

Is there a territorial bias in the geography of OSH in Italy? Evidence from Inail data

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Session

Incentives as an answer for the context of accidents in Italy

Chair: A. Castaldo

A spatial evaluation of the ISI calls context



Occupational risk is a **diversified phenomenon** and the distribution of accidents is very **heterogeneous at the sectoral and territorial levels**

This presentation concerns the analysis of the *outcome variables* (frequency and severity of accidents) and of the *peculiarities of the spatial context in Italy*

Our results are **preparatory to impact evaluation** and help:

- ❖ Selecting the **proper outcome variable(s)**
- ❖ Improving the understanding of the **determinants of heterogeneous impacts** at the local (**provincial**) level
- ❖ Providing variables (and understanding) for *matching techniques*
- ❖ Providing evidence to assess the **external validity**

Literature on risk analysis identifies two main dimensions of risk:

- **Probability**: how likely is an adverse event?
- **Impact**: which consequences will result from an adverse event?

These two dimensions of risk apply to OSH as well:

- Probability may be investigated observing the relative **frequency** of accidents (or professional diseases)
- Impact may be analyzed observing the **severity** of consequences of accidents or professional diseases (e.g., *number of days off work, permanent health consequences, death*)

Based on these two dimensions of risk (**probability** and **impact**) we identify three metrics:

Frequency index $(FI_{ij}) = \frac{Indemnified\ accidents_{ij}}{Employees_{ij}} \cdot 1000$

Severity Index $(SI_{ij}) = \frac{Severe\ accidents_{ij}}{Employees_{ij}} \cdot 1000$

Severity Share $(SS_{ij}) = \frac{Severe\ accidents_{ij}}{Indemnified\ accidents_{ij}} = SI_{ij}/FI_{ij}$

Where: *i* = territorial unit and *j* = industry; Severe Accidents = Accidents > 30 days prognosis + permanent outcomes + fatal outcomes

Thresholds to **define low/medium/ high risk**: 40th/60th percentiles *across industries* (based on Inail, 2021)

