



ISTITUTO NAZIONALE PER L'ASSICURAZIONE
CONTRO GLI INFORTUNI SUL LAVORO

Occupational Safety and Health: a Bibliometric Exploration of the Policy Effects on Scientific Production

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SCIENCE-BASED POLICY MAKING IN
OCCUPATIONAL SAFETY AND HEALTH

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TOPIC AND RESEARCH QUESTION

Topic & RQ • Bibliometrics ○ Literature ○ Data & methodology ○○ General results ○○○○○○ Specific cases ○○○○○○ Conclusions & takeaways ○○○

The paper aims to explore a specific research question:

“Is it possible to devise, starting from the bibliometric analysis of OSH scientific production, external effects, driven by social dynamics (and/or by policies), on the scientific activities? How does this influence evolve?”

The research question is set in a wider explorative effort that we might define as responding to the question:

“Is it possible to capture the social/policy effects, as well as their evolution, on scientific research – mediated through the analysis of scientific production – in specific related topics?”

(Short answer: partly yes)

BIBLIOMETRICS: WHAT DOES IT MEAN?

Topic & RQ Bibliometrics Literature Data & methodology General results Specific cases Conclusions & takeaways

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Bibliometrics: measure of scientific production through indicators linked to scientific publications: authors, their countries and affiliations, content and topic, use by part of scientific community (citations), links between authors, countries, topics (e.g., through co-publishing or co-citation). (Garfield, 1955; de Solla Price, 1976; De Bellis, 2014).

Bibliometrics uses specific databases: Google Scholar® (free access), Scopus®, WofS® (pay per view).

In this way it is possible to:

- Offer a picture of the *status quo* of scientific research of institutions, Countries, research fields (whatever the meaning of the term).
- Measure the evolution of such magnitudes through the analysis of data relative to different timings.

(Note that bibliometrics also have a dark side: the excessive use of indicators in the evaluation) (Garfield, 1972).

Indicators are objective but must be used carefully!

LITERATURE OVERVIEW

Topic & RQ	Bibliometrics	Literature	Data & methodology	General results	Specific cases	Conclusions & takeaways
○	○	●	○○	○○○○○	○○○○○	○○○

Literature on the effects of science- and research-related policies on scientific production is mainly concentrated on **policies for research**:

- agglomeration effects deriving from funding (Bonaccorsi and Daraio 2005, Scientometrics);
- effects of funding on “publish or perish” behaviour (Shibayama and Baba, 2015, Res. Pol.);
- theoretical approach to research incentives (Kiri et al., 2018, Res. Pol.);
- effects of policies on a national university system (Millones-Gómez et al., 2021, PLOS One);
- effects of performance-based funding (Banal-Estañol et al., 2023, Res. Pol.).

Literature on the **social effects** of scientific research is even scarcer.

A stream of literature deals with “responsible research and innovation” (RRI), in particular in the medical field.

See for instance:

- Wiarda et al., 2021, *TFSC*, resuming past literature on RRI;
- Lukovics et al., 2019, *J. Knowl. Econ.*, on the instruments to raise awareness of scientists towards RRI.

IN ORDER TO TRY TO ANSWER
TO THE RESEARCH QUESTION DESCRIBED ABOVE,
THE PAPER EXPLORES,
EXPLOITING SOME SIMPLE BIBLIOMETRIC INSTRUMENTS,
A DATASET OF SCIENTIFIC PUBLICATIONS
STRONGLY RELATED TO
OCCUPATIONAL SAFETY AND HEALTH

DATA AND METHODOLOGY

Topic & RQ	Bibliometrics	Literature	Data & methodology	General results	Specific cases	Conclusions & takeaways
○	○	○	●○	○○○○○	○○○○○	○○○

Data extraction from Web of Science was performed April - July 2023 in different steps.

The dataset joins **two different queries**, performed in “**Topic**” (Title, abstract, keywords):

TS=(("occupational safety and health") NOT ((OSHA) OR ("occupational safety and health agency")))) (**many works refer to OSHA**)

AND

TS=“occupational health and safety”

Total of 9,984 scientific products (journal articles, book chapters, congress papers etc.).

