

# Evaluating incentives for investments to enhance occupational safety and health

An attempt to evaluate the ISI programme

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# Structure of the presentation

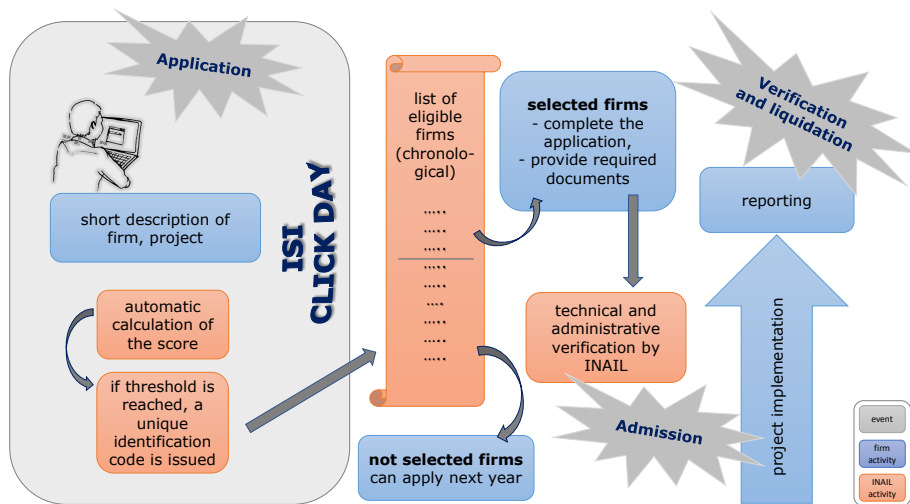
- 1 The ISI programme
- 2 Data and sample
- 3 Research question and challenges
- 4 Evaluation of ISI funding for RMS
- 5 Summary and conclusion

# General features of ISI

<i>name of program</i>	Support incentives for enterprises (ISI)
<i>responsible institution</i>	National Institute for Insurance against Accidents at Work (INAIL)
<i>aims</i>	reduction of work-related accidents and occupational diseases improvement of safety and health at work in general increase of awareness to occupational safety and health (OSH)
<i>subject of funding</i>	investment projects, organisational interventions
<i>type of support</i>	non-repayable grants yearly national calls (regional budget)
<i>subsidy rate</i>	40% to 65% of investment costs
<i>applicants</i>	small and micro firms, self-employed; targeted primarily to high-risk sectors (e.g. transport, agriculture)
<i>application process</i>	standardized online application at "click day" assessment by INAIL and regional governments
<i>payment/liquidation</i>	after detailed check of the project and verification of the implementation

Source: [https://osha.europa.eu/sites/default/files/Italy\\_EconomicInitiative.pdf](https://osha.europa.eu/sites/default/files/Italy_EconomicInitiative.pdf)

# The ISI funding process



# Risk management systems and the ISI programme

A **Risk Management System (RMS) for occupational safety and health (OSH)** is an "integrated set of organizational elements involved in a continuous cycle of planning, implementation, evaluation, and continual improvement, aimed at the abatement of occupational hazards in the workplace." (Robson et al. 2005)

RMS very heterogeneous measures/activities, can be

- mandatory
  - ⇒ implement laws, regulations
  - e.g. EU Directive 89/391/EEC (1989); "Framework Directive for OSH"
- voluntary
  - ⇒ (certified) guidelines, standards
  - e.g. health and safety instructions, risk assessment

*ISI funding*: consultancy and certification costs for voluntary RMS

Eligibility

- dependent on a score calculated in the application phase
- score defined by characteristics of the firm (size, sector) and the project (type of RMS, "quality")
- threshold defined by regional budget

# Data sources and analysed sample

**Data base** = combination of information from different INAIL administrative sources

- ISI calls
  - ISI participants and their project proposals
- firm data
  - yearly information on all insured local units (organized by region)
- accident data
  - records of all Italian occupational accidents (organized by region)

⇒ unbalanced panel for all firms applying for RMS funding in the 2012-2016 calls  
= preselected firms with similar characteristics

*units of observation*: *PATs* (insurance positions)  
= local firm units with job tasks of similar risk