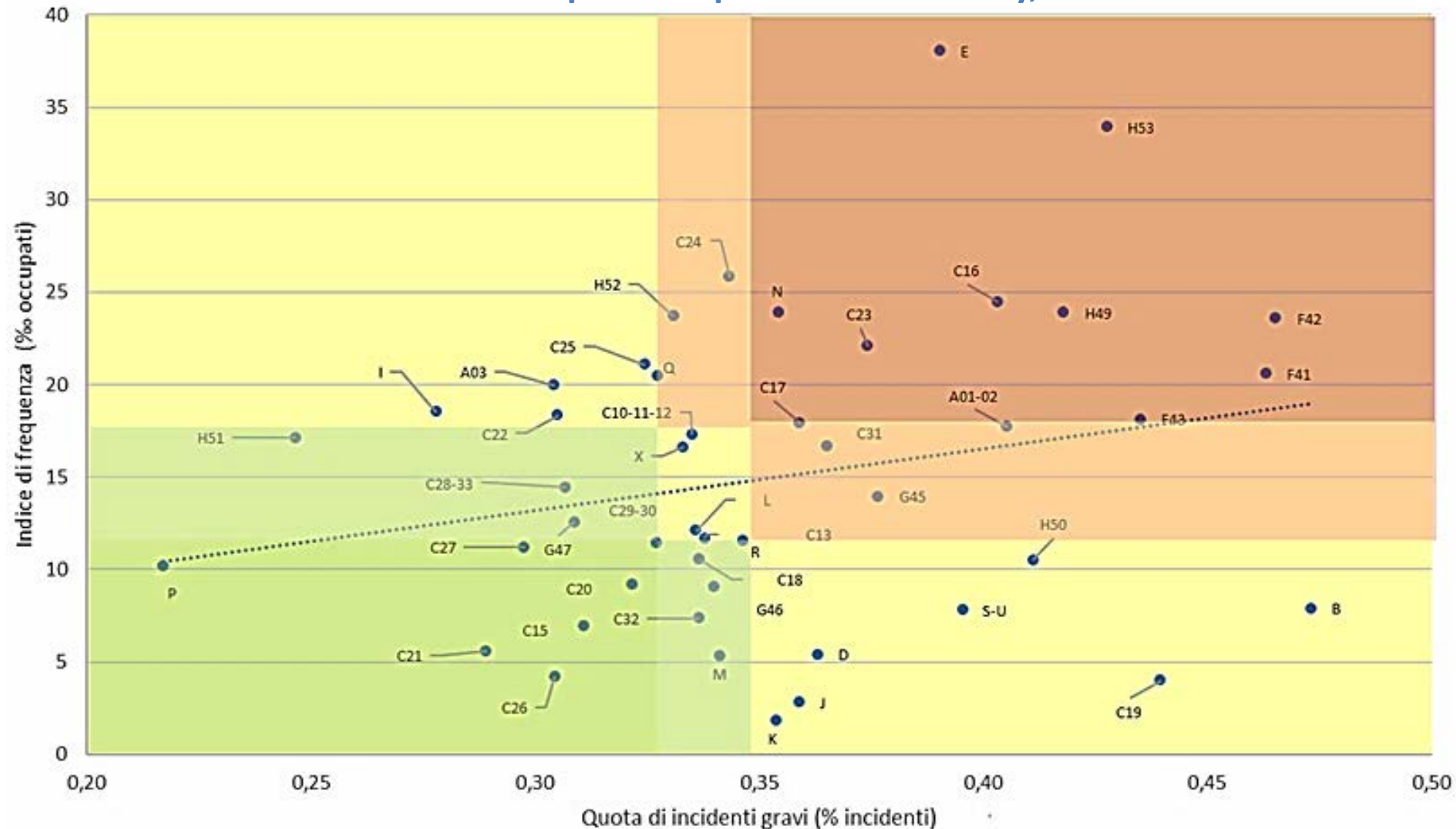
Index	N	Min	P20	P40	P50	P60	P80	Max
Freq Index (‰ employees)	46	1,82	7,79	11,56	14,18	17,29	21,08	38,03
Sev Index (‰ employees)	46	0,16	2,42	3,92	4,43	5,67	7,96	13,51
Sev Share (% accidents)	46	0,09	0,31	0,34	0,34	0,35	0,40	0,61

Sectoral map of occupational risk in Italy, 2018

We notice:

- a **wide dispersion** (very different situations) ...
- ... over a **slightly positive trend**

