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Abstract

We conduct a bibliometric analysis to examine the evolution of health inequality research over nearly four decades (1986–2023), drawing data from Scopus, with the aim of analysing the influence of economists' contributions to this interdisciplinary topic. We collect a total of 3,228 peer-reviewed papers using the keywords: "Health", "Inequality", and Economics" (including variations such as "economic" and "economy"). In the second part of the paper we assess the impact of external political and economic shocks, specifically the Fiscal Compact, on academic output related to health inequalities issues. To address this objective, a Difference-in-Differences (DiD) approach is applied, comparing research trends in countries that faced severe austerity measures with those that did not experience comparable fiscal constraints. Empirical analysis suggests that research output on health inequalities increased significantly in the aftermath of the Fiscal Compact in the affected countries. Our findings highlight how economic policies and austerity measures can influence academic research priorities, potentially as a response to increased societal concerns.

Keywords: Health Inequality, Bibliometric Analysis, Difference-in-Differences, Fiscal Compact.

JEL Classification: A12; A13; H51; E62; E65; O38.

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1 Introduction

The rise of inequality and its multiple dimensions has attracted growing attention across the social sciences. This concern extends to health, where disparities across individuals, social groups, and countries persist, and where health functions both as a consequence and a driver of broader socioeconomic inequalities—affecting life expectancy, quality of life, and income. Despite decades of academic research and policy engagement, inequalities continue to widen. According to the OXFAM 2025 Report[1], the number of people living in poverty has remained largely unchanged since 1990, while billionaire wealth has accelerated sharply in recent years, a trend projected to intensify further. Similar patterns emerge in health outcomes[2], where substantial research efforts have not translated into sustained reductions in disparities.

Evidence from advanced economies underscores the urgency of the problem. The Institute of Health Inequality reports that in England alone, nearly 890,000 excess deaths occurred between 2011 and 2019 relative to the least deprived areas[3]. These dynamics characterize both developed and developing countries. At the same time, recent policy developments suggest a weakening commitment to health spending. The World Health Organization's Global Spending on Health Report for 2024[4] documents that, for the first time since 2000, governments have deprioritized health expenditure as a share of total public spending, even against a backdrop of rising overall government budgets. This trend raises concerns about the capacity of public systems to address health inequalities, particularly in ageing societies facing increasing fiscal pressure[5].

[1]The detailed report is available here: Takers, Not Makers – The unjust poverty and unearned wealth of colonialism.

[2]We do not address the distinction between health inequalities and inequities. The term 'health inequality' or 'disparities' refers to differences in health outcomes and does not inherently imply a judgment about their fairness. However, it is worth noting that discussions about health inequalities often involve considerations of fairness and equity. For a review of the different definitions of health inequality and inequity in the literature, see McCartney *et al.* (2019).

[3]The detailed report is available here: Institute of Health Equity – Health inequalities, lives cut short.

[4]More detail here: 2024 Global Health Expenditure Report.

[5]According to Eurostat, in 2022 general government expenditure on health amounted to

Taken together, these patterns point to a striking paradox. Health inequalities remain pervasive and, in some contexts, worsening, despite a rapidly expanding body of academic research devoted to their study. This disconnect has prompted growing reflection within the literature. As noted by Mackenbach, a leading scholar in social epidemiology, the health inequality field has produced multifaceted and often heterogeneous theoretical and empirical results, with limited policy impact. In particular, the strong emphasis placed on the income–health gradient may have constrained the scope of inquiry, leaving other mechanisms underexplored. These observations suggest that understanding what research is produced and why certain research agendas emerge and evolve, is crucial.

This paper addresses these issues from a science-of-science perspective by pursuing two complementary objectives. The first is to examine how research on health inequality has evolved over the past four decades, with particular attention to the economic aspects of health inequality. The second is to assess whether major political and economic shocks influence academic research agendas, shaping both the volume and the thematic focus of scholarly output on health inequalities.

To answer these questions, we combine bibliometric analysis with an event-study framework. Building on insights from the science-of-science literature, which emphasizes that researchers' topic choices respond to incentives, funding structures, and policy salience, we examine whether external shocks can redirect scholarly attention. In particular, mission-oriented funding schemes and policy-driven research calls have been shown to influence both funded and unfunded researchers' subsequent trajectories, while heightened policy relevance may also affect how evidence is produced under constraints of time and effort.

In this context, periods of austerity represent a salient policy shock. The introduction of the European Fiscal Compact in 2012 imposed stringent fiscal constraints on several countries, intensifying public debate around welfare provision, healthcare access, and social protection. Such conditions may increase the salience of health inequalities, potentially stimulating academic attention

7.7% of GDP, the second largest item after social protection.

to these issues. Accordingly, this study interprets post-shock changes in publication patterns as shifts in scholarly attention and topic prioritisation, rather than as direct measures of research quality or impact.

The remainder of the paper proceeds as follows. Section 2 reviews the background literature and positions our contribution within existing qualitative and bibliometric studies. Section 3 presents the bibliometric analysis of health inequality research, with a focus on economists' contributions and interdisciplinary collaboration. Section 4 examines the impact of austerity measures associated with the Fiscal Compact using a difference-in-differences approach. Section 5 discusses the empirical results, and Section 6 concludes with implications for research policy and future work.