# Sample description

	<i>sample</i>	<i>non-treated</i>	<i>treated</i>	<i>dropouts</i>
median unit size	12.72	12.14	15.51	12.42
micro unit	43.12%	44.64%	35.27%	44.12%
small unit	39.94%	39.21%	45.59%	37.49%
primary sector	4.94%	4.79%	5.49%	5.04%
manufacturing	32.96%	32.64%	36.61%	30.59%
construction	22.82%	22.82%	23.63%	21.93%
tertiary sector	39.29%	39.74%	34.28%	42.44%
centre	22.45%	20.98%	24.38%	27.50%
island/south	28.48%	27.40%	27.12%	35.19%
northeast	25.57%	27.58%	25.21%	16.27%
northwest	23.50%	24.05%	23.29%	21.04%
former sev. accidents	30.62%	29.92%	34.19%	30.24%
mean no. not sev. accidents	0.78	0.74	0.86	0.88
mean index not sev. accidents	0.03	0.04	0.02	0.02
mean no. sev. accidents	0.32	0.30	0.36	0.36
mean index sev. accidents	0.01	0.01	0.01	0.01
<i>number firm units</i>	<i>7,801</i>	<i>5,468</i>	<i>1,202</i>	<i>1,131</i>
<i>sample share</i>	<i>100.00%</i>	<i>70.09%</i>	<i>15.41%</i>	<i>14.50%</i>

# Research question

**Do subsidies to invest in risk management systems (RMS) help to prevent/reduce accidents/severe accidents ?**

## *Challenges for the analysis*

- RMS heterogeneous, rather low-level interventions
  - ⇒ expected measurable effect rather small
  - ⇒ find an adequate index to measure the effect
  - ⇒ consider "quality ranking" according to INAIL score
- sample attrition among selected firms after click day
  - ⇒ find adequate estimation approach
- potential influence of economic / financial stability
  - ⇒ include balance sheet data
- potentially different intentions for implementing RMS
  - ⇒ deadweight effects ?
  - ⇒ include RMS certification data (ACCREDIA)



# Analyzed outcomes

- ⇒ number of not severe accidents
- ⇒ number of severe accidents
- ⇒ frequency index (non-severe accidents)

$$fi_{it} = \frac{(ac_{it} - sac_{it})}{emp_{it}} * 1000$$

- ⇒ severity index (severe accidents)

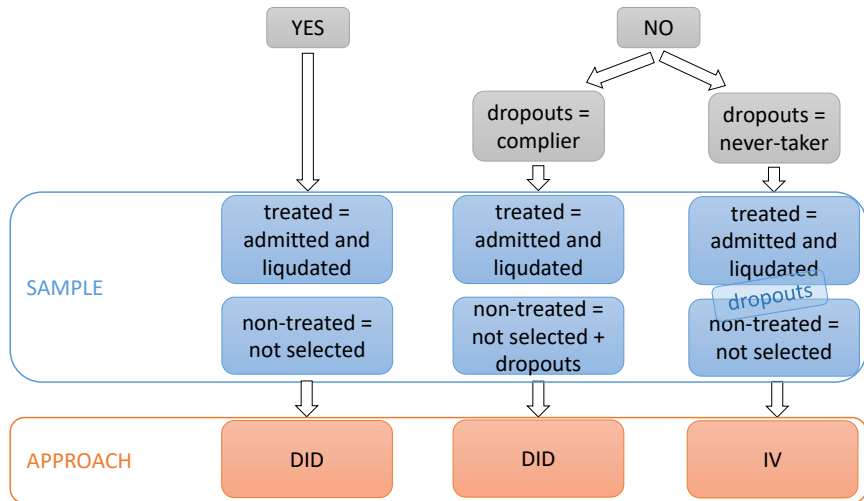
$$si_{it} = \frac{sac_{it}}{emp_{it}} * 1000$$

with

$ac_{it}$	-	number of indemnified accidents
$sac_{it}$	-	number of severe accidents
$emp_{it}$	-	number of employees

... alternative measures ???

# Question: can we ignore the dropouts ?



# First answer: YES !

## Estimation approach: Difference-in-Differences

- approach justified by the experimental setting of click day
- comparison of treated (admitted & liquidated) and controls (not selected)
- verification of different approaches:
  - standard DID
  - combination of matching and Callaway/Sant'Anna (2021) approach
- results not robust

⇒ main takeaways

- severe accidents before application is important for impact evaluation
  - experimental setting vanished due to sample attrition during verification phase
- ⇒ drop-outs cannot be ignored

# Revised answer: NO !

## Estimation approach: Panel IV poisson regression

$$\mathbb{E}[Y_{it}|D_{it}, x_{it}, \alpha_i] = \exp(\beta_1 D_{it} + x'_{it}\beta_2 + \alpha_i)$$

$$D_{it} = e'_{it}\gamma_1 + x'_{it}\gamma_2 + \alpha_i + \nu_{it}$$

where	$Y_{it}$	-	outcome of firm unit $i$ at time $t$
	$x_{it}$	-	observed covariates for firm unit $i$ at time $t$
	$D_{it}$	-	funding RMS implementation in firm $i$ at time $t$
	$e_{it}$	-	selection of firm unit $i$ at time $t$ for RMS funding
	$\alpha_i$	-	individual heterogeneity