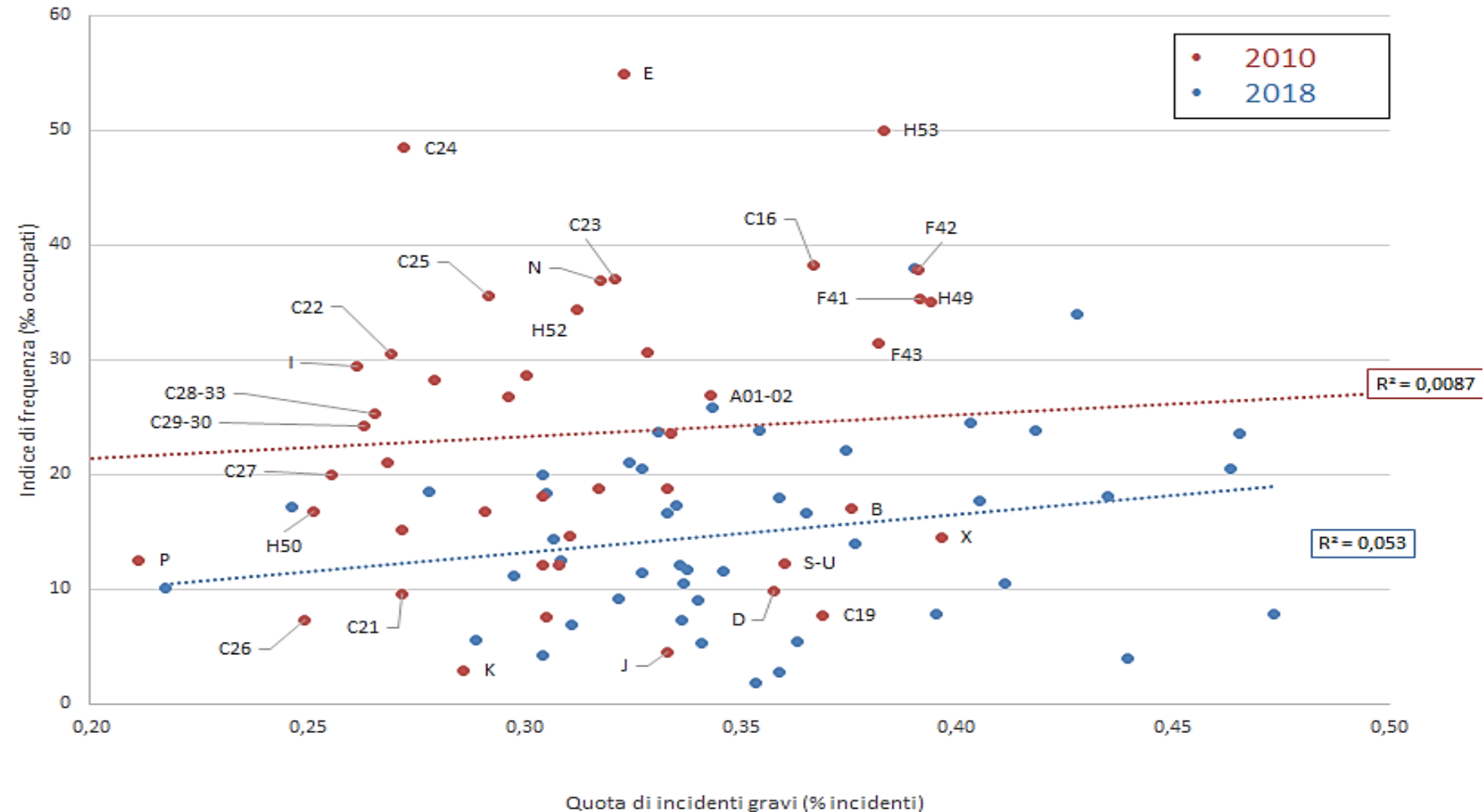
(i.e., high risk industries show problems on both probability and impact)



As time goes by we notice:

- the **risk** tendency is generally **lower** (lower intercept) ...
- ... but the **correlation** between risk dimensions (frequency & severity) is a bit **stronger** (wider slope)

