0.06)	(0.07)	(0.08)	(0.06)
Ln Engines pw				0.11***	
				(0.03)	
Observations	435	348	435	347	348
R^2 adjusted	0.6912	0.6752	0.7571	0.7574	0.6997
Province FE	yes	yes	yes	yes	yes
Time (year) FE	no	no	yes	yes	yes

Notes: All regressions are run with robust standard errors clustered at provincial level; Standard errors are in parentheses below the results; ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively; Activism index A includes AES, precarious employment and unionization rate, Activism index B includes AES, precarious employment, unionization rate and hours of strike per worker.
Source: own elaborations. Look at section 3.

[25] In the case of the unionization rate (7-8), the variable becomes insignificant due to a change in the nature of its relationship with fatality rates. Prior to 1981, this relationship is clearly negative, whereas it reverses thereafter. As shown in Figure 3.a in the Appendix, during the 1970s and 1980s the unionization rate — largely for political reasons — became more widespread in southern regions. This development weakened the link between unionization and actual workers' bargaining power at the provincial level, as indicated by the behavior of the other bargaining-power variables.

Considering the high correlation between average establishment size and all the bargaining power variables at the provincial level, using composite indexes that combine these factors could enhance the robustness of the framework. Table 3 shows the results of the relation – with fixed effects and controls – between fatality rates and two indexes – Activism index A and B — ranging from 0 to 1[26]. The first index, "Activism rate A", include the variables AES, precarious employment and unionization rate normalized over the whole period and divided by three. The second index, "Activism rate B", includes also hours of strike per worker. The historical evolution of the indexes for Italy and macroregions are shown in Figure 7.a and 8.a in the appendix. The results generally confirm the evidence highlighted in table 1 and 2. Considering only province fixed effects, a 1-point increase in Activism rate A decreases fatality rate by 0.82%, while a 1-point increase in Activism rate B decreases fatality rates by 1.1%. Taking into account both fixed effects, the effects of the indexes slightly decrease but remain very significant, thereby suggesting that considering AES and the bargaining power variables together improve – analytically and historically — our understanding of the phenomenon.

To conclude, the empirical section has shown how the variables suggested by the historical evidence are able to explain the reduction in fatality rates occurred in Italian industry during the post-war period. Unfortunately, considering the historical coevolution of provincial industrial structure and workers' bargaining power, it is very difficult to disentangle the effect of one variable or the other on the phenomenon. However, it can be argued that both factors probably had a certain impact. While the increase in workers' bargaining power – common to all the provinces – historically drove the improvements in OHS standards and labor rights, the provincial industrial structure may better explain the adoption of such measures at the provincial level, as employer resistance was lower in areas where the impact of rising labor costs could be more easily absorbed[27]. It can be argued, indeed, that national regulations and contracts were more likely respected in areas where big establishments were present. However, in the long run, the role of the centralized wage bargaining probably played an important role in the adoption of OHS standards and better working conditions in provinces dominated by small local units (Rappa, 2025). The sectoral composition of the province, together with GDP level, also appears to play an important role in determining fatality rates, whereas other control variables are more context dependent. The analysis of the joint indexes (table 3) confirms the results.

[26] Table 3.a. in the appendix show the same specifications with Compensated fatality rates as dependent variable.

[27] It is interesting to note that among the variables capturing workers' bargaining power, the one that best fits the relationships observed is precarious employment. This variable likely reflects more accurately the real forces at play in the labor market, as unionization and strike activity are partly mediated by the political context and do not necessarily mirror workers' concern for OHS. Moreover, while strikes per worker and the unionization rate refer to the entire working population (see Section 3), the measure of precarious employment pertains only to industrial sectors, making it a more precise indicator.

7. Conclusion

Italy in post-WWII period (1951–1991) is particularly revealing for observing OHS historical dynamics. During these decades, institutions were often either unable or unwilling to enforce workplace safety and health regulations, effectively leaving these issues to free negotiation between workers and employers and thereby fostering a rapid evolution of OHS outcomes. Marginality, unemployment, and precarious living conditions among the working class declined during the 1960s, fueling strong worker activism around wages and workplace conditions, particularly after 1969. At the same time, industrial complexity and profit margins reached historical highs in the country, giving employers the financial capacity to agree to improvements in working conditions. The combination of these factors led to a significant decrease in workplace fatality rates from the mid-1960s to the early 1980s. Moreover, the expansion of social welfare and the institutionalization of workers' struggles in the 1970s further reduced marginality in poorer regions, fostering a convergence in safety outcomes that persisted until the mid-1980s. During the 1970s and 1980s, the Italian industrial structure began to collapse, along with union activism and occupational protections, thus halting the process of reducing fatalities — a situation that persists to this day similarly replicating income inequality outcomes. During the 1990s, indeed, the protection of workers was increasingly delegated to institutions and regulations which, unfortunately, proved sufficient only for preserving existing rights rather than advancing occupational safety or further reducing fatality rates (Carnevale, 2017).

To conclude, drawing on historical and empirical analysis, this paper suggests that OHS can be integrated into an income distribution framework. Improvements in OHS standards tend to occur alongside rising wages and labor shares, as all appear to be driven by the same underlying forces.

References

Alberti, M. (2024). *Il lavoro in Italia. Un profilo storico dall'Unità a oggi,* Carocci editore, Roma.

Antonelli, M. A., Castaldo, A., Forti, M., Marrocco, A., & Salustri, A. (2024). «Workplace accidents, economic determinants and underreporting: an empirical analysis in Italy*», International Journal of Manpower*, (pp. 1555-1572), 45(8).

Ardeni, P. G. (2024). *Le classi sociali in Italia oggi*, Editori Laterza, Roma.

Bagnara, S., Biocca, M., & Mazzonis, D. G. (1981). «Trends in occupational health and safety policy in Italy*», International Journal of Health Services*, 11(3), 431-450.

Barca, F. (1999). *Il capitalismo italiano: storia di un compromesso senza riforme*, Donzelli Editore, Roma.

Bartrip, P. W., & Fenn, P. T. (1988). «Factory fatalities and regulation in Britain, 1878–1913», *Explorations in economic history*, 25(1), 60-74.

Belzer, M. H., & Quinlan, M. G. (2024). «The economics of occupational health and safety», *The Economic and Labour Relations Review*, 35(3), 483-498.

Berlinguer, G. (1969). *La salute nelle fabbriche*, De Donato editore, Bari.

