LA RICERCA VENUTA DAL FUTURO

1923 CNR 2023

Parlamentino Inail

via Quattro Novembre, 144 – Roma

13 ottobre 2023

DISEGNARE POLITICHE EFFICACI PER LA SALUTE E LA SICUREZZA SUI LUOGHI DI LAVORO

Valutare l'efficacia degli incentivi alla sicurezza per orientare l'azione di istituzioni e imprese

CNR IRCrES Istituto di Ricerca sulla Crescita Economica Sostenibile

Dipartimento di Studi Giuridici ed Economici
Sapienza Università di Roma

Progetto realizzato nell'ambito del Bando di Ricerca in Collaborazione Inail 2019 – ID 18

VIP moving

INAIL
ISTITUTO NAZIONALE PER L'ASSICURAZIONE CONTRO GLI INFORTUNI SUL LAVORO

Il Centenario del CNR è realizzato con il contributo della Presidenza del Consiglio dei Ministri e con il Patrocinio di Rai

PRESIDENZA DEL CONSIGLIO DEI MINISTRI
Struttura di missione anniversari nazionali ed eventi sportivi nazionali e internazionali

Anniversari Nazionali

Rai

LA RICERCA VENUTA DAL FUTURO

1923 CNR 2023

Parlamentino Inail

via Quattro Novembre, 144 – Roma

13 ottobre 2023

Occupational Safety and Health and Economic Performance: the effect of ISI-Inail policy on firms' survival

Angelo Castaldo, Marco Forti, Alessia Marrocco

CNR IRCrES Istituto di Ricerca sulla Crescita Economica Sostenibile

Dipartimento di Studi Giuridici ed Economici

Sapienza Università di Roma

Progetto realizzato nell'ambito del Bando di Ricerca in Collaborazione Inail 2019 – ID 18

VIP moving

INAIL

ISTITUTO NAZIONALE PER L'ASSICURAZIONE CONTRO GLI INFORTUNI SUL LAVORO

Il Centenario del CNR è realizzato con il contributo della Presidenza del Consiglio dei Ministri e con il Patrocinio di Rai

PRESIDENZA DEL CONSIGLIO DEI MINISTRI

Struttura di missione anniversari nazionali ed eventi sportivi nazionali e internazionali

ANNIVERSARI NAZIONALI

Rai

LA RICERCA VENUTA DAL FUTURO

1923 CNR 2023

Parlamentino Inail

via Quattro Novembre, 144 – Roma

13 ottobre 2023

Occupational Safety and Health and Economic Performance: the effect of ISI-Inail policy on firms' survival

Relatrice

Alessia Marrocco

PhD Student and Postdoc

Dipartimento di Studi Giuridici ed Economici

Sapienza Università di Roma

CNR IRCrES Istituto di Ricerca sulla Crescita Economica Sostenibile

Dipartimento di Studi Giuridici ed Economici

Sapienza Università di Roma

Progetto realizzato nell'ambito del Bando di Ricerca in Collaborazione Inail 2019 – ID 18

VIP moving

INAIL

ISTITUTO NAZIONALE PER L'ASSICURAZIONE CONTRO GLI INFORTUNI SUL LAVORO

Il Centenario del CNR è realizzato con il contributo della Presidenza del Consiglio dei Ministri e con il Patrocinio di Rai

PRESIDENZA DEL CONSIGLIO DEI MINISTRI

Struttura di missione anniversari nazionali ed eventi sportivi nazionali e internazionali

ANNIVERSARI NAZIONALI

Rai

Outline

1. Introduction
2. The economics of OSH
3. Data
4. Identification Strategy
5. Estimation results
6. Robustness check
7. Heterogeneous effect
8. Limits: External Validity and Extensive Margin
9. Conclusions and Policy implications

Introduction

- Public policies on occupational safety and health (OSH) aim primarily at **improving working conditions**

- Occupational safety and health are **traditionally studied in relation** to their consequences in terms of **occupational accidents and illnesses**

- However, in light of the **impact on workers' health** and, consequently, on **their activity within the production process**, the **economics of OSH** has emerged as a key research area (Burdorf, 2007)

The economics of OSH

Understanding the economic perspective is particularly important in the context of OSH

Market failure	Source	Consequences	Solution
Negative externalities	Unsafe or unhealthy working conditions usually **imply costs** (monetary and non-monetary) **for third parties**, such as families, relatives and society (Dorman, 2000), and **employers do not internalize them**	**Over-production**	The government has an interest in addressing OSH matters, and can achieve the internalization of these social costs **by regulation**. In fact, the existence of liability or regulatory sanctions for such damages will induce higher levels of OSH by imposing **higher marginal costs on the firm** (Viscusi, 2007)
Positive externalities	Firm investing or implementing a new pro-OSH technology typically creates **benefits for others that is not fully internalized in the firms' revenue functions**, while bearing all the costs (Jeff et al. 2005)	**Under-investment in OSH**	The effectiveness of regulation tools is likely to be increased by also relying **on direct public subsidies** that facilitate the deployment of new pro-OSH technologies
Asymmetric information	Particularly in SMEs, **employers are not sufficiently aware of the economic implications of occupational health and safety at firms' level** (Tompa et al., 2019; Lebeau et al., 2014; Parent-Thirion et al. 2012; Giuffrida et al., 2002; Dorman, 2000; Arrow 1978; Hayek, 1945)	**Under-investment in OSH**	The market failure in terms of asymmetric information leads to an **inefficient resources allocation** and exacerbates the need for **public support**