Sectoral map of occupational risk in Italy, 2010 - 2018



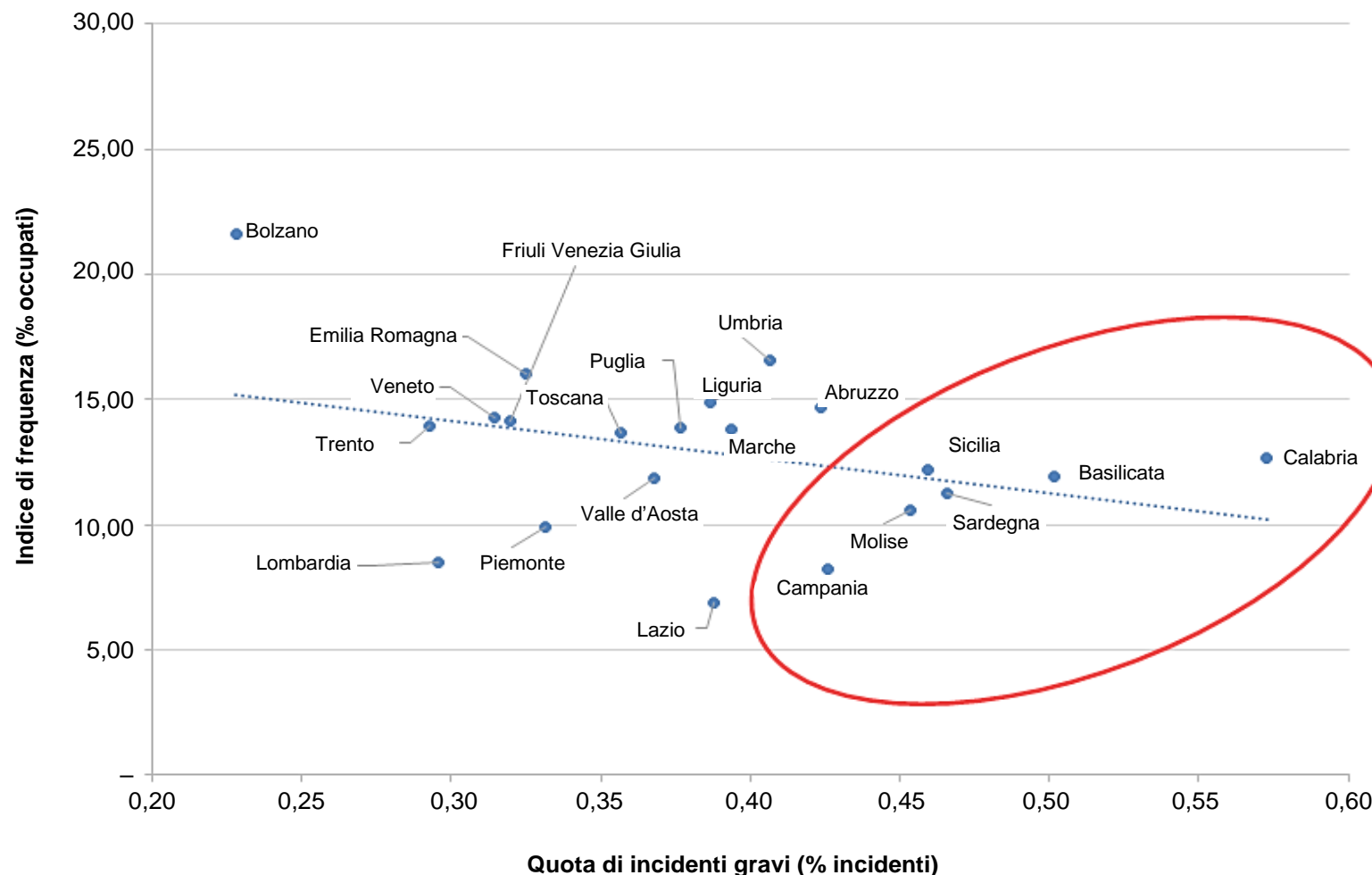
We observe:

- high **heterogeneity**
- a slightly **negative trend**
- **spatial regularity**: all *southern regions* show low FI and high SS