Berlinguer, G., & Biocca, M. (1987). «Recent developments in occupational health policy in Italy»*, International Journal of Health Services*, 17(3), 455-474.

Boal, W. M. (2018). «Work intensity and worker safety in early twentieth-century coal mining», *Explorations in Economic History*, 70, 132-149.

Boone, J. and Van Ours, J.C. (2006), "Are recessions good for workplace safety?", Journal of Health Economics, Vol. 25 No. 6, pp. 1069-1093.

Braverman, H. (1974). *Labor and monopoly capital: The degradation of work in the twentieth century*. NYU Press, New York.

Brusco, S. (1982). «The Emilian model: productive decentralisation and social integration», *Cambridge journal of economics*, 6(2), 167-184.

Carnevale, F., (2017). «Salute, classi lavoratrici e istituzioni», in Musso, S. (ed.), *Il Novecento, 1945-2000: la ricostruzione, il miracolo economico, la globalizzazione,* Castelvecchi, Roma.

Carnevale, F., & Baldasseroni, A. (1999). *Mal da lavoro: storia della salute dei lavoratori,* Laterza, Bari-Roma.

Carnevale, F., & Baldasseroni, A. (2005). «A history of union struggles for control of the work environment in Italy», *International journal of occupational and environmental health*, *11*(1), 6-11.

Cella, G.P., & Treu, T. (1989). «La contrattazione collettiva» in Cella. G.P. & Treu, T. (ed), *Relazioni Industriali*, il Mulino, Bologna.

CESOS (different years). Le relazioni sindacali in Italia: rapporto – Cesos, Centro di studi sociali e sindacali, Firenze.

Chiaiese, D. and Ciriotto, V. (2025), «Italy in Wide-Angle: Workforce, emigration, population and GDP at the provincial level in Republican Italy (1951-1991)», *Rivista di Storia Economica / Italian Review of Economic History* (pp. 121-155), 2/2025.

Derickson, A. (1992) «From company doctors to union hospitals: The first democratic health-care experiments of the United Mine Workers of America», *Labor History*, 33(3), 325-342.

De Cecco, M. (1971). «Lo sviluppo dell'economia italiana e la sua collocazione internazionale», *Rivista internazionale di scienze economiche e commerciali* (pp. 973-988), 10.

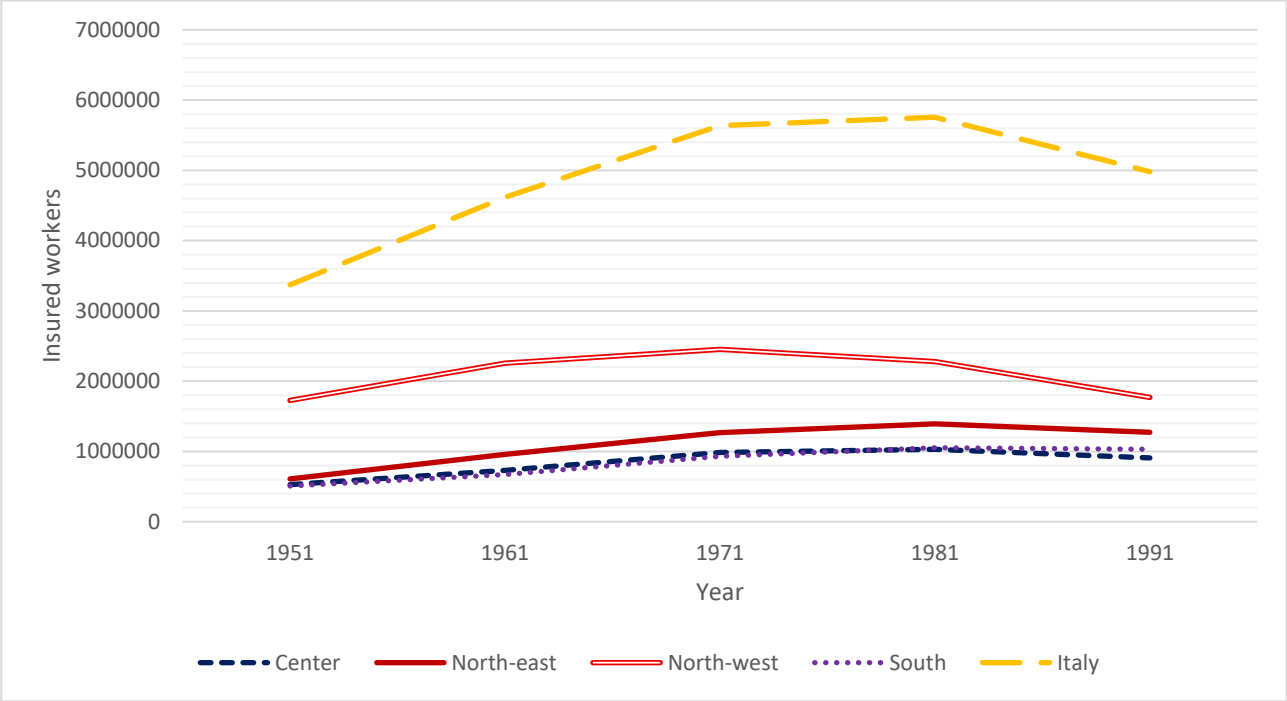
De Cecco, M. (1972). «Una interpretazione ricardiana della dinamica della forza-lavoro in Italia nel decennio 1959-69», *Note economiche: rivista economica del Monte dei Paschi di Siena*, 5(2), 76-119.
De Cecco, M. (2004). «Alle radici dei problemi dell'industria italiana nel secondo dopoguerra», *Rivista italiana degli economisti* (pp. 103-116), 9(1).
De Cecco, M. (2007). «Italy's dysfunctional political economy», *West European Politics*, 30:4, 763-783.
Fabiano, B., Currò, F. and Pastorino, R. (2004). «A study of the relationship between occupational injuries and firm size and type in the Italian industry», *Safety Science*, 42(7), 587-600.
Di Martino, P., & Vasta, M. (2018). «Reassessing the Italian "Economic Miracle": Law, firms' governance, and management, 1950–1973», *Business History Review*, 92(2), 281-306.
Felice, C. E. (2015). *Ascesa e declino. Storia economica d'Italia*, il Mulino, Bologna.
Felice, E. (2019). «The roots of a dual equilibrium: GDP, productivity, and structural change in the Italian regions in the long run (1871–2011) », *European Review of Economic History*, 23(4), 499-528.
Fishback, P. V. (1986). «Workplace safety during the Progressive Era: Fatal accidents in bituminous coal mining, 1912–1923», *Explorations in Economic History*, 23(3), 269-298.
Fishback, P. V. (1998). «Operations of" unfettered" labor markets: Exit and voice in American labor markets at the turn of the century», Journal of Economic Literature, 36(2), 722-765.
Gallo, S., & Loreto, F. (2023). *Storia del lavoro nell'Italia contemporanea*, il Mulino, Bologna.
García, C. B., Salmerón, R., García, C., & García, J. (2020). «Residualization: justification, properties and application», *Journal of Applied Statistics*, 47(11), 1990-2010.
Graziani, A. (1998). *Lo sviluppo dell'economia italiana: dalla ricostruzione alla moneta europea*, Bollati Boringhieri, Torino.
Gregson, S., & Quinlan, M. (2020). «Subcontracting and low pay kill: lessons from the health and safety consequences of sweated labour in the garment industry, 1880–1920», *Labor History*, 61(5-6), 534-550.
Guzzardi, D. & Morelli, S. (2024). «A New Geography of Inequality: Top incomes in Italian Regions and Inner Areas», *World Inequality Lab Working Paper 2024/19.*
Huberman, M., & Lewchuk, W. (2003). «European economic integration and the labour compact, 1850–1913», *European Review of Economic History*, 7(1), 3-41.
ISTAT (2011). Sommario di Statistiche Storiche (1861-2010), Istituto centrale di statistica, Roma.
ISTAT (1951-1961-1971-1981-1991). Censimento generale dell'industria, Istituto centrale di statistica, Roma.
ISTAT (1951-1961-1971-1981-1991). Censimento generale della popolazione, Istituto centrale di statistica, Roma.
ISTAT (different years). Annuario di Statistiche Provinciali, Istituto centrale di statistica, Roma.
ISTAT (different years). Annuario di Statistiche del Lavoro, Istituto centrale di statistica, Roma.
ISTAT (different years). Annuario Statistico, Istituto centrale di statistica, Roma.
INAIL (different years). Notiziario Statistico, Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro, Roma.
INAIL (1962). *Notizie Statistiche 1959-1961*, Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro, Roma.
INAIL (2024). *Relazione Annuale 2024*, Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro, Roma.
Iuzzolino, G., Pellegrini, G., & Viesti, G. (2013). «Regional convergence», in Toniolo, G. (ed), *The Oxford handbook of the Italian economy since unification,* Oxford University Press.