⇒ 2-step GMM estimation

⇒ std.errors clustered at level of firm units

## Results - full sample

	<i>severe accidents</i>		<i>not severe accidents</i>	
	<i>index</i>	<i>number</i>	<i>index</i>	<i>number</i>
<b>funding</b>	<b>-0.318**</b>	<b>0.108</b>	<b>-0.894**</b>	<b>0.033</b>
former sev. accidents	1.590***	2.369***	0.667***	1.915***
risk job tasks	0.006***	0.002*	0.009	0.001
primary sector <sup>(1)</sup>	0.321***	0.543***	0.067	0.434***
manufacturing <sup>(1)</sup>	-0.029	-0.039	-0.218	0.101
construction <sup>(1)</sup>	0.378***	-0.204**	-0.200	-0.411***
northeast <sup>(2)</sup>	0.173***	0.134**	0.172***	0.090
centre <sup>(2)</sup>	0.125**	-0.144	0.192	-0.422***
island/south <sup>(2)</sup>	0.425***	-0.067	-0.049	-0.622***
size	-0.003***	0.002***	-0.001***	0.002***
constant	-5.631***	-2.731***	-4.085***	-1.381***
<i>observations</i>	<i>68,780</i>	<i>69,990</i>	<i>68,780</i>	<i>69,990</i>
<i>number firm units</i>	<i>7,786</i>	<i>7,801</i>	<i>7,786</i>	<i>7,801</i>

Notes: <sup>(1)</sup> reference: tertiary sector; <sup>(2)</sup> reference: northwest.

# Robustness - omitted variables I

## *economic/financial stability*

- "better" firms might ...
  - have better machinery, equipment
  - be more motivated to really succeed in reducing (severe) accidents
- "worse" firms might ...
  - take more risky jobs
  - have older machinery & equipment
  - (in worst case) struggle to survive

⇒ inclusion of balance sheet data

## Robustness - omitted variables: balance sheet data (bankruptcy predictor)

	<i>severe accidents</i>		<i>not severe accidents</i>	
	<i>index</i>	<i>number</i>	<i>index</i>	<i>number</i>
<b>funding</b>	<b>-0.241*</b>	<b>0.128</b>	<b>-0.626</b>	<b>0.124</b>
former sev. accidents	1.375***	2.145***	0.712***	1.846***
risk job tasks	0.005**	0.002**	0.012**	0.001
primary sector <sup>(1)</sup>	0.267*	0.599***	0.019	0.444***
manufacturing <sup>(1)</sup>	-0.096	-0.056	-0.224	0.058
construction <sup>(1)</sup>	0.208	-0.218**	-0.333	-0.447***
northeast <sup>(2)</sup>	0.168***	0.130*	0.207***	0.094
centre <sup>(2)</sup>	0.057	-0.175*	0.009	-0.386***
island/south <sup>(2)</sup>	0.409***	-0.018	0.050	-0.567***
size	-0.003***	0.002***	-0.001***	0.002***
bad predictor	-0.046	-0.363***	1.592**	-0.381***
medium predictor	0.256	0.169	-0.105	0.093
constant	-5.480***	-2.535***	-4.327***	-1.355***
<i>observations</i>	<i>44,860</i>	<i>45,582</i>	<i>44,860</i>	<i>45,582</i>
<i>number firm units</i>	<i>6,969</i>	<i>7,006</i>	<i>6,969</i>	<i>7,006</i>

Notes: <sup>(1)</sup> reference: tertiary sector; <sup>(2)</sup> reference: northwest.

## Robustness - omitted variables II

*different objectives for RMS implementation:*

- willing to reduce (severe) accidents vs.
- get funding for (renewal of) certification for public tender applications
  - ⇒ deadweight effects ?

⇒ inclusion of ACCREDIA data (all Italian firms included in RMS certification systems)

... to be done



### Does RMS funding help to reduce incidence of (severe) accidents ?

severity index	yes
number of severe accidents	no
frequency index	(yes)
number of not severe accidents	no

- *RMS comparably soft, flexible intervention for enhancing OSH*
- *influence of further characteristics on incidence of accidents (e.g., former sev. accidents, risk of job tasks, size of firm unit, region)*

- ⇒ further robustness checks
- ⇒ analysis of combination of RMS and other investments

Many thanks for your attention!

Comments and questions:

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