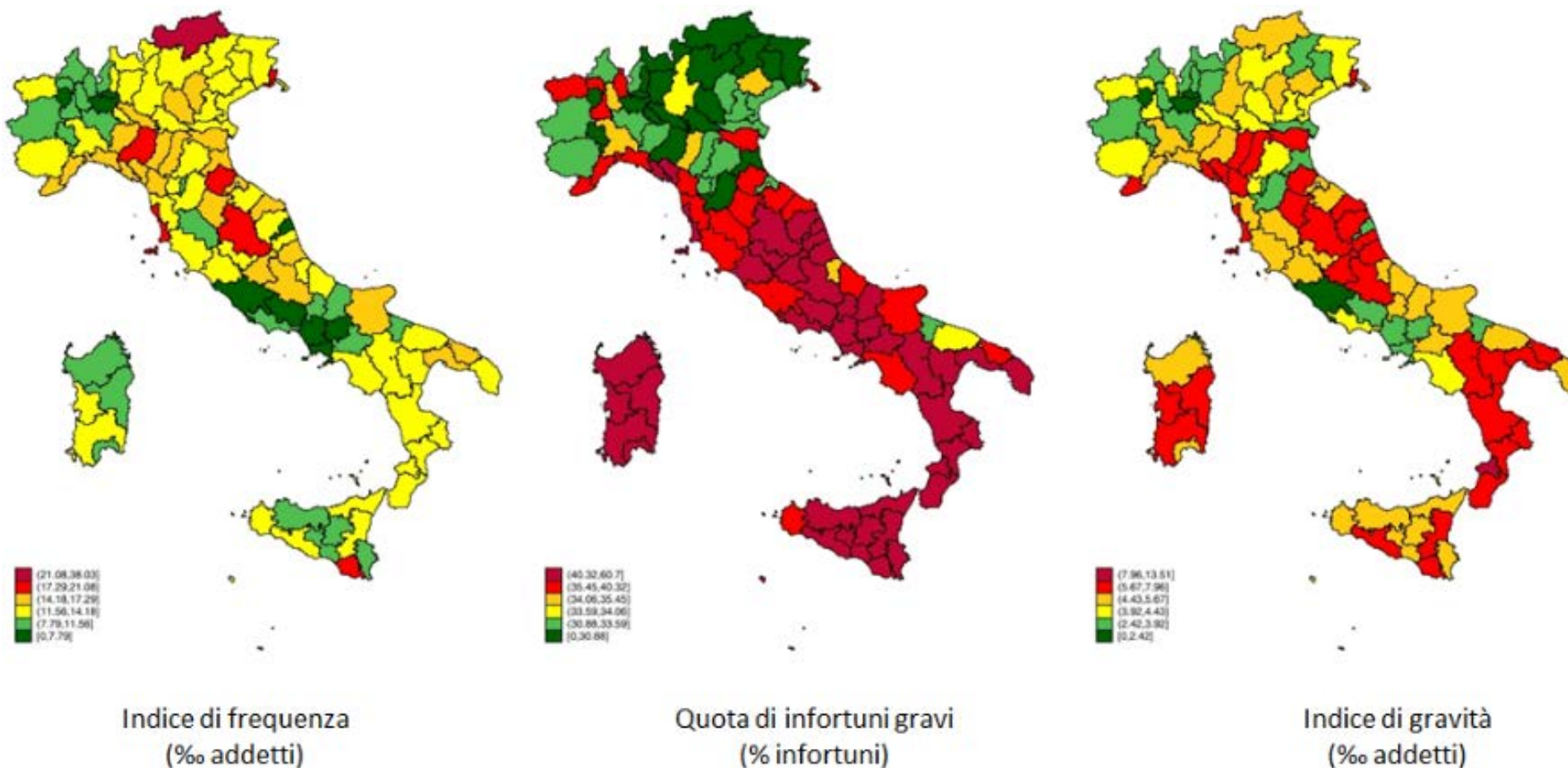
→ **STRONG CONCERN
ON REPORTING BIAS**

- Since it is difficult to avoid declaring serious accidents, the **bias is stronger for FI**
- No estimation of the size of the reporting bias
- The **less undermined** indicator seems to be the **Severity Index**

Regional map of occupational risk in Italy, 2018



Provincial maps of occupational risk in Italy, 2018



The color range is based on the values calculated for Q_{20} , Q_{40} , Q_{50} , Q_{60} , Q_{80} of industry ranking of each indicator.