Lenaerts, K., Vandekerckhove, S., Lamberts, M., Seghir, M., Mofakhami, M. and Greenan, N. (2020). «Working Conditions in Sectors», Publications Office of the European Union.
Lewchuk, W. (1991). «Industrialization and Occupational Mortality in France prior to 1914», *Explorations in Economic History*, 28(3), 344-366.
Lutz, V. (1962). *Italy. A study in economic development*, Oxford University press, Oxford.
Marri, G., & Oddone, I. (1969). *L'ambiente di lavoro*, FIM-FIOM-UILM Sindacati Metalmeccanici, Roma.
Meldolesi, L. (1972). *Disoccupazione ed esercito industriale di riserva in Italia*, Editori Laterza & Figli, Roma.
Morantz, A. D. (2013). «Coal mine safety: do unions make a difference? », *ILR Review*, 66(1), 88-116.
Moses, J. (2018). *The first modern risk: Workplace accidents and the origins of European social states,* Cambridge University Press.
Nichols, T., & Armstrong, P. (1973). *Safety or profit. International studies in governance, change and the work environment,* Falling wall press, Bristol.
Paci, M. (1973). *Mercato del lavoro e classi sociali in Italia: ricerche sulla composizione del proletariato,* Il Mulino, Bologna.
Ramazzotti, A. (2023), *The Legacy of 1969? Essays on the Historical Roots of Italy's Economic Decline: Human Capital, Internal Migration and Manufacturing Firms, 1960s-2000s,* Doctoral dissertation, London School of Economics and Political Science.
Rappa, E. (2025). «Conflict inflation in Italy during the Golden Age. Evidence from provincial data, 1952-1972», *Rivista di Storia Economica / Italian Review of Economic History.*
Reich, M. R., & Goldman, R. H. (1984). «Italian occupational health: concepts, conflicts, implications», *American journal of public health*, 74(9), 1031-1041.
Reid, D. (1981). «The role of mine safety in the development of working-class consciousness and organization: The case of the Aubin Coal Basin, 1867-1914», *French Historical Studies*, 12(1), 98-119.
Righi, M. L. (2010). «Ascesa e declino di un modello: le lotte sindacali sull'ambiente di lavoro», *Annali della Fondazione Giuseppe Di Vittorio*, 157-190.
Romagnoli, G., and Cammarota, A. (1980), *La Sindacalizzazione tra ideologia e pratica: il caso italiano, 1950-1977*, Centro Nazionale studi Cisl, Firenze.
Silvestre, J. (2008). «Workplace accidents and early safety policies in Spain, 1900–1932», *Social History of Medicine*, 21(1), 67-86.
Silvestre, J. (2010). «Improving workplace safety in the Ontario manufacturing industry, 1914–1939», *Business History Review*, 84(3), 527-550.
Smuraglia, C. (1963). *Il comportamento concludente nel rapporto di lavoro*, Giuffrè Editore, Milano.
Smuraglia, C. (1974*). La sicurezza del lavoro e la sua tutela penale*, Giuffrè Editore, Milano.
Sylos-Labini, P. (1964). «Precarious employment in Sicily», *International Labour Review* 89, no. 3 (March 1964): 268-28.
Sylos-Labini, P. (1970). *Problemi dello sviluppo economico*, Editori Laterza, Bari.
Sylos-Labini, P. (1974). *Saggio sulle classi sociali*, Editori Laterza, Bari.
Tucker, E. (1992). «Worker participation in health and safety regulation: Lessons from Sweden», *Studies in Political Economy*, 37(1), 95-127.
Walters, D., & Quinlan, M. (2019). «Representing workers on occupational safety and health: some lessons from a largely ignored history», *Industrial Relations Journal*, 50(4), 399-414.