The economics of OSH

- Following Uegaki *et al*. (2011), we can identify three labels to denote **three proxy of the measure of productivity** that links health to firm performance:

1. **sick leave:** short-term absenteeism
2. **compensated sick leave:** long-term absenteeism
3. **working-presenteeism:** decreased work performance while on the job

The economics of OSH

Most of the existing literature only focuses on the
categorisation and estimation of OSH-related economic burdens

With respect to the existing literature,
we test the following hypothesis:

Hp. 1

The 2013 ISI Call founded by Inail, by providing incentives to tangible OSH investments, displaces an additional positive effect on firms' survival

Hp. 2

The policy also has a positive effect when analysing the sub-groups of companies belonging to manufacturing and construction, which represent the most numerous sectors in the sample

Data

1. To build the database for our analysis, we start by collecting information from two unique and original datasets provided by Inail:

- **DB-ISI**: **administrative information** (company name, location, company tax code, project value, amount granted, etc…) on the firms participating to the ISI 2013 Call for the 2010-2018 time span
- **Information Flow** ("Flussi Informativi"): we merge 1:1 this DB with a second source provided by Inail that contains, in the same time frame, **firms specific insurance information** (sector, company size, national average tariff rate, etc…)

2. We furtherly match the resulting dataset with the balance sheet database provided by:

- **Aida Bureau van Dijk** (Informatics Analysis of Italian Companies): it records the **economic-financial**, **statutory**, **and commercial information of all corporations operating in Italy**; particularly, Aida database collects detailed data on the nature of the firm, including date of establishment, location, sector of activity, data regarding firm activity, such as revenue, profitability, number of employees, wages costs, and data related to the insolvency proceedings