GREEN: LOW RISK

YELLOW: MEDIUM RISK

RED: HIGH RISK

OSH literature acknowledges **two main determinants of occupational risk at the firm level**

Sector proxying:

- specific nature of the **job** (Abdalla et al., 2017)
- specific nature of the **job tasks** (ILO, 2001)
- type of **workers** involved (Abdalla et al., 2017)
- involvement within the **shadow economy** (Buckley et al., 2016)

Firm size proxying:

- available **resources** (ILO, 2020; Walters & Wadsworth, 2016)
- formal/informal **management structure** (Hasle and Limborg, 2006)
- **awareness** of OSH
- pressure due to **position in the Global Supply chain** (ILO, 2005)
- involvement within the **shadow economy** (ILO, 2020)

How can we **explain the large territorial heterogeneity** in the previous pictures?

Differences in reporting attitudes? Industrial composition? Socio-cultural determinants?

- If the **local industrial (and size) composition** was the unique determinant of territorial OSH heterogeneity ...
- ... then it would be possible to foresee the number of (serious) accidents per province by:
 - applying the **sectoral FI (SI) calculated at the national level** to the number of employees in each local industry, thus obtaining the number of **expected (serious) accidents per sector and province**
 - aggregating them to obtain the **total expected (serious) accidents per province**

But we actually observe a **huge difference between the real and expected accidents (territorial bias)**, which could be eventually explained by **local social, cultural and economic features**

It is the residual variability that cannot be explained by the sectoral composition of the local economy

- $N_{acc_{ij}}$ = Indemnified accidents in province i and industry j
- $N_{sev_{ij}}$ = Severe accidents in province i and industry j
- *Sectoral indexes calculated at the national level*

$$F_{I*j} = \frac{\text{Indemnified accidents}_{*j}}{\text{Employees}_{*j}} \cdot 1000 \quad \text{and} \quad S_{I*j} = \frac{\text{Severe accidents}_{*j}}{\text{Employees}_{*j}} \cdot 1000$$

May be used
to calculate
expected
values of FI,
SS, and SI

- *Expected accidents per industry and province*

$$E[N_{acc_{ij}}] = F_{I*j} \cdot \text{Employees}_{ij} \quad \text{and} \quad E[N_{sev_{ij}}] = S_{I*j} \cdot \text{Employees}_{ij}$$

- *Expected accidents per province*

$$E[N_{acc_{i*}}] = \sum_j E[N_{acc_{ij}}] \quad \text{and} \quad E[N_{sev_{i*}}] = \sum_j E[N_{sev_{ij}}]$$

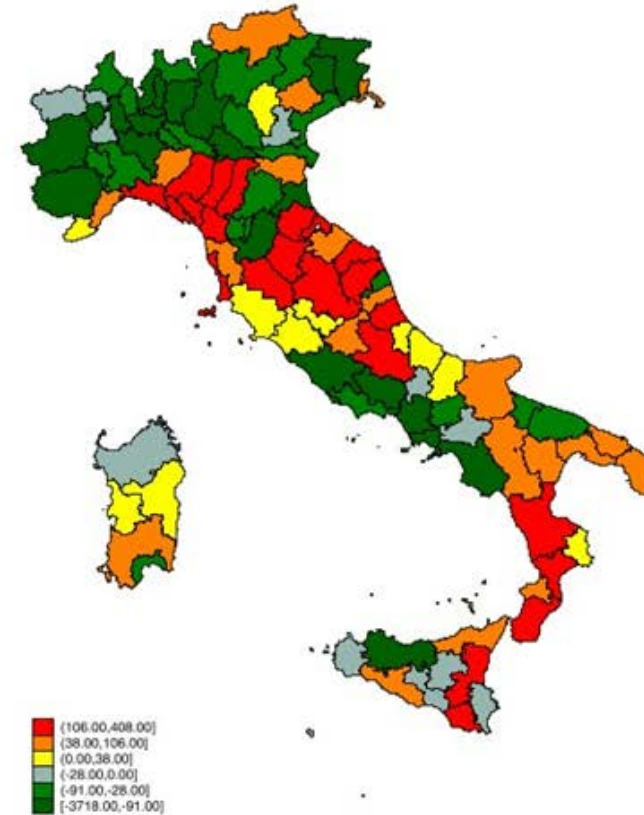
- $TB_{acc_{i*}} = N_{acc_{i*}} - E[N_{acc_{i*}}]$ **Territorial bias on all accidents**
- $TB_{sev_{i*}} = N_{sev_{i*}} - E[N_{sev_{i*}}]$ **Territorial bias on severe accidents**