Walters, D., Wadsworth, E., Hasle, P., Refslund, B., Ramioul, M. and Antonsson, A.B. (2018), «Safety and health in micro and small enterprises in the EU: the view from the workplace»

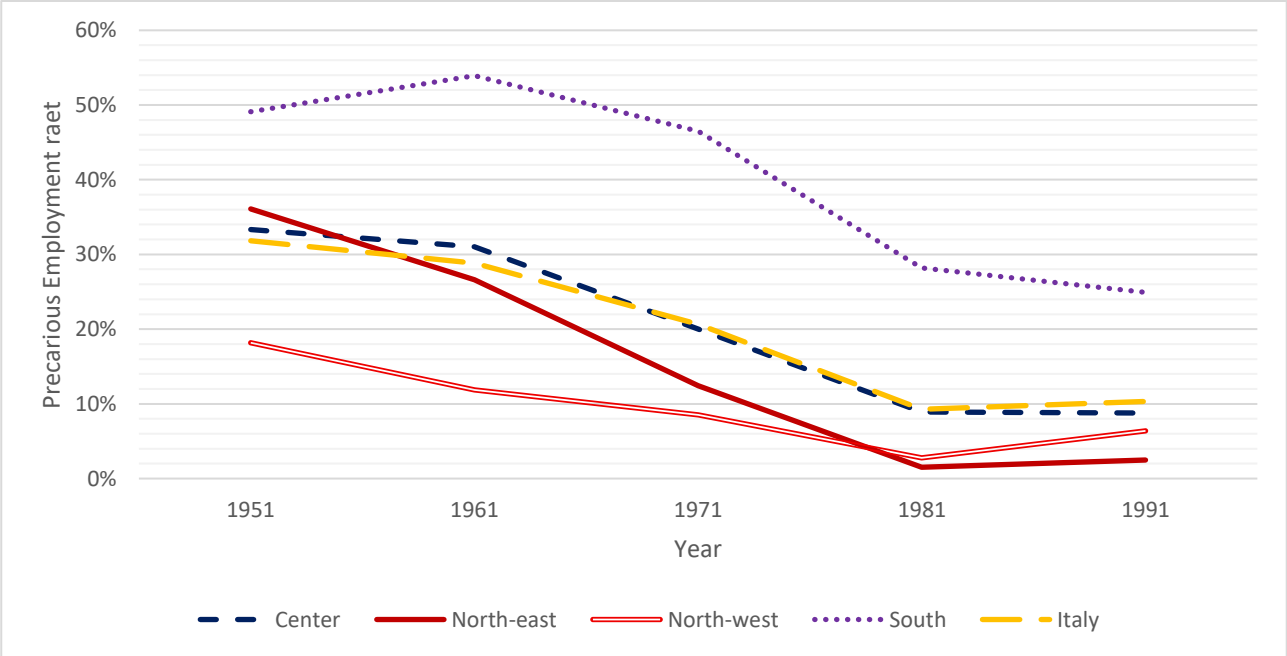
Appendix

Fig. 1.a. Insured workers in Industry for Italy and Macroregions (1951-1991)



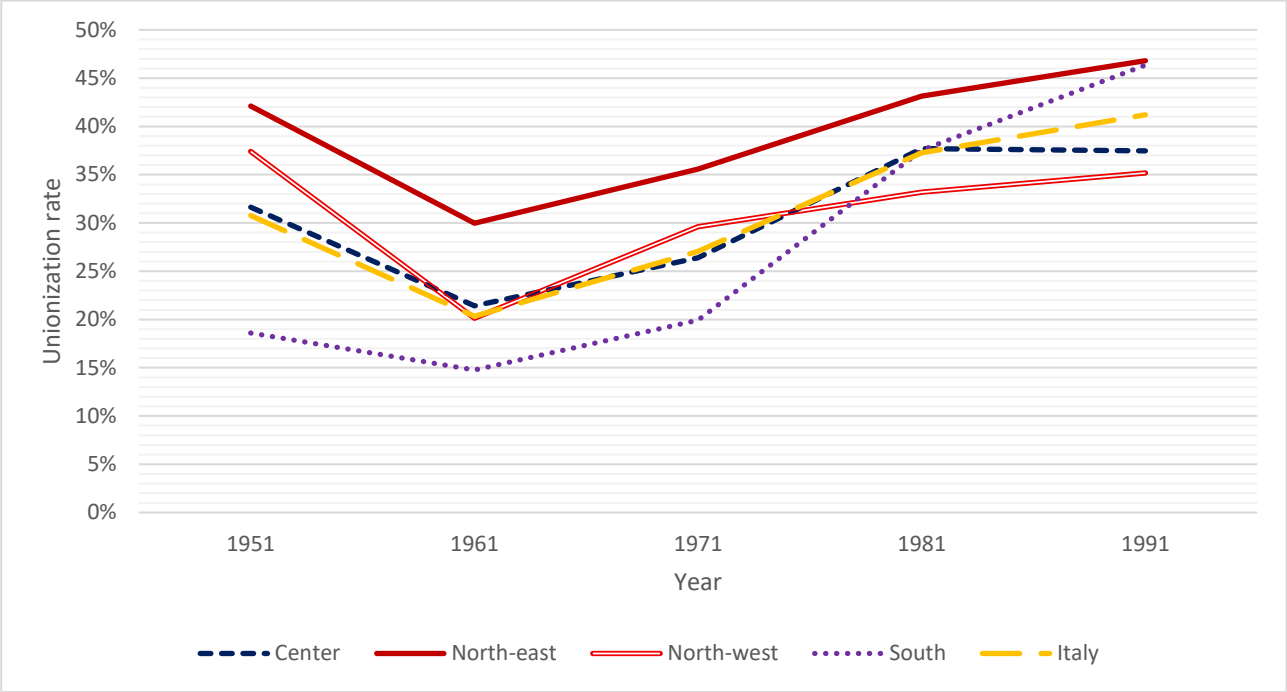
Source: own elaborations from the industrial censuses. Look at section 3.
Note: Insured workers include dependent workers, apprentices, helpers and artisans. The industrial sectors included are: extractive, manufacturing, utilities, construction and transport sectors.