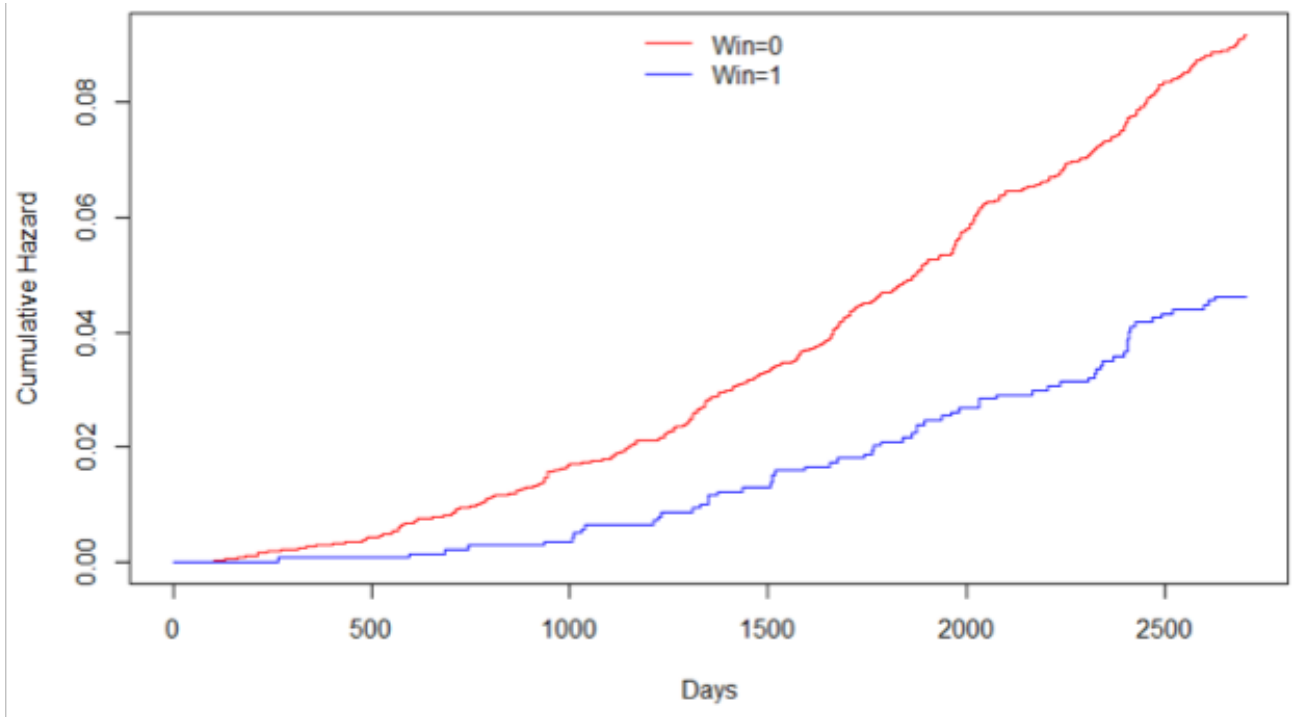
Data source

Variables	Definition	Source
Enterprise survival	Dichotomous variable: = 1 if firm is survived, = 0 if firm is failed	**Aida**
Debts	Rate of change from the previous year of the total debts in millions of Euro	**Aida**
Assets	Rate of change from the previous year of the total equity in millions of Euro	**Aida**
Production	Rate of change from the previous year of the total production value in millions of Euro	**Aida**
Revenues	Rate of change from the previous year of the revenues from sales in millions of Euro	**Aida**
Wages	Rate of change from the previous year of the wages and salaries paid in millions of Euro	**Aida**
ROE	Rate of change from the previous year of the Return of Equity (profit divided by equity capital)	**Aida**
ROS	Rate of change from the previous year of the Return of Sales (operating profit divided by net sales)	**Aida**
Company type	Stratification variable: = 1 if company is an S.r.l. (reference stratum), = 2 if the company is an S.p.a., = 3 if the company assumes the form of Cooperatives and Consortia, = 4 for other forms	**Aida**
Ateco	Stratification variable: = 1 when the sector is manufacturing (reference stratum), = 2 when referring to construction sector, = 3 for all other sectors.	**Inail**
Macro region	Stratification variable: = 1 if the company operates in Northern Italy (reference stratum), = 2 if it is in the Centre, = 3 if it is in the South	**Inail**
Technology	Dichotomous variable: = 1 if the company operates with high technology, = 0 otherwise	**Istat**

Data: descriptive statistics

Hazard curve for the whole sample

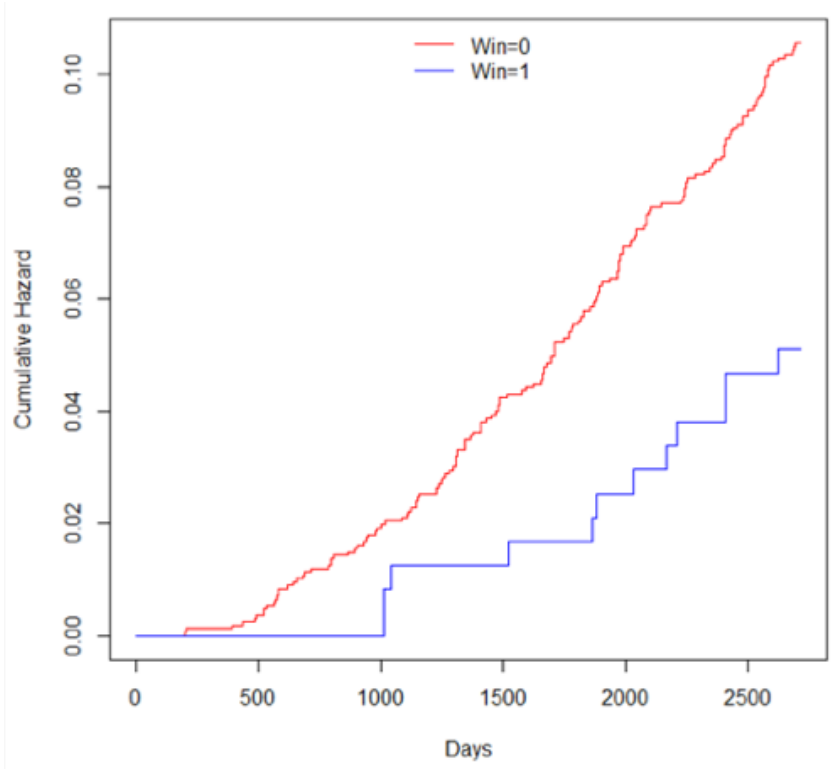
(Win = 0: *untreated*, Win = 1: *treated*)



Data: descriptive statistics

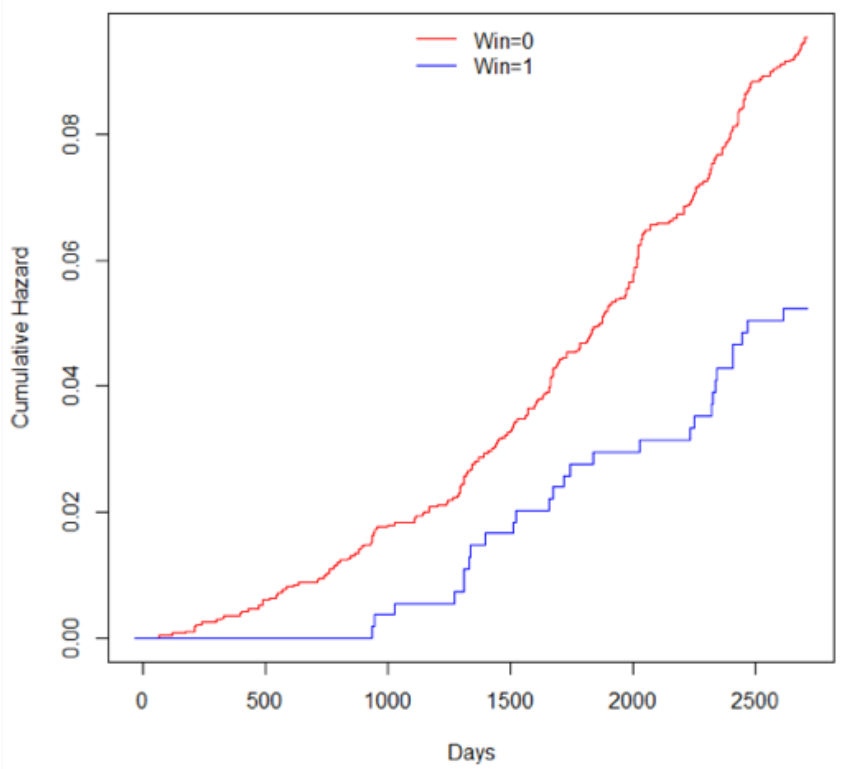
Hazard curve for construction sector

(Win = 0: *untreated*, Win = 1: *treated*)