TBs may be plotted on a map or used as dependent variable of a model

TBI_i* (# infortuni)



TBS_i* (# infortuni gravi)



Green (red) area means low (high) TB, i.e. real accidents lower (higher) than expected

High correlation between the two maps (accidents & severe accidents)

Hypothesis: Residual variability to be explained by social and cultural characteristics

A large orange arrow pointing to the right, containing the text 'Social capital' in white. The arrow has a white outline and a white arrowhead.

Social capital

- A long-lived concept to indicate the **set of intangible relational goods** that are **important in daily life** (Hanifan, 1916) **and fundamental to the functioning of complex societies** (Jacobs, 1961)
- **Deep spatial heterogeneity** in the distribution of social capital among Italian provinces/regions (Putnam, 1993; Calcagnini et al., 2019; Calcagnini & Perugini, 2019; Cartocci & Vanelli, 2015)
- Relevance to **reciprocity in interpersonal relations** and to the **quality of norms and institutions in territories**

We can hypothesize a link between some dimensions of social capital and the indicators of injury risk

- Simple multivariate model
- Data on Italian provinces 2018
- 4 dependent variables: TB based on
 - Accidents (1) and frequency index (3)
 - Severity accidents (2) and index (4)
- Independent variables proxying
 - **Socio-economic dimension**
 - **Relational dimension**
 - **Institutional dimension**

Variabile	TBI (1)	TBS (2)	TBfi (3)	TBsi (4)
Pop	-0.003*** (0.000)	-0.001*** (0.000)	-3.3e6*** (0.003)	-1.5e6*** (0.005)
Dim_impresa	-123.571 (0.414)	-137.664** (0.036)	0.162 (0.791)	-0.407* (0.100)
Diplomati	14.212 (0.291)	5.061 (0.398)	0.129** (0.012)	0.062*** (0.002)
Donaz_sang	-30.017 (0.373)	-17.796 (0.223)		
CoopS%			-6.092* (0.093)	
CoopS_add%			0.568 (0.228)	
Ass_crim	31.314** (0.008)	15.725** (0.003)	0.070* (0.093)	0.032* (0.098)
Omicidi			61.747 (0.120)	48.227** (0.012)
Rifiuti			-0.033 (0.121)	-0.017** (0.047)
VotantiPE	27.070** (0.041)	7.633* (0.076)	0.048 (0.206)	
Ammin_donne	48.467** (0.014)	17.741** (0.030)	0.214*** (0.003)	0.047 (0.116)
Attività_diff	32.401* (0.068)	13.104* (0.076)		
Costante	-3908.5 (0.010)	-833.174 (0.152)	-10.025* (0.051)	-2.658* (0.059)
R ²	0.732	0.677	0.401	0.294
Osservazioni	102	102	105	105

- At least one variable per dimension is significant in all models: **relevant dimensions!**
- **Firm size** is important: in fact, small firms suffer from
 - lack of resources, especially technological (Walters & Wadsworth, 2016)
 - informal management models (Hasle & Limborg, 2006; Sørensen et al., 2007)
 - low awareness, competitive pressure from value chains (Walters et al., 2018)
 - shadow economy and undeclared work (ILO, 2020)
- **Human capital** (education) seems to influence reporting attitudes (soft injuries)
- **Culture of legality**: Areas with widespread criminal networks and a high number of homicides, also manifest more injuries than expected
- **Institutional quality**: Territories are more virtuous if services to the population are efficient, but more accidents happen where participation in civic life is more developed (reporting attitude)