(Hint: the dataset is not so vast, scientific production on OSH – and OHS – is not so large).

The analysis has been performed on **WoS subject categories** (keywords are too dispersed), considering the **first** (most relevant) SC for each publication.

WoS subject categories are 254, each encompassing journals related to a specific scientific field.

DATA AND METHODOLOGY

Topic & RQ	Bibliometrics	Literature	Data & methodology	General results	Specific cases	Conclusions & takeaways
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Measure of the **prevalence** of a specific research field (represented by a SC) at Country level in the OSH-related literature.

Prevalence of the **Country at world level** in the SC **AND/OR** of the **SC at Country level**, measured as **fraction** of a SC over the total production of a Country **AND/OR** **fraction** of the production of a country in a SC over the total world production in the SC.

Once a SC has been highlighted in this way, a **more specific analysis** tries, case-by-case, to understand if and how specific **social external** (to research) **effects** on scientific production itself exist. That is, *why* this scientific field is so relevant (in quantitative terms) in the Country's OSH scientific production.

6 time periods have been considered (prior to 1999, 2000-2004, 2005-2009, 2010-2014, 2015-2019, 2020-2023) .

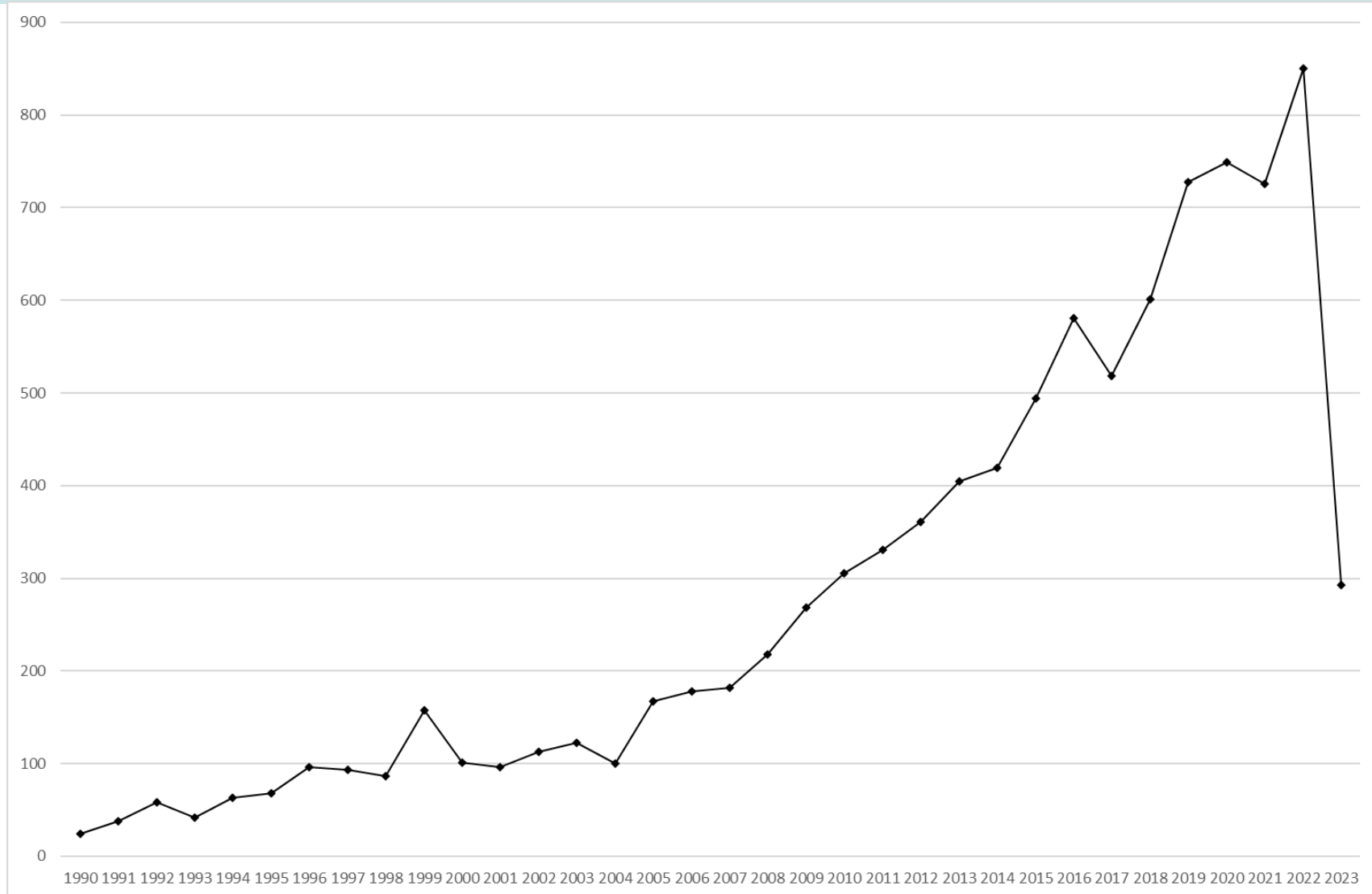
Together with percentages *a/so* **absolute values** have been considered.