Hazard curve for manufacturing sector

(Win = 0: un*treated*, Win = 1: *treated*)



Identification Strategy

In our empirical exercise, we evaluate the effectiveness of 2013 Inail's direct aid programme to support firms investments in safer machinery

Treatment

1. **Click day** (first come, first served)
2. **Randomized** (hundreds of second) with respect observable and unobservable characteristic
3. **Independent** with respect to the covariates included into the model
4. **Potentially** affected by **attrition bias** (drop-out)
5. **Corrected** through **Matching** (NN and PS matching)

Identification Strategy

- We start the analysis by implementing a **logistic regression model** that computes the probability of a dichotomous event occurring in a population of independent sample units

- The logistic model predicts the logit of *Y* (dependent variable) from *X* (independent variables); the logit is the natural logarithm (ln) of odds of *Y*, and odds are ratios of probabilities (*p*) of happening (i.e., firms default) to probabilities *(1-p)* of *Y* not happening (firms survived) (Peng *et al.*, 2002)

- Our estimate based on logistic regression is represented by the following formula:

$$ln\left(\frac{Fail}{1-Fail}\right) = \beta_0 + \beta_1 Treatment_i + \beta_2 Ateco2_i + \beta_3 Ateco3_i + \beta_4 Debts_i + \beta_5 Assets_i + \beta_6 Production_i + \beta_7 Revenues_i + \beta_8 Wage_i + \beta_9 ROE_i + \beta_{10} ROS_i + \beta_{11} macro\_reg_i + \beta_{12} tech_i + \beta_{13} comp\_type_i + \varepsilon_i$$

- The outcome is the **odds ratio** (*OR*), which is a measure of association, as it approximates how much more likely (or unlikely) the outcome is for the reference group than the compared group (Hosmer *et al.*, 2013). To interpret the estimation results, **a statistically significant hazard ratio lower** (higher) **than one implies that the variable decreases** (increases) **the corresponding probability of default, other things being equal**

Identification Strategy

- We further implement some alternative **econometric counterfactual methods** by computing different ATE estimates

- In this framework there exist the "***fundamental problem of causal inference***" (Holland, 1986):

> «*it is **impossible** to **observe** the value of $Y_t(u)$ **and** $Y_c(u)$ on the **same unit** and, therefore it is impossible to observe the effect of t on u, where $Y_t(u)$ is the value of the response that would be observed if the unit were exposed to the treatment and $Y_c(u)$ is the value that would be observed on the same unit if it were exposed to control*»

- Nevertheless, **the randomization of units** (allowed by **Click Day mechanism**) to different treatments **ensure that on average there should be no systematic differences in observed or unobserved covariates** (that is, bias) **between *treated* and *untreated*** (D'Agostino Jr., 1998)

- This framework allows to estimate ATE as the **simple difference between the sample mean of the outcome variable of the *treated* units and the sample mean of the outcome variable**, which is the well-known "**Difference-in-means**" (DIM) **estimator** (Cerulli, 2015)

Identification Strategy

- We first compute the DIM estimator for ATE without conditioning for any control variable

$$Fail_i = \beta_0 + \beta_1 Treatment_i$$

- But even with randomized data the evaluator may want to adjust the model specification to address the risk of a potential bias (King *et al.*, 2021; Clarke, 2005; Angrist and Krueger, 1999, Rubin, 1974), and to obtain more precise estimates of the causal effect of interest (Angrist and Pischke, 2009)

- So, **we adjust the model for other possible explanatory covariates** (Negi and Wooldridge, 2021; Lin, 2013; Cochran, 1957). Formally, we rely on the following model specification:

$$Fail_i = \beta_0 + \beta_1 Treatment_i + \beta_2 Ateco2_i + \beta_3 Ateco3_i + \beta_4 Debts_i + \beta_5 Assets_i + \beta_6 Production_i + \beta_7 Revenues_i + \beta_8 Wage_i + \beta_9 ROE_i + \beta_{10} ROS_i + \beta_{11} macro\_reg_i + \beta_{12} tech_i + \beta_{13} comp\_type_i + \varepsilon_i$$

where β_1 represents the ATE estimator, that represents the difference between the expected outcomes after participation in the Inail programme and the outcomes of non-participation conditional on the set of covariates mentioned above

Robustness check: attrition bias

- However, as we above specified, **some firms admitted based on the Click Day did not complete the investment**
- This means that, while for the *untreated* we included the entire sample of not admitted firms, in the sample of the *treated* firms we include only those that have completed the investment and received the subsidy in full
- Therefore, it is nevertheless possible that the **drop-out phenomenon** might affect the randomization characteristic of our groups (**attrition bias**)
- Considering Inail ISI 2013 call, **the advantages offered by the random assignment may diminish in practice due to the administrative filters applied to eligible firms** (i.e., drop-out)
- To deal with this **potential attrition bias**, we reinforce our analysis by computing ATE estimates applying **two alternative types of matching methods** (exact matching and PSM)

Robustness check: attrition bias

- By definition, all **matching techniques** are oriented **to recover the potential unobservable outcome of a unit using the observable outcome of similar units** - having homogeneous structural characteristics - **in the opposite status** (Cerulli, 2015)