Fig. 2.a. Industrial Precarious employment rates in Italy and Macroregions, 1951-1991



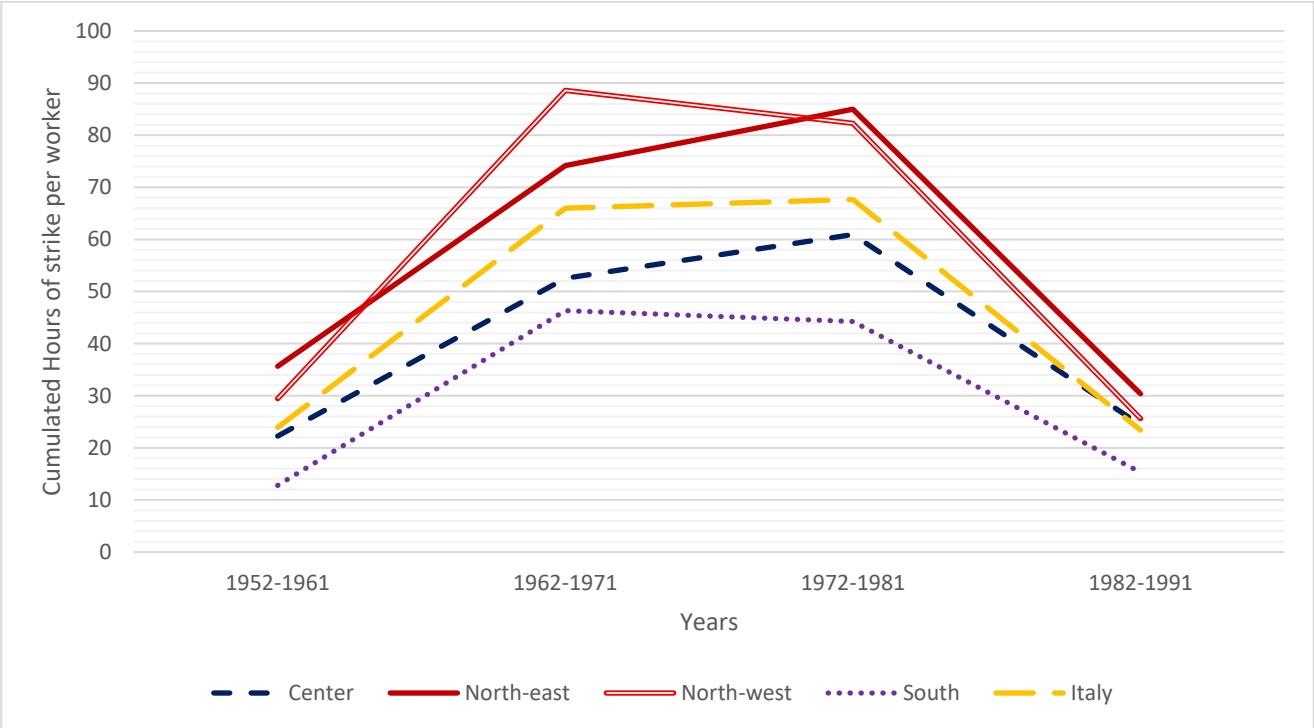
Source: own elaborations. Look at section 3.
Note: Precarious Employment rate is computed as the marginal workforce over total workforce in the industrial sectors of interest.

Fig. 3.a. Unionization rate for Italy and Macroregions, 1951-1991



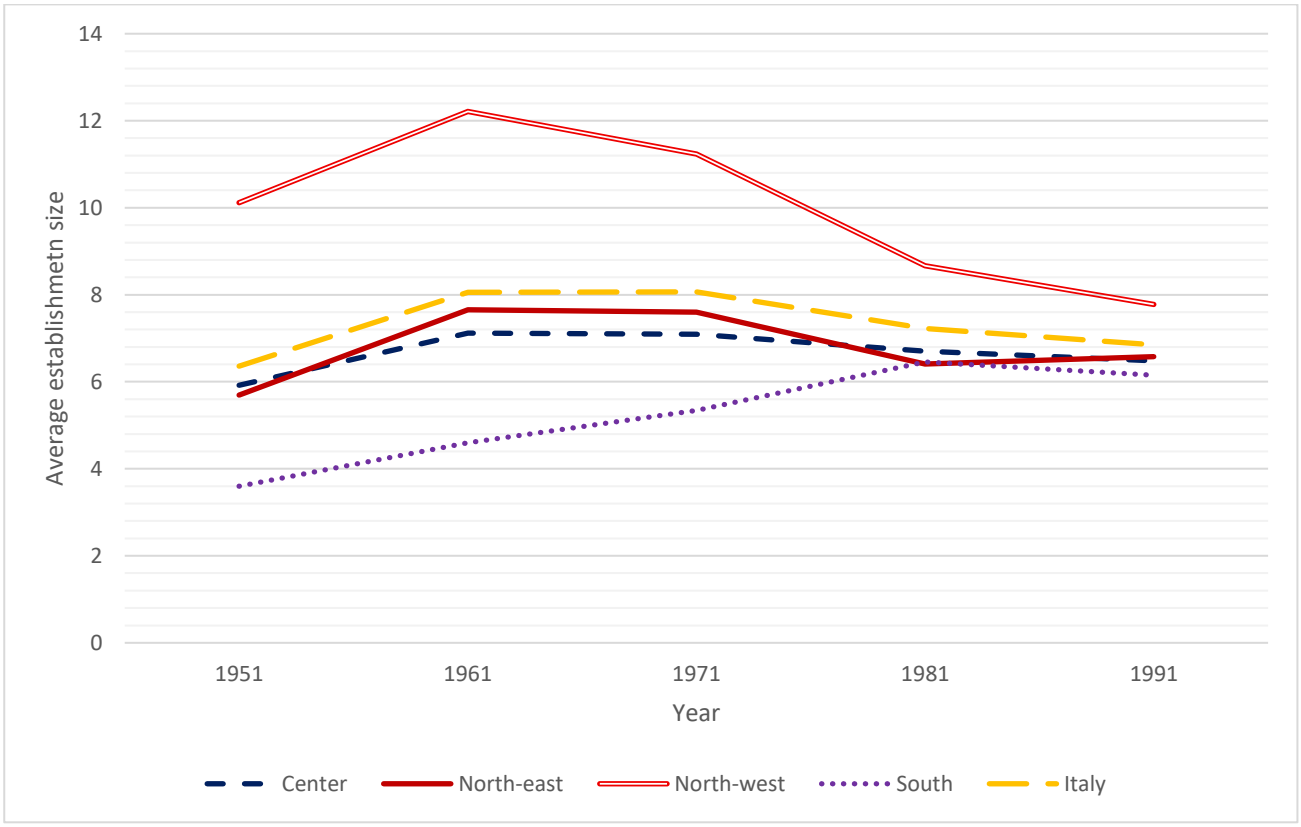
Source: own elaborations. Look at section 3.