(Hint: it is not meaningful to our purposes affirming that a Country A produces 20 % of world production in the SC when it has published, e.g., 2 papers on 10 at world level).

TOTAL NUMBER OF PUBLICATIONS PER YEAR

Topic & RQ Bibliometrics Literature Data & methodology General results Specific cases Conclusions & takeaways

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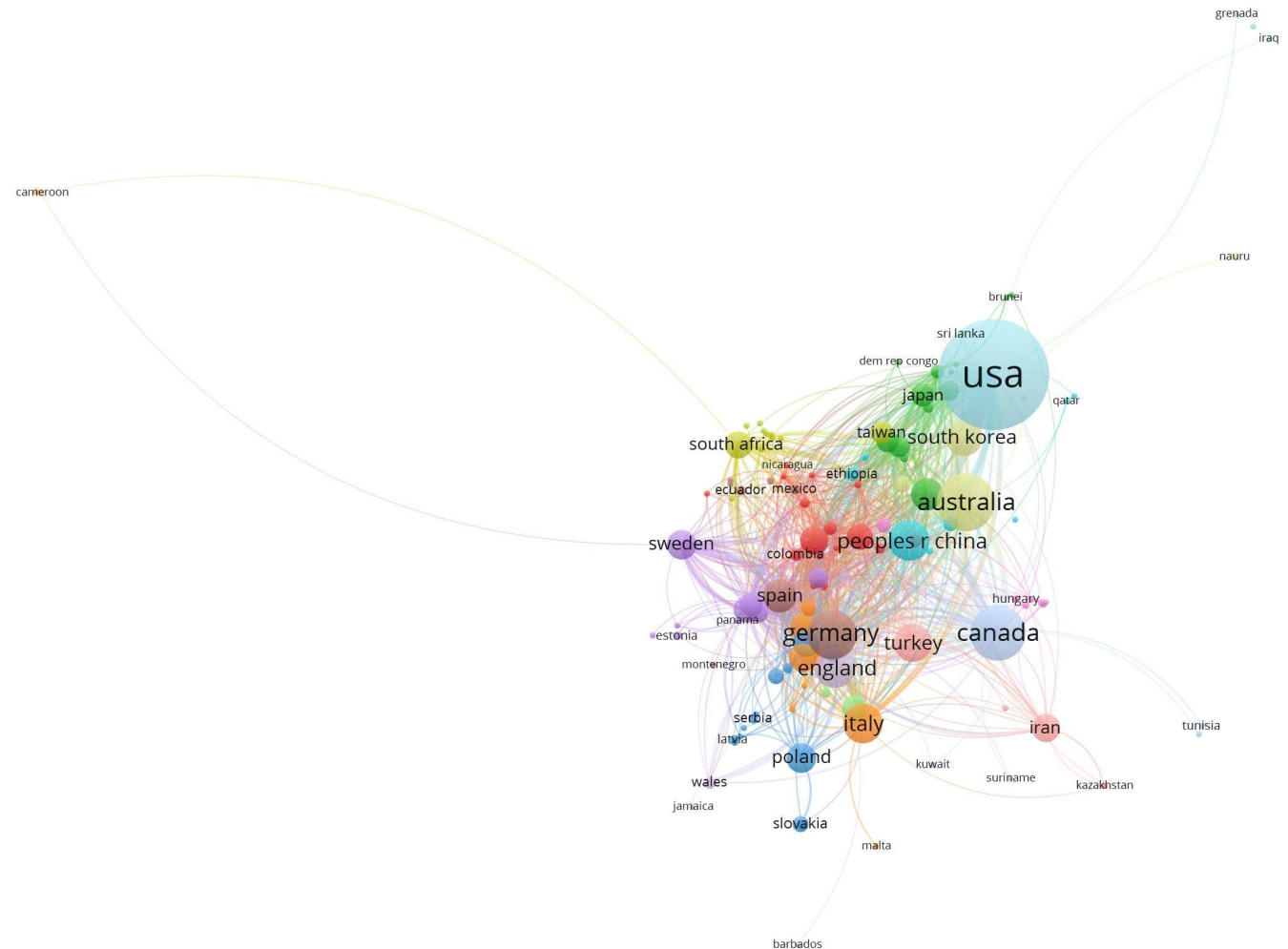
Does growth outgrow
total scientific
production?