- In practice, the first matching method that we apply is a standard **Nearest-Neighbour** (NN) matching based on Mahalanobis distance, and to apply this **exact matching**, we restrict the matching procedure by using solely the discrete (dichotomous and stratification) variables ***Company type***, ***Ateco***, ***Macro Region***, and ***Technology***

- The choice is motivated by the fact that when the vector of covariates is large and/or it contains continuous variables, then exact Matching is unfeasible ("***dimensionality problem***") (Cerulli, 2015)

- Practically, we match each unit in a given treatment status with the "nearest" unit in the opposite status based on the above mentioned discrete variables

Robustness check: attrition bias

- Nevertheless, **discrete variables may not be sufficient to capture the potential differences between *treated* and *untreated* units** generated by the aforementioned risk of attrition bias

- To address the dimensionality problem, and to match units according to financial (continuous) variables, following Rosenbaum and Rubin, (1983), we compute ATE after applying the **PSM technique**

- This method **allows to reduce multidimensionality to a single scalar dimension estimated**, namely the **propensity score *p(x)***, defined as the conditional probability of assignment to a particular treatment given a vector of observed covariates (Dehejia and Wahba, 1999; Rosenbaum and Rubin, 1983)

- The distance metric used in the PSM is the Manhattan metric distance and the variables used to match the *treated* and *untreated* units are ***Company type***, ***Ateco***, ***Macro Region***, ***Technology***, ***Debts***, ***Assets***, ***Production***, ***Revenues***, and ***Wages***

Robustness check: attrition bias

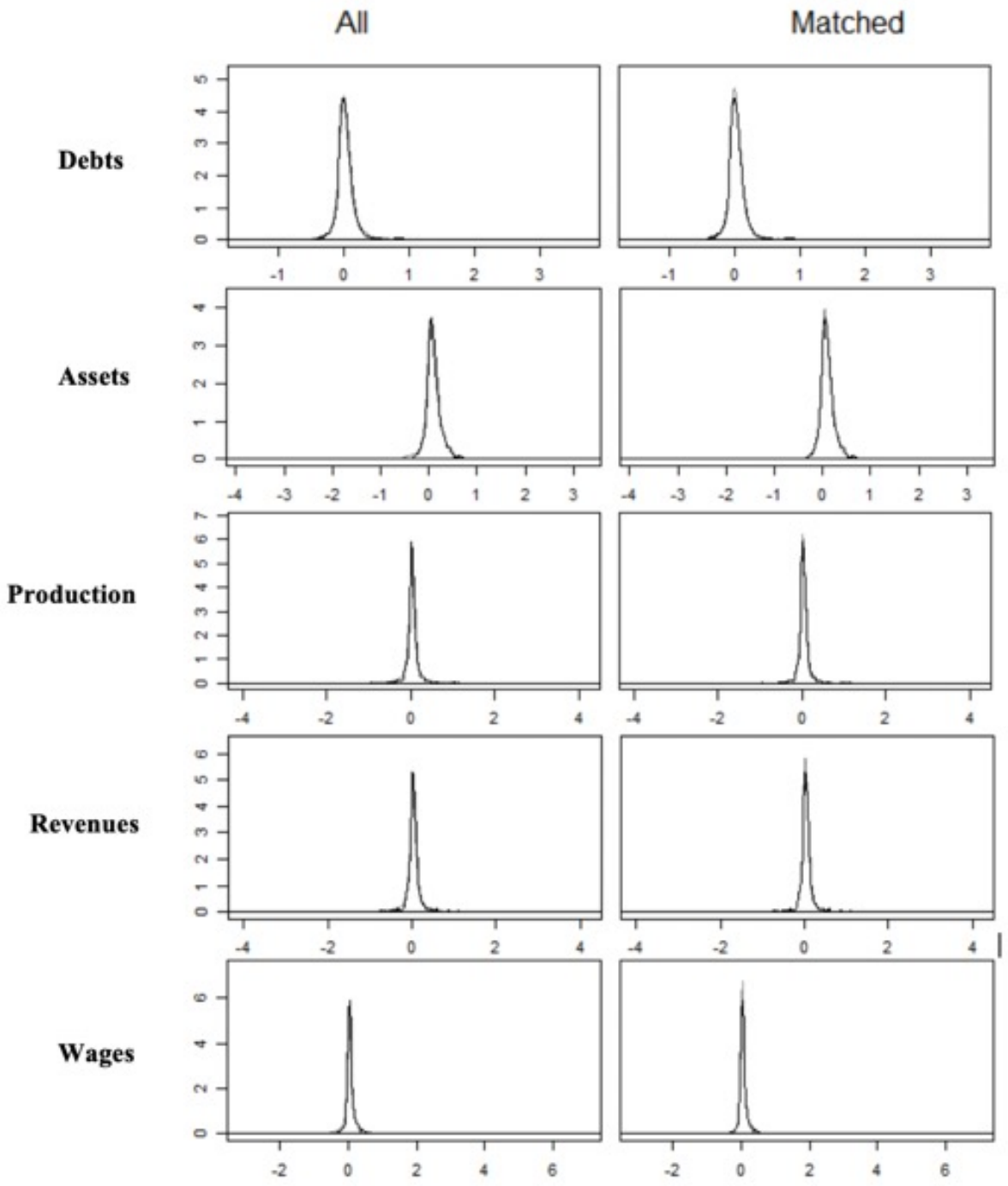
❖ The PSM identifies ATEs only under three assumptions (Cerulli, 2015):