Fig. 4.a. Hours of strike per worker (10 years cumulated) for Italy and Macroregions, 1951-1991



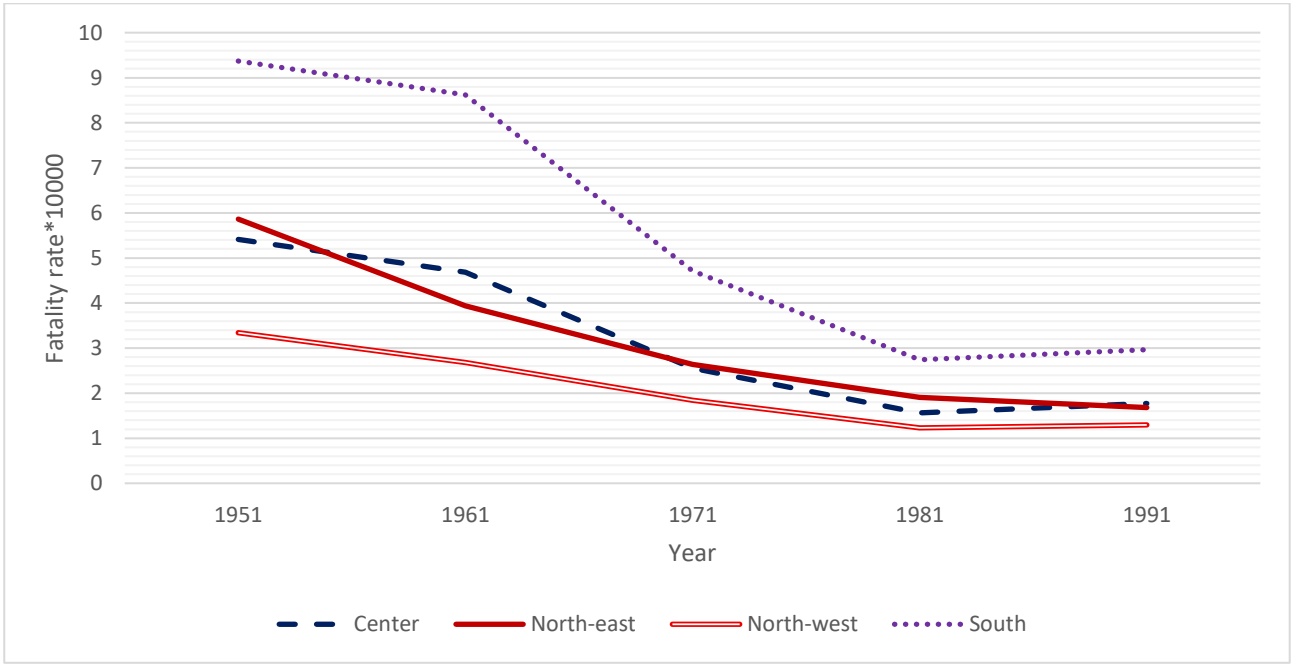
Source: own elaborations. Look at section 3.

Fig. 5.a. Average establishment size in industry for Italy and Macroregions, 1951-1991



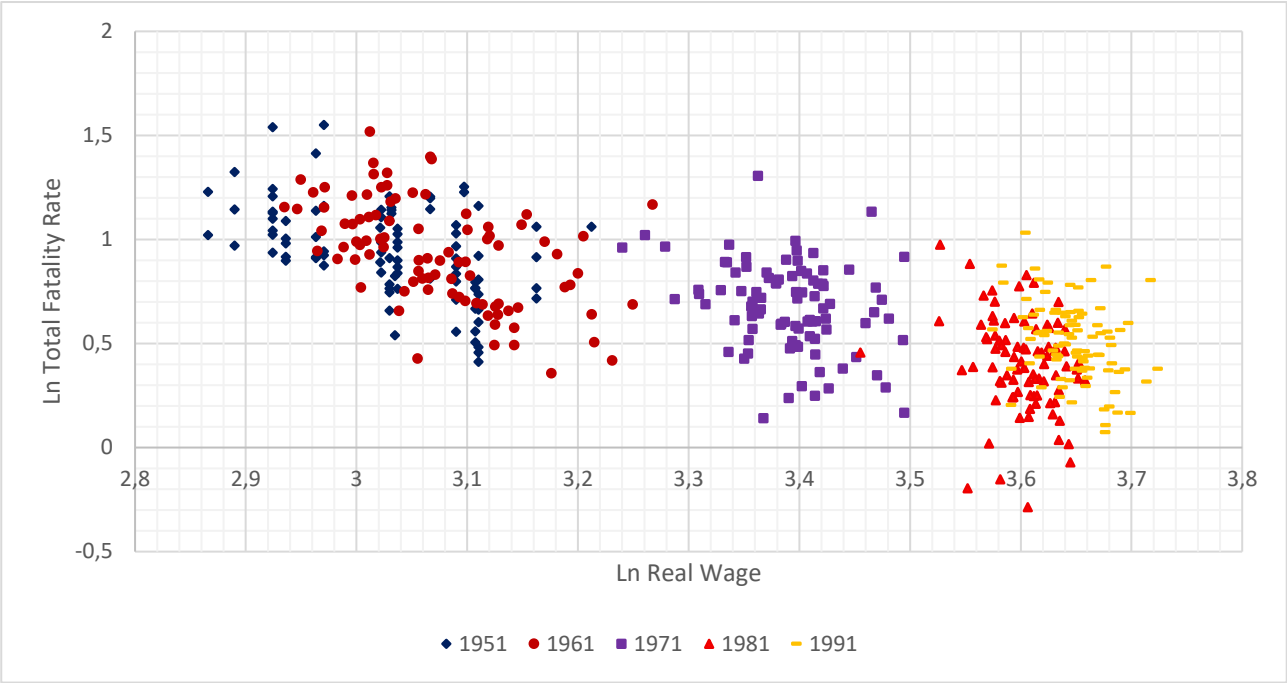
Source: own elaborations. Look at section 3.
Note: Average establishment size is computed as the number of workers per local unit.

Fig. 6.a. Compensated fatal injury rates in Industry for Italy and Macroregions (1951-1991)



Source: own elaborations. Look at section 3.
Note: the industrial sectors included are: extractive, manufacturing, utilities, construction and transport sectors.