A first *relevant* point.

Scientific production in OSH/OHS is strongly concentrated in:

- the US (2938 publications, 29.4 % of the total).
- WoS SC “Public, Environmental & Occupational Health” (3,015 publications, 30,2 % of the total).

The pattern of collaborations is wide, but numbers are low.



SELECTION OF THE DATASET

Topic & RQ	Bibliometrics	Literature	Data & methodology	General results	Specific cases	Conclusions & takeaways
○	○	○	○○	○○●○○	○○○○○	○○○

The dataset is rather dispersed → many Countries AND many SC present a low/very low number of publications.

Selection:

- Subject Categories with > 50 publications (~ 0,5 % of the total).
These SC represent 8,119 publications (81.3 % of the total).
- Countries presenting > 200 publications (~ 2 % of the total).
These Countries represent 7,357 publications (73.7 % of the total)

(for each considered country, specific queries have been performed on WoS.)

This in order to obtain operability and an analysis on meaningful data.

(hint: it is nonsensical to study countries which published few papers).

Thus: the analysis was performed on

- 30 subject categories;
- 11 Countries.
- At the crossing (top SC in top Countries): 5,893 publications (59.0 % of the total).

COUNTRIES AND SUBJECT CATEGORIES

Topic & RQ

Bibliometrics

Literature

Data & methodology

General results

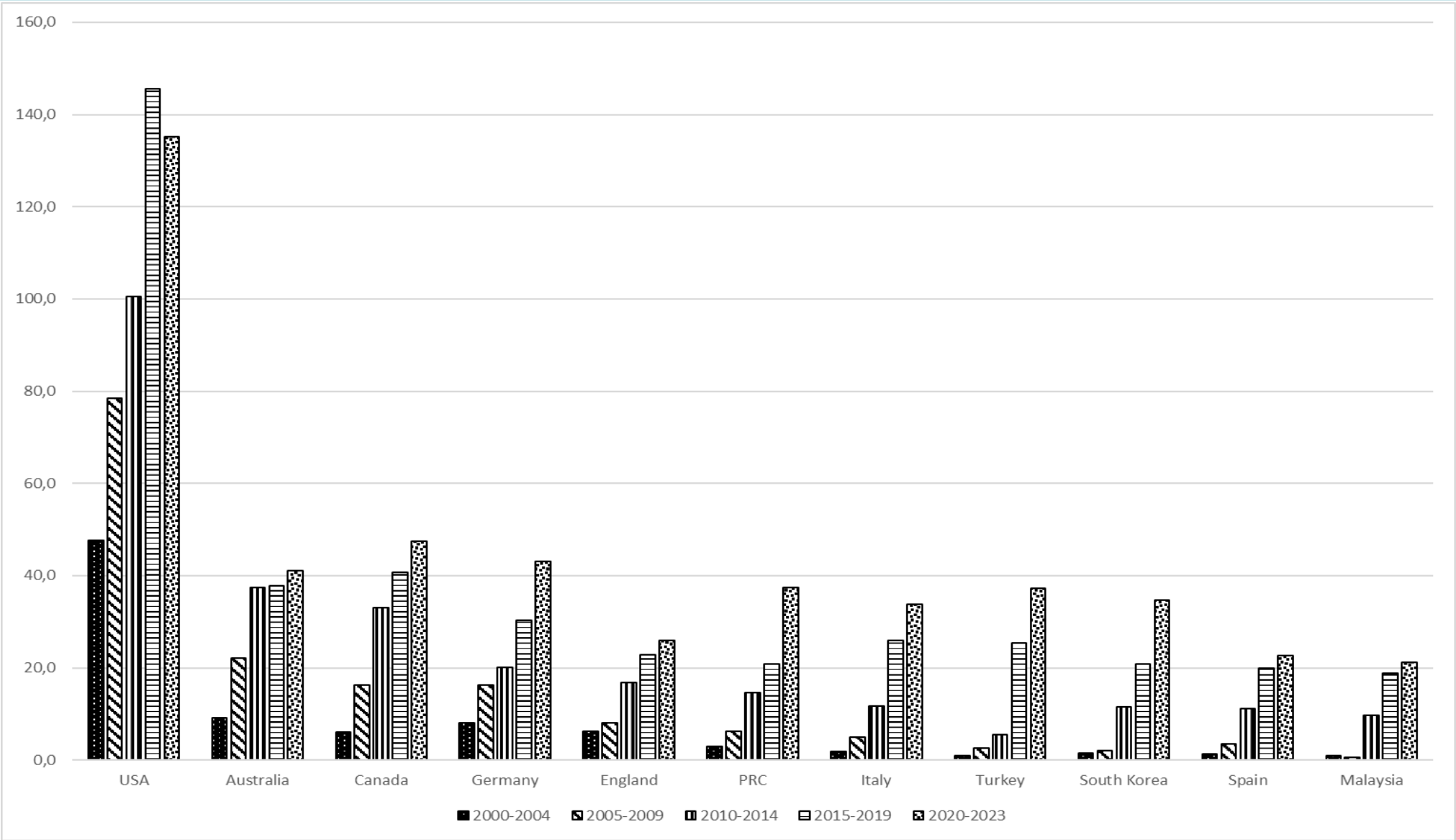
Specific cases

Conclusions & takeaways

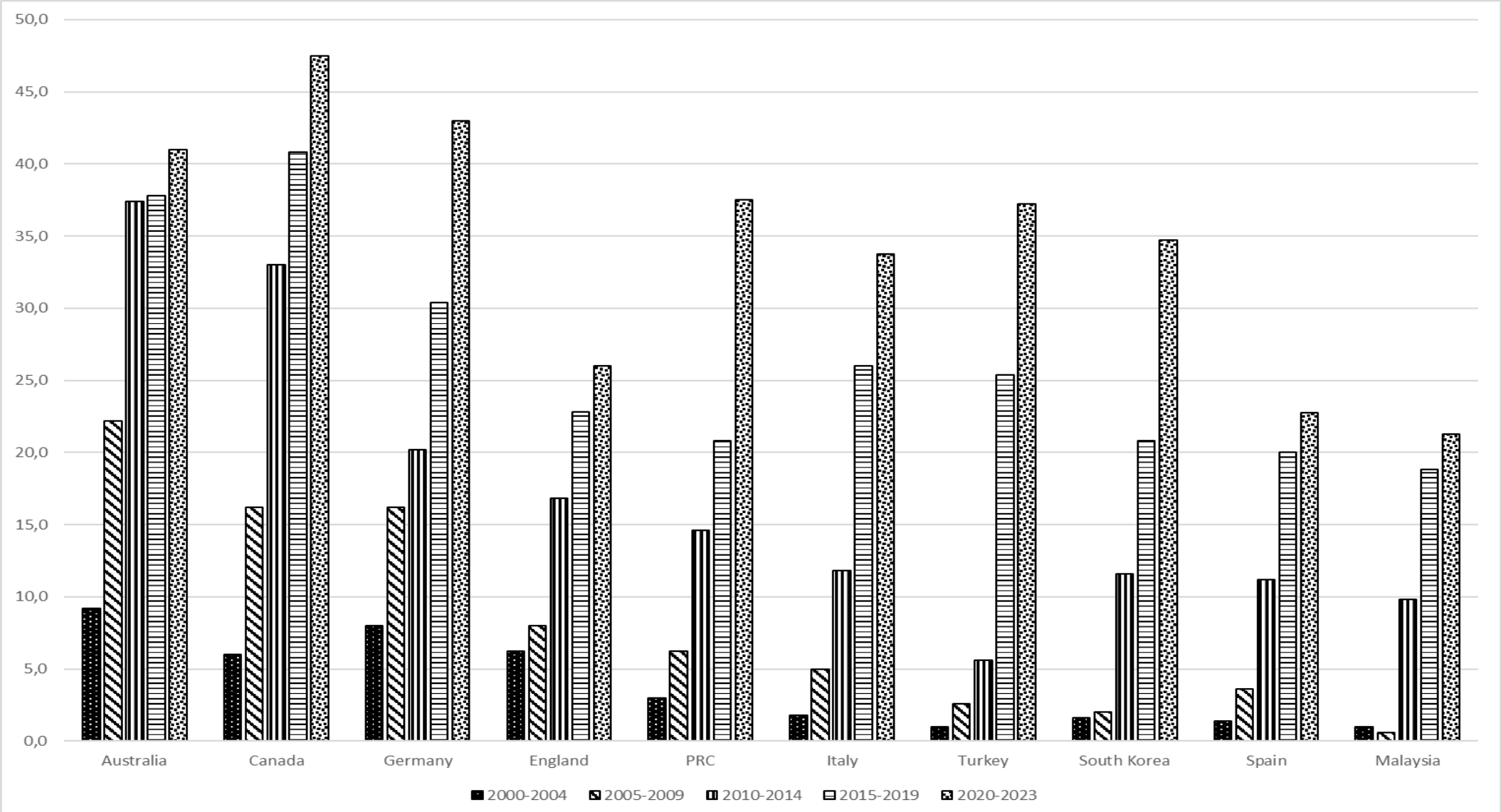
Public, Environmental & Occupational Health	3015
Environmental Sciences	932
Engineering, Industrial	690
Ergonomics	362
Engineering, Environmental	218
Industrial Relations & Labor	211
Nursing	206
Engineering, Multidisciplinary	201
Management	186
Business	185
Medicine, General & Internal	152
Construction & Building Technology	151
Health Care Sciences & Services	149
Green & Sustainable Science & Technology	136
Education & Educational Research	125
Law	117
Mining & Mineral Processing	108
Economics	107
Computer Science, Artificial Intelligence	101
Multidisciplinary Sciences	93
Engineering, Chemical	87
Metallurgy & Metallurgical Engineering	85
Chemistry, Multidisciplinary	81
Social Sciences, Interdisciplinary	80
Chemistry, Analytical	67
Engineering, Electrical & Electronic	64
Engineering, Manufacturing	57
Veterinary Sciences	52
Computer Science, Information Systems	51
Automation & Control Systems	50

USA	2938
Australia	757
Canada	752
Germany	581
England	415
PRC	376
Italy	364
Turkey	322
South Korea	322
Spain	274
Malaysia	239