✓ 1. **Conditional mean independence (CMI)**: $E(Y_1|x,T) = E(Y_1|x)$ and $(Y_0|x,T) = E(Y_0|x)$

✓ 2. **Overlap**: $0 < p(x) < 1$, where $p(x)$ is the propensity score

? 3. **Balancing**: $\{(T\_|\_x)|Matching\}$, i.e., after matching, the covariates' distribution in the treated and untreated group has to be equal

❖ We check the balancing of covariates used in estimation (*Company type*, *Ateco*, *Macro Region*, *Technology*, *Debts*, *Assets*, *Production*, *Revenues*, and *Wages*), before and after computing ATE estimate for "Treatment" variable based on PSM



1923 CNR 2023

LA RICERCA VENUTA DAL FUTURO

Balancing of the (continuous) financial variables before and after matching based on PS

(N *treated* = N *untreated* = 1069)

Il Centenario del CNR è realizzato con il contributo della Presidenza del Consiglio dei Ministri e con il Patrocinio di Rai

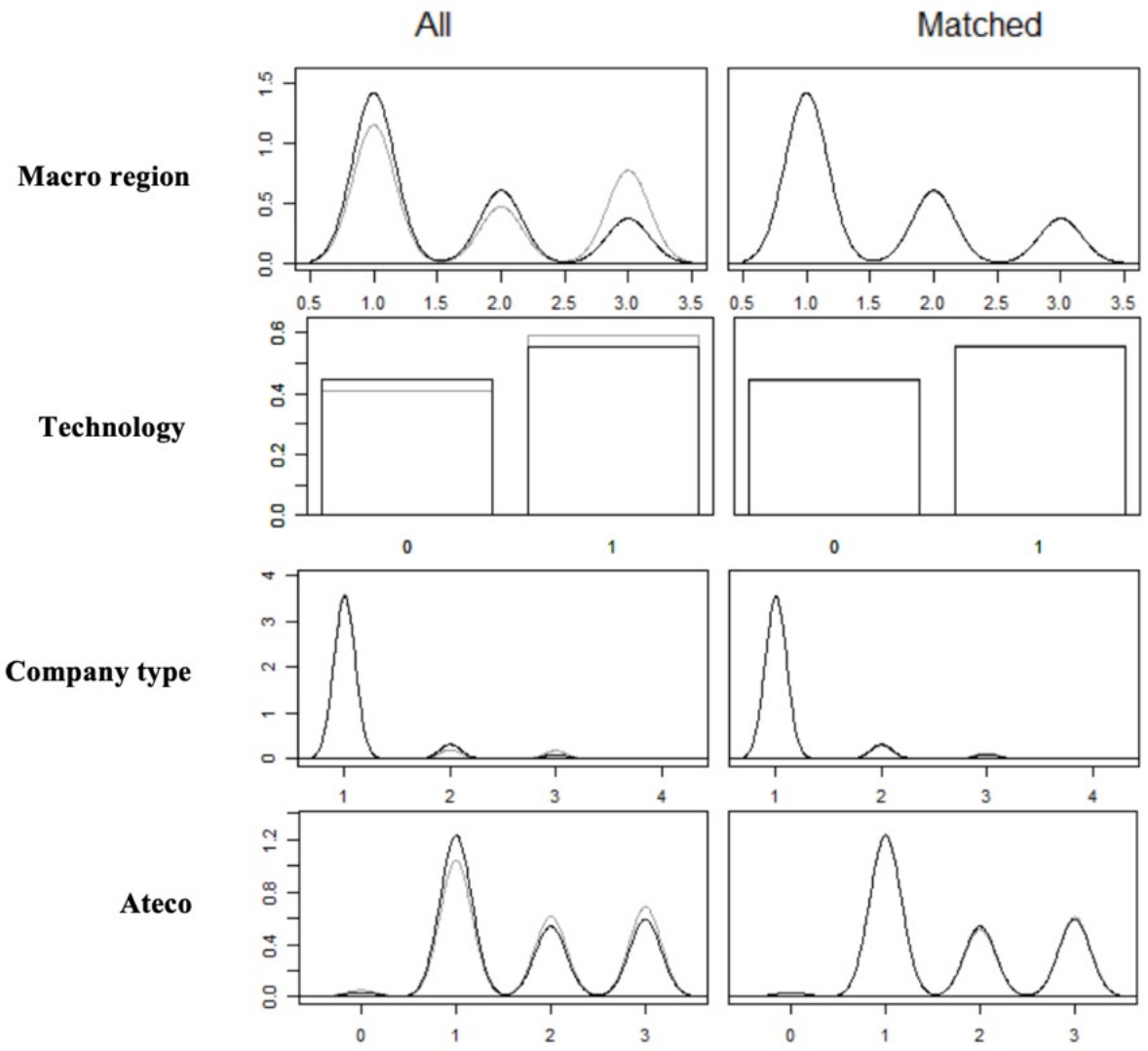
VIP moving

PRESIDENZA DEL CONSIGLIO DEI MINISTRI

Struttura di missione anniversari nazionali ed eventi sportivi nazionali e internazionali

ANNIVERSARI NAZIONALI

Rai



1923 CNR 2023 LA RICERCA VENUTA DAL FUTURO

Balancing of the stratification and dichotomous variables before and after matching based on PS

(N *treated* = N *untreated* = 1069)

Il Centenario del CNR è realizzato con il contributo della Presidenza del Consiglio dei Ministri e con il Patrocinio di Rai