- Assessing OSH specificities at the local level, **different indicators may give very different pictures**, due to ...
 - the two dimensions of risk (probability and impact)
 - the impact of under/over-reporting
- The **territorial bias** (TB) describes **territorial heterogeneity** much better, once you have controlled for the main risk determinants (sector and firm size)
- TB is related to an **unobservable mix of social, cultural and labor market determinants** that affect the attitude towards OSH
- **Very interesting relationships emerge between the socio-cultural aspects (e.g., culture of legality, human and social capital) and safety at work**
- **TB** is a useful indicator that can be measured at the **territorial, sectoral, firm level** to evaluate attitudes towards OSH and **design specific policies**

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Thanks for your attention

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VIP moving

**Valutazione degli Incentivi
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Generato dai bandi ISI**



New book - **copies available**



Angelo Castaldo, Elena Ragazzi e Lisa Sella (a cura di) (2023). *È possibile incentivare la sicurezza sui luoghi di lavoro? Concezione, contesto e implementazione dei Bandi ISI Inail*. Giappichelli, Torino

Just issued (in Italian). **We have some free copies** (paper or e-book). If you are interested write to elena.ragazzi@ircres.cnr.it

The second volume is expected for the end of the year.

<https://www.giappichelli.it/e-possibile-incentivare-la-sicurezza-sui-luoghi-di-lavoro-9791221101294>



Occupational safety and health (OSH) is at the center of the attention of citizens, researchers and policy makers. Even though the number of injuries has been on a downward trend for long, there are still significant differences between countries and regions; types of firms and sectors. There are therefore contexts on which public action must focus attention with incisive interventions. The ISI call, promoted by Inail, are the only example in Europe in which the instrument of economic incentives offered to companies investing in OSH above the legal minimums has been adopted. From this perspective many questions arise: Is the initiative potentially capable of affecting OSH levels, also considering the context in which it operates? Is it aimed at a need that companies would not be able to satisfy independently? Is it appropriate to recalibrate the policy mix by adding to the indirect intervention tools (sticks and sermons) tools (carrots) aimed at leveraging the social responsibility of SMEs? The book presents the results of the BRIC INAIL 2019 project "Evaluation of Incentives for Prevention. Evaluation Models on the Impact Generated by ISI Calls ". See an upcoming second volume for evidence on impact.

Mailing list: a network for policy evaluators



There is a community connected to this session.
Mailing-list is an informal network among researchers working on policy evaluation
The aim is to ease the diffusion and sharing of results and methodological advances, and news about events and calls

It is possible to adhere by writing an e-mail to mlist@ircres.cnr.it

It will give access to bibliographical newsletters, news concerning call for papers, conferences, project calls, and circulation of open source papers

<http://tools.ircres.cnr.it/index.php/mailling-list>

Special Issue: **Impact assessment methods in regional studies, how to go further?**



This special issue, launched by S. Bourdin, E. Ragazzi and L. Sella, aims to explore the methodological challenges and opportunities associated with assessing regional public policies. Key topics:

- Accuracy of observation and measurement of variables related to policy management, its context, and its beneficiaries.
- The role of space, including territorial specificities, location effects, and distance.
- Evaluation of net impact, choice of control group, and methods for assessing and correcting selection distortion.
- Issues related to database access, reliability, and data quality management, particularly for interregional comparisons.

The editor is interested in the proposal, but asked us to provide a list of potential papers. If you are interested in the initiative, please write to us within September 20th (elena.ragazzi@ircres.cnr.it lisa.sella@ircres.cnr.it sbourdin@em-normandie.fr) specifying:

- Title, authors, address for the corresponding author, suggestions for the revision
- A very short abstract (1,000 characters) including object, approach and a comment explaining why the proposal goes further...