Fig 7.a Correlation of Real wages and Total fatality rates in industry differentiated per census year



Source: Nominal wages at provincial level in industry are recovered from *Annuario Statistico* INAIL for all census years. They are then converted into real values using the Consumer price index (CPI) provided by ISTAT (2011). For a detailed review of the strengths and weaknesses of the source, see Rappa (2025) and Ramazzotti (2023). For Fatality rates sources and reconstruction look at section 3.

Note: The points represent provincial observations in censuses years (1951-1991). The correlation is shown in logarithmic terms.

Table 1.a Regression results with province fixed effects, dependent variable = Log Fatality rate with compensation in industry, provincial data (1951-1991)

Ln Compensation Fatality Rate (%)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Ln AES	**-0.22****				-0.12	-0.16	-0.37***
	(.10)				(0.09)	(0.10)	(0.11)
Precarious employment (%)		**0.57*****			0.54***		
		(0.12)			(0.12)		
Ln Unionization (%)			-0.24***			-0.22***	
			(0.06)			(0.06)	
Ln Strikes pw				-0.12***			-0.10***
				(0.02)			(0.02)
Ln Building Sector (%)	0.31***	0.23***	0.31***	0.06	**0.24*****	**0.31*****	0.12
	(0.09)	(0.08)	(0.09)	(0.10)	**(0.08)**	**(0.09)**	(0.11)
Ln Real GDPpc	-0.79***	-.059***	-0.74***	-0.88***	-0.58***	-0.72***	-0.89***
	(0.03)	(0.05)	(0.04)	(0.03)	(0.05)	(0.04)	(0.03)
Ln Private healthcare (%)	0.21***	0.10*	0.12*	0.07	0.11*	0.13**	0.03
	(0.05)	(0.06)	(0.06)	(0.07)	(0.05)	(0.06)	(0.06)
Observations	452	452	435	360	452	435	360
R^2 adjusted	0.6784	0.7068	0.6757	0.6364	0.7076	0.6888	0.6754
Province FE	yes	yes	yes	yes	yes	yes	yes
Time (year) FE	no	no	no	no	no	no	no

Notes: All regressions are run with robust standard errors clustered at provincial level; Standard errors are in parentheses below the results; ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Source: own elaborations. Look at section 3.

Table 2.a Regression results with province and time fixed effects, dependent variable = Log Fatality rate with compensation in industry, provincial data (1951-1991)

Ln Compensation Fatality Rate (%)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Ln AES	-0.49***	.			-0.40***	-0.61***	-0.51***	-0.61***	-0.60***
	(0.09)				(0.09)	(0.11)	(0.10)	(0.11)	(0.11)
Precarious employment (%)		0.48***			0.29**	0.19			
		(0.12)			(0.12)	(0.14)			
Ln Unionization (%)			-0.14*				0.06	-0.06	
			(0.09)				(0.09)	(0.11)	
Ln Strikes pw				-0.08**					-0.03
				(0.04)					(0.03)
Ln Building Sector (%)	**0.21****	**0.16***	0.22**	0.02	**0.19****	**0.18**	0.19**	0.18*	0.10
	(0.08)	**(0.09)**	(0.09)	(0.11)	**(0.08)**	**(0.10)**	(0.09)	(0.10)	(0.11)
Ln Real GDP pc	-0.15	-0.18	-0.37**	-0.46**	-0.05	-0.14	-0.16	-0.21	-0.14
	(0.14)	(0.13)	(0.14)	(0.21)	(0.13)	(0.17)	(0.14)	(0.18)	(0.19)
Ln Private healthcare share (%)	0.02	-0.01	0.01	-0.03	0.00	0.00	0.03	0.00	-0.11
	(0.06)	(0.06)	(0.07)	(0.07)	(0.06)	(0.07)	(0.06)	(0.08)	(0.07)
Ln Engines per worker						0.14***		0.17***	
						(0.03)		(0.04)	
Observations	452	452	435	360	452	361	435	347	360
R^2 adjusted	0.7202	0.7198	0.6646	0.5821	0.7441	0.7093	0.7246	0.6793	0.6244
Province FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time (year) FE	yes	yes	yes	yes	yes	yes	yes	yes	yes

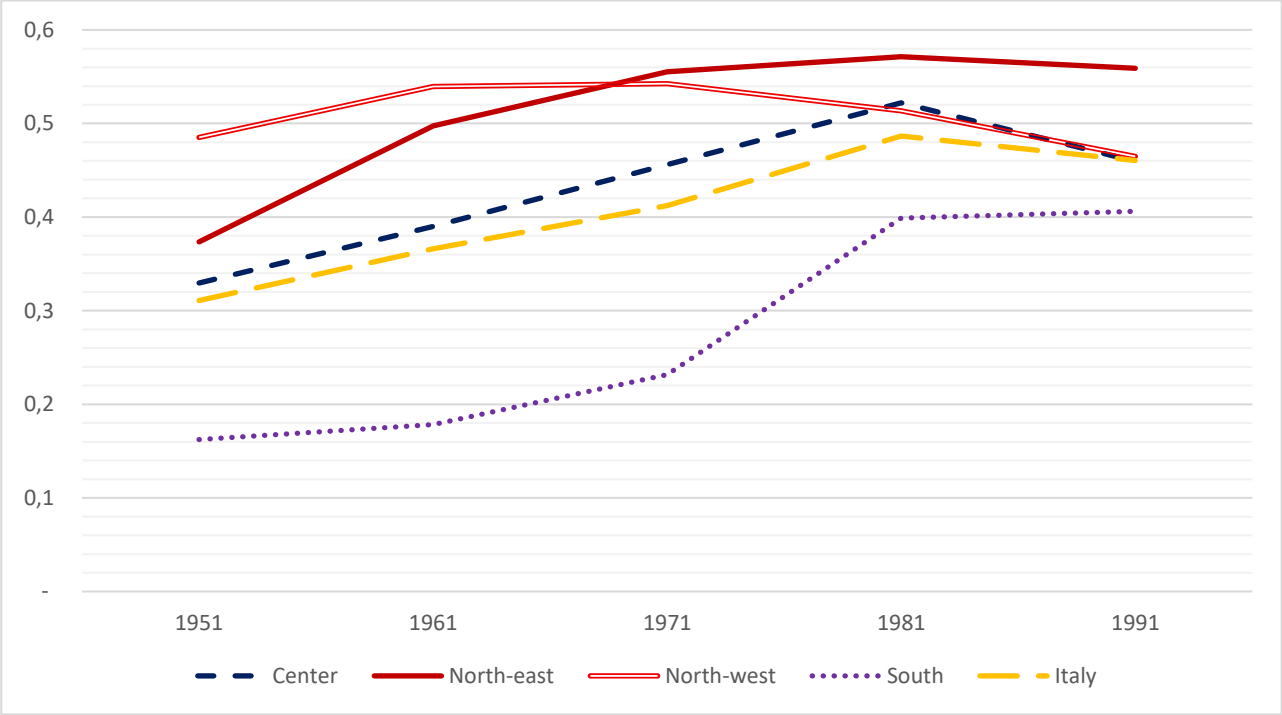
Notes: All regressions are run with robust standard errors clustered at provincial level; Standard errors are in parentheses below the results; ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.
Source: own elaborations. Look at section 3.