VIP moving

PRESIDENZA DEL CONSIGLIO DEI MINISTRI
Struttura di missione anniversari nazionali ed eventi sportivi nazionali e internazionali

ANNIVERSARI NAZIONALI

Rai

Variables	Logistic (Model 1)	Logistic (Model 2)	Logistic (Model 3)
Treatment	-0.574***	-0.544***	-0.532***
	(0.177)	(0.045)	(0.181)
Debts	1.890***	1.846***	1.739***
	(0.300)	(0.301)	(0.308)
Assets	-1.177***	-1.247***	-1.24***
	(0.278)	(0.277)	(0.285)
Production	-2.450***	-2.378***	-2.396***
	(0.327)	(0.325)	(0.336)
Revenues	-0.699***	-0.606**	-0.627**
	(0.230)	(0.299)	(0.303)
Wages	0.292	0.246	0.322***
	(0.196)	(0.196)	(0.208)
ROE	-0.156**	-0.139*	-0.120*
	(0.080)	(0.082)	(0.083)
ROS	-0.158	-0.158	-0.145
	(0.130)	(0.131)	(0.133)
Centre		0.191	0.416
		(0.128)	(0.621)
South		0.076	0.389
		(0.119)	(0.554)
Technology		-0.237	-0.227*
		(0.128)	(0.130)
Spa		-0.274	-0.343
		(0.257)	(0.262)
Cooperative and Consortia		0.226	0.169
		(0.267)	(0.276)
Other company types		-12.802	-14.7
		(289.07)	(762.6)
Construction		0.341	0.375**
		(0.157)	(0.162)
Other sectors		0.23	0.218*
		(0.129)	(0.133)
Constant	-2.591***	-2.658***	-2.527***
	(0.057)	(0.101)	(0.313)
Province dummies	NO	NO	YES
Observations	6961	6961	6961
n. treated	1069	1069	1069
n. untreated	5892	5892	5892
Log likelihood	-1602.797	-1578.509	-1513.19
Pseudo R^2	0.29944	0.31	0.339
LR Test	248.189	254.924	385.562
Wald χ^2	10.5***	9.3***	8.6***

1923 CNR 2023 LA RICERCA VENUTA DAL FUTURO

Estimation Results

Logistic regression: table of outcomes (dependent variable: default)

Il Centenario del CNR è realizzato con il contributo della Presidenza del Consiglio dei Ministri e con il Patrocinio di Rai

VIP moving

PRESIDENZA DEL CONSIGLIO DEI MINISTRI
Struttura di missione anniversari nazionali ed eventi sportivi nazionali

ANNIVERSARI NAZIONALI

Rai

Estimation Results

DIM estimator without control variables
observations = 6961
N *treated* = 1069, N *untreated* = 5892

	Coeff	Conf, Int		Std. Error	z value	Pr(>|z|)	
		2,50%	97,50%				
(Intercept)	0.098	-0.066	0.029	0.009	-5.020	0.000	***
Treatment	-0.048	0.091	0.105	0.004	27.640	0.000	***

DIM estimator with control variables
observations = 6961
N *treated* =1069, N *untreated* = 5892

	Coeff	Conf. Int		Std. Error	t value	Pr(>|t|)	
		2,50%	97,50%				
(Intercept)	0.0862	0.062	0.110	0.012	7.030	0.000	***
Treatment	-0.0328	-0.051	-0.015	0.009	-3.570	0.000	***
Debt	0.2248	0.184	0.266	0.021	10.840	0.000	***
Asset	-0.1111	-0.139	-0.083	0.014	-7.700	0.000	***
Production	-0.3039	-0.345	-0.263	0.021	-14.490	0.000	***
Revenues	-0.0167	-0.056	0.023	0.020	-0.830	0.409	
Wages	0.0204	-0.011	0.052	0.016	1.280	0.202	
Company type				Yes			
Ateco				Yes			*
Macro region				Yes			
Technology				Yes			

Robustness check

1-to-1 Nearest-Neighbour Matching (Mahalanobis distance) estimator for ATE
(N *treated* = N *untreated* = 1069)

	Coeff	Normal-based Conf. Int		Abadie-Imbens Robust Std. Error	z value	Pr(>|z|)		Neighbours
		2,50%	97,50%					
ATE Treatment (1 Vs 0)	-0.048	-0.064	-0.032	0.008	-5.920	0.000	***	1

Propensity Score Matching (Manhattan distance)
(N *treated* = N *untreated* 1069)

	Coeff	Normal-based Conf. Int		Abadie-Imbens Robust Std. Error	z value	Pr(>|z|)		Neighbours
		2,50%	97,50%					
ATE Treatment (1 Vs 0)	-0.043	-0.062	-0.023	0.009	-4.33	0.000	***	1