EVOLUTION OF COUNTRIES' PRODUCTION



EVOLUTION OF COUNTRIES' PRODUCTION



THE FOLLOWING OF THE TALK
DESCRIBES THREE SPECIFIC CASE STUDIES
OUTLINED WITH THE
PREVIOUSLY DESCRIBED METHODOLOGY

“NURSING” IN USA

Topic & RQ Bibliometrics Literature Data & methodology General results Specific cases Conclusions & takeaways

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US “Nursing” SC is 72.8 % of the global production (150 of 191),
2/3 of the total (99) in years 2015-2019.

118 (90) articles on “**WORKPLACE HEALTH & SAFETY**”,
official publication of the American Association of Occupational Health Nursing, Inc. (**AAOHN**).

Most targeted keywords: “Occupational health and safety programs”,
“Health coaching/education/literacy/promotion”, in line with the aim of AAOHN.

Most relevant affiliations: State Universities of Alabama, North Carolina, Florida (35 % of the total):
specific **NIOSH** (National Institute for Occupational Safety and Health)-financed “Education and
Research Centers”, with specific education programs for occupational and environmental nursing.

It is feasible that the presence of a National Professional Association of professional nurses,
AAOHN, engaged in the specific field of occupational and environmental nursing directs and
enhances research activities in the specific field, in particular through its official journal (which is
listed in WoS).

“NURSING” IN USA

Analysis of keywords, sources, affiliations...

Keywords	TOTAL	2015-2019
Occupational health and safety programs	80	73
Health coaching/education/literacy/promotion	69	66
Disease prevention	31	29
Occupational hazard(s)	29	25
Workforce	23	21
Occupational health and safety team	20	20
Occupational injuries	18	17
Best practices	13	13
Government regulation	13	13
Program planning and evaluation	13	13
Mental health	13	11
Chronic diseases/illnesses	12	10
Global occupational health	11	10
Safety	11	11

Source	TOTAL	2015-19
WORKPLACE HEALTH & SAFETY	118	90
ORTHOPAEDIC NURSING	7	0
JOURNAL OF INFUSION NURSING	4	3
INTERNATIONAL JOURNAL OF NURSING STUDIES	3	1
SAGE OPEN NURSING	3	3

US STATE/Affiliation	2015-2019
Alabama	40
University of Alabama System	
University of Alabama Birmingham	
University of Alabama Huntsville	
North Carolina	28
University of North Carolina	
University of North Carolina Chapel Hill	
University of North Carolina School of Medicine	
Florida	24
State University System of Florida	
University of South Florida	
University of Central Florida	
University of Florida	
TOTAL: 92 out of 264 (35 %)	

Workplace Health & Safety is the official publication of the American Association of Occupational Health Nursing, Inc. (AAOHN), the professional association of licensed nurses engaged in the practice of occupation and environmental health nursing.

“ENGINEERING, ENVIRONMENTAL” IN GERMANY

Topic & RQ Bibliometrics Literature Data & methodology General results Specific cases Conclusions & takeaways

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More than **56% of the world production** in this SC comes from Germany.

This SC which represents more than **21 % of Germany’s OSH scientific production**.

Scientific production remains constant across time.

113 of 124 works are published in “**Gefahrstoffe Reinhaltung der Luft**” (Hazardous Substances - Keeping the Air Clean).

This journal is published by the **Institute for Occupational Safety and Health of the German Social Accident Insurance** (Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung).

WoS does not list keywords for this journal, so a keyword (specific topics) analysis is not possible.

Nevertheless it was possible to perform an analysis of affiliations.