Table 3.a Regression results with province and time fixed effects, dependent variable = Log total fatality rate in industry, provincial data (1951-1991)

Ln Compensation Fatality rate (%)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Activism rate A	-0.65***		-0.63***	-0.94***	
	(0.15)		(0.14)	(0.18)	
Activism rate B		-0.87***			-0.75***
		(0.19)			(0.17)
Ln Building Sector (%)	**0.27*****	**0.19***	**0.19****	0.15	**0.05**
	(0.08)	**(0.11)**	**(0.09)**	(0.10)	**(0.11)**
Ln Real GDP pc	-0.64***	-0.69***	-0.18	-0.19	-0.33*
	(0.05)	(0.05)	(0.14)	(0.17)	(0.19)
Ln Private healthcare share (%)	0.10*	0.00	-0.02	-0.03	-0.17**
	(0.06)	(0.07)	(0.07)	(0.08)	(0.07)
Ln Engines pw				0.14***	
				(0.04)	
Observations	435	348	435	347	348
R^2 adjusted	0.7126	0.6812	0.7235	0.7165	0.6243
Province FE	yes	yes	yes	yes	yes
Time (year) FE	no	no	yes	yes	yes

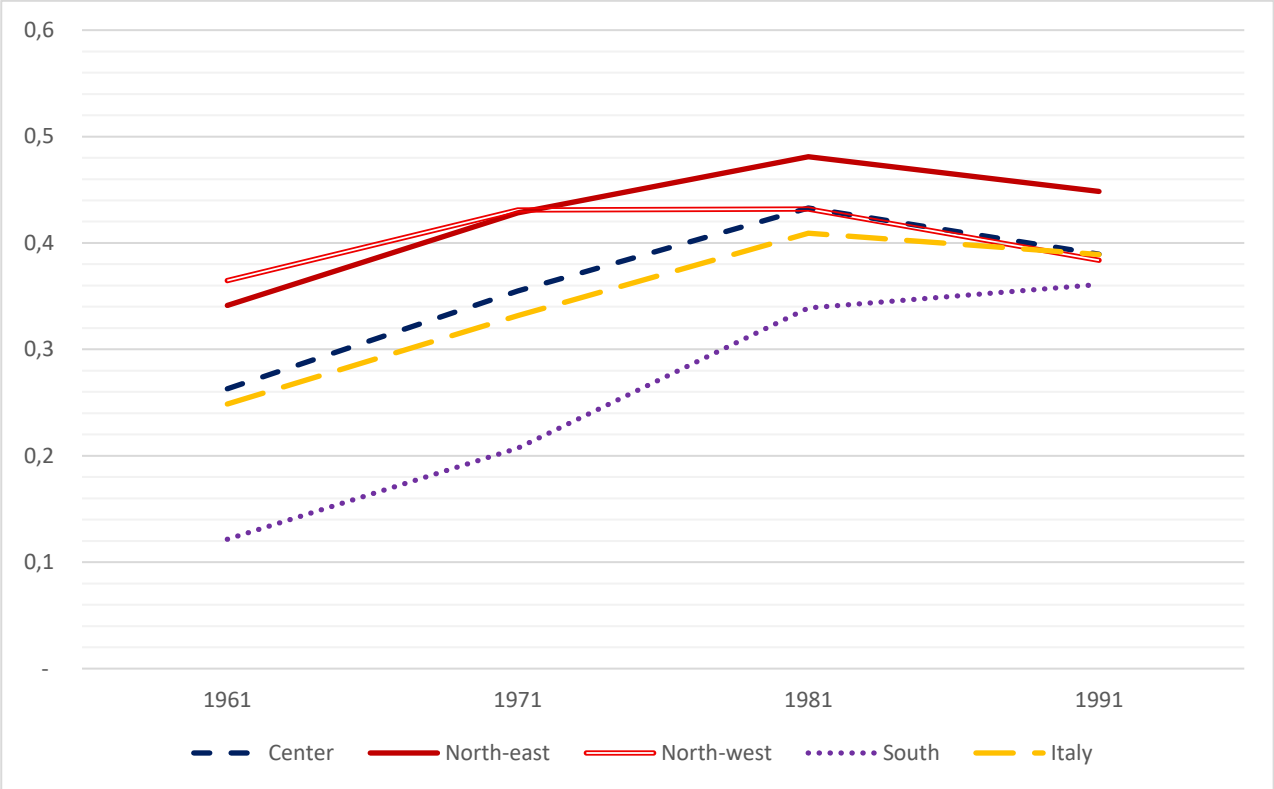
Notes: All regressions are run with robust standard errors clustered at provincial level; Standard errors are in parentheses below the results; ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.
Source: own elaborations. Look at section 3.

Fig. 7.a. Activism index A for Italy and Macroregions (1951-1991)



Source: own elaborations on the reconstructed variables described in section 3. The Activism index A include average establishment size, precarious employment and unionization rate normalized over the whole period and divided by three.
Note: the industrial sectors included are: extractive, manufacturing, utilities, construction and transport.

Fig. 8.a. Activism index B for Italy and Macroregions (1951-1991)



Source: own elaborations on the reconstructed variables described in section 3. The Activism index B include average establishment size, precarious employment, unionization rate and cumulated hours of strikes per worker (10 previous years) normalized over the whole period and divided by four.
Note: the industrial sectors included are: extractive, manufacturing, utilities, construction and transport.