Heterogeneous effect

Logistic regression for manufacturing sector

Variables	Logistic (Model 1)	Logistic (Model 2)	Logistic (Model 3)
Treatment	-0.458* (0.256)	-0.348 (0.260)	-0.360 (0.266)
Debts	1.503** (0.632)	1.222* (0.638)	1.374** (0.678)
Assets	-0.923** (0.480)	-0.843* (0.488)	-1.014* (0.535)
Production	-1.861*** (0.511)	-1.553*** (0.528)	-1.823*** (0.571)
Revenues	-1.529** (0.645)	-1.804*** (0.674)	-1.420** (0.696)
Wages	-0.093 (0.591)	0.015 (0.587)	0.129 (0.646)
ROE	-0.090 (0.143)	-0.042 (0.148)	-0.080 (0.150)
ROS	-0.446** (0.209)	-0.484** (0.210)	-0.449** (0.219)
Centre		-0.256 (1.266)	-0.202 (1.296)
South		0.163 (0.270)	-0.033 (1.354)
Technology		0.033 (0.177)	-0.051 (0.184)
Spa		-0.064 (0.313)	-0.153 (0.324)
Cooperative and Consortia		0.931* (0.557)	0.841 (0.575)
Other company types		-13.345 (748.97)	-15.505 (197.4)
Constant	-2.715*** (0.092)	-2.576*** (0.266)	-2.581*** (0.403)
Province dummies	NO	NO	YES
Observations	3559	3559	3559
n. treated	702	702	702
n. untreated	2857	2857	2857
Log likelihood	-651.984	-631.179	--593.585
Pseudo R^2	0.715	0.724	0.74
LR Test	80.353***	121.96***	197.15***
Wald χ^2	3.2*	1.8	1.8

Logistic regression for construction sector

Variables	Logistic (Model 1)	Logistic (Model 2)	Logistic (Model 3)
Treatment	-0.395 (0.330)	-0.625* (0.344)	-0.670* (0.369)
Debts	3.026*** (0.499)	3.177*** (0.524)	3.243*** (0.587)
Assets	-0.348 (0.515)	-0.,240 (0.500)	-0.354 (0.572)
Production	-3.097*** (0.558)	-3.120*** (0.591)	-3.455*** (0.666)
Revenues	-0.720* (0.420)	-0.828* (0.436)	-0.613 (0.478)
Wages	0.295 (0.233)	0.379 (0.240)	0.453* (0.275)
ROE	-0.226 (0.147)	-0.253* (0.149)	-0.262* (0.161)
ROS	-0.01 (0.245)	-0.072 (0.258)	0.007 (0.262)
Centre		0.451 (1.458)	-0.524 (1.617)
South		-0.469 (1.253)	0.380 (1.454)
Technology		NA	NA
Spa		-1.000 (1.027)	-0.927 (1.052)
Cooperative and Consortia		0.722 (0.567)	0.754 (0.637)
Other company types		-14.09 (1391.68)	-15.050 (3480)
Constant	-2.671*** (0.117)	-2.360*** (0.376)	-2.250*** (0.680)
Province dummies	NO	NO	YES
Observations	2072	2072	2072
n. treated	393	393	393
n. untreated	1679	1679	1679
Log likelihood	-443.355	-422.461	-380.469
Pseudo R^2	0.81	0.81	0.83
LR Test	103.09***	144.87***	228.86***
Wald χ^2	1.4	NA	NA

Limits: External Validity and Extensive Margin

- **External validity**: it is imputable to evaluation requirements, since we estimate the policy effect on business survival, so we needed financial variables that are not available for individual corporations (partnerships). Therefore, **our results can only be extended to corporations**, so **we cannot state whether the effect found for corporations could be equal**, **less or even greater then for companies not included in our sample**

- **Extensive margin**: it is worth pointing out that **our results should only be read along the extensive margin** ("whether the effect is there or not, whether it is positive or negative") **and not also along the intensive margin** (the magnitude of the effect), since our objective was to understand whether the tangible investments in OSH displaces positive effects on the economic performance of the firms, and **this is a second-round effect** (i.e., the policy aims to decrease occupational injuries and illnesses)

Conclusions and Policy implications

- Despite the existence of a theoretical link between OSH and firm economic performance, there is still scant empirical literature on the effect exerted by OSH investments on firms' resilience and survival

- Our **baseline estimates** show that **the evaluated initiative generates an impact on the ability of firms to survive**, pinning down a statistically significant negative effect of the policy on the number of default of *treated* with respect to *untreated* companies

- This suggests that **the Inail's policy implemented in 2013**, **besides pursuing a decrease in the number of occupational injuries and illnesses**, **determines a positive result on a second round effect of improving firms' survival performance and resilience**

- Furthermore, **our results are confirmed by the robustness checks** implemented through the DIM estimators (with and without control variables) and the ATEs calculated by both nearest-neighbour matching on the covariates and the PSM

- Finally, checking for the **heterogeneity** of the policy effect across sub-group **does not alter the main results obtained in the baseline estimates**

Conclusions and Policy implications

- The main finding of this paper is that **extending the OSH policy mix**, **by including in addition to regulation and enforcement** (**sticks**) **direct incentives** (**carrots**), could enhance OSH levels and firms economic performance, especially in the case of SMEs

- Finally, these results emphasise **the need to disseminate the knowledge of the economic value of OSH**

- Managers must be made aware of the impact of tangible investments in OSH on company performance, since a **productivity and its improvement through specific interventions is key element of the economic attractiveness of OSH investments** (Steel *et al.*, 2018): OSH investments could be viewed **from a strategic perspective and not as a mere economic burden**

- This is why **legal measures and incentives to support companies need to be complemented by an economic justification to reverse the trend of cutbacks in risk management and company closures due to poor and unsustainable working lives** (Takala *et al.*, 2014)

LA RICERCA VENUTA DAL FUTURO

1923 CNR 2023

Thank you for your attention!

VIP moving

Consiglio Nazionale delle Ricerche