“ENGINEERING, ENVIRONMENTAL” IN GERMANY

Topic & RQ	Bibliometrics	Literature	Data & methodology	General results	Specific cases	Conclusions & takeaways
○	○	○	○○	○○○○○	○○●○○	○○○

The analysis of affiliations (224 in total, an average of almost two affiliations for each article) renders this result:

- 55 (24.5 %) are relative to **IFA** (the public body that publishes GRdL).
- 45 (20,1 %) are relative to the “**Berufsgenossenschaft**”. These are the professional associations in charge of the Statutory Accident Insurance for the German private sector firms and their workers.
- 18 (8.0 %) are relative to the "**Federal Institute of Occupational Safety and Health**", a German federal agency (controlled by the Ministry of Labour and Social Affairs) responsible for OSH.
- 20 (8,9 %) are relative to Universities/University institutes. This is a vast minority.

Research in OSH in Germany in the **specific field** of “Environmental engineering” (the most relevant at national level) is **dominated** mainly by institutions that take care of the aspects of OSH under the **professional** or **practical** point of view.

“**Public, Environmental & Occupational Health**” is the most relevant SC at world level BUT in SK we have **211 works over 322** (65,5 % of the total), with numbers **growing** steadily.

- Concentration in the journal “**Safety and Health at Work**” (Elsevier) (more than 75%, 160 on 211).
 - Dispersion of authors: **529 authors** (national and international, max n° of products is 16).
 - Dispersion of author keywords: **693 keywords**, most (556) are present only once. Most targeted are “occupational exposure” (11 times) followed by “exposure” (9 times) (very general).
-

BUT:

“Safety and Health at Work” is the **official peer-reviewed journal** of the
“**Occupational Safety and Health Research Institute, Korea Occupational Safety and Health Agency**” (<https://oshri.kosha.or.kr>).

The institute performs both **research** on safety and health policy AND **professional services** (epidemiological investigation on occupational diseases).

“P., E. & OCCUPATIONAL HEALTH” IN SOUTH KOREA

In this case research is mainly led by academia:

a search made on author/affiliations (counting the number of authors according to their affiliations) renders this result:

Affiliation/author	TOTAL	SaHaW
Yonsei University	49	38
Seoul National University (SNU)	42	25
Catholic University of Korea	28	22
Pusan National University	21	16
Yonsei University Health System	19	18
Gachon University	18	17
Catholic University of Daegu	17	14
Jeju National University	15	15
Korea National Open University	15	13
Korea University	15	7

SUMMING UP...

Topic & RQ	Bibliometrics	Literature	Data & methodology	General results	Specific cases	Conclusions & takeaways
○	○	○	○○	○○○○○	○○○○○	●○○

*Aim of the paper: try to understand the existence and nature of the effects of some **social dynamics** (possibly policy-driven) **on scientific research** in OSH (mediated through scientific production), and their evolution.*

The results at this stage need further deepening and systematization, first of all from the methodological point of view.

Nevertheless, it is possible to say that **some social dynamics** (if not directly policy) can **shape** in some way research output in OSH in different countries.

In particular the findings of the three presented cases tell us that research in this field is **not** necessarily **led by academics**, that a consistent body of literature might derive from **professionals/practitioners**, that public bodies that are **not specific research institution** can foster research, in particular in such a practical oriented field.

SUMMING UP...

Topic & RQ	Bibliometrics	Literature	Data & methodology	General results	Specific cases	Conclusions & takeaways
○	○	○	○○	○○○○○	○○○○○	○●○

It is important to note that:

This specific case (OSH or OHS) is a rather **niche field**.

This means scientific production is **not-so-abundant**, which makes a fine-grained bibliometric analysis rather difficult.

What still lacks is, among other things, trying to find a specific **connection** between **research** activities AND country-specific work safety **problems**.

Under this point of view, it might prove relevant the use of databases related to accidents etc.

If we widen our vision, it is relevant to note that the presented case studies show that **publishing** in **English** in **indexed** journals (or, better, to be able to index the institutional house organ) might prove relevant in order to **widen network**, audience, topics etc.

Research in practice-oriented fields might be driven mainly **not** by curiosity but by issues stemming out of the direct engagement of **practitioners** AND “policy orienting” bodies.

Under this point of view the engagement of “non-research” public bodies AND the nature of the produced research deserves deepening.

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