2 Background

Controversial issues ask for systematic reviews, with qualitative and bibliometric analysis of the literature which provide insights into theoretical and methodological challenges. Qualitative reviews assess the most influential studies in the field to evaluate the state of the art, highlight the issues at stake, support competing views, and identify promising research directions. Such reviews can also testify the 'authority' of new subfields. Conversely, bibliometric analysis, which relies on large datasets (e.g., academic articles), maps the structure of research fields by tracking evolving topics and collaborations among scholars. It explores how key research topics and ideas are preserved and transmitted. While numerous qualitative reviews on the literature on health inequality have emerged in recent years, bibliometric reviews are still lacking. Through bibliometric and content analysis, Bouchard *et al.* (2015) investigate the evolution of such a literature, by examining academic articles and policy reports from 1966 to 2014. Among other findings, it appears from their review, that one-third of the 25 most-cited papers belong to the field of epidemiology, followed by ecological studies, methodological research, policy

studies, and economic analyses[6]. Geographical distribution of publications in health inequality is also highly concentrated. Ten countries account for 94% of the scientific output in this field, with the United States contributing 52% and the United Kingdom 30% (p. 102). The spatial dimension of this research is further explored by Cash-Gibson *et al.* (2018), whose departure point is the fact that "Anglo-Saxon and European countries disproportionately dominate first and co-authorship, and are at the core of the global collaborative ... with the Global South on the periphery" (p. 18). However, they also found that when health inequalities research output is adjusted by socio-economic and socio-demographic characteristics of a country, exceptions appear, with some low-income country who perform "particularly well, despite their limited resources" (p. 15; see Badenhorst *et al.* (2016) for similar results for public health research)[7].

This North-South divide is not a matter of research field, being not limited to health inequality research. Aigner *et al.* (2025) found similar patterns in their study on the global distribution of authorships in economics and business journals since 1980.[8]

In the first part of the paper, we examine how the study of health inequality fits within the broader field of health economics, an issue that has not yet been clearly assessed. According to Bhattacharya *et al.* (2014), "few other areas of health economics have garnered as much attention in recent years than the study of the links between socioeconomic status and health" (Ch. 4 p. 51).[9]

[6]It also appears that the earliest article on the most-cited list is the Whitehall II Study (Marmot *et al.*, 1991), which represented 'a turning point in health inequality research that coincided with the start of an exponential growth in scientific productivity' (Bouchard *et al.*, 2015, p. 7).

[7]They show that adjusting scientific production on health inequalities by country GDP per capita, Uganda and Malawi perform equally well as the UK, and when adjusted by population size, Estonia performs better than Germany. See also Xiang *et al.* (2022) bibliometric analysis specifically focused on the relationship between health status and income inequality.

[8]Their analysis revealed a significant imbalance, with authors from low-income countries largely excluded from top-ranked journals in any economics fields, and receiving less attention from the broader academic community. To them, this excessive geographical concentration of research impoverishes the discipline, particularly in fields such as international and development economics, since research driven by local experiences is crucial for uncovering the role of social and cultural structures and for avoiding "parochial perspectives" (p. 2).

[9]Indeed any syllabus of health economics courses include a section devoted to a so much

Their argument is supported by the bibliometric analysis of Wagstaff and Culyer (2012), which shows that health economics has shifted away from traditional areas such as cost–benefit analysis and the demand for health and healthcare, moving toward broader categories that encompass the health–wealth nexus, health and economic development, and the behavioural determinants of health (see also Perri and Rancan, 2025).

On the other hand, in one of the first attempts to assess the structure of the health economics research field, Maynard and Kanavos (2000), and more recently Barbu (2023), conclude that economists' attention on health inequality remain marginal withing the field of health economics, which mainly concentrate on health care issues (Maynard and Kanavos, 2000; Barbu, 2023).[10]

We therefore seek to assess research trends and patterns in the economics literature on health inequality. Specifically, we map collaborations across departments and scholars, examine cross-fertilization, and identify both established and emerging research trends. We then analyze whether publications on health inequality increased following the introduction of the Fiscal Compact in the EU in 2013, particularly in countries most affected by this restrictive policy. More broadly, we assess whether research output on health inequality is higher in countries with poorer health outcomes, wider inequalities, or struggling healthcare systems.

Bibliometric research on health inequalities has employed a range of methodological tools, from descriptive statistics to network analysis, demonstrating the value of quantitative approaches for mapping accumulated knowledge and identifying connections, schools of thought, and research gaps in the field (Cash-Gibson *et al.*, 2018; Xiang *et al.*, 2022; Barbu, 2023; Aigner *et al.*, 2025). Science mapping techniques commonly applied include trend and citation analysis to

pervasive topic which involve any country across the words (Bhattacharya *et al.*, 2014, p. 51)

[10] Maynard and Kanavos (2000) analyzed publications in Health Economics and the Journal of Health Economics to assess the structure of the emerging field of health economics: the topics explored and the methods economists have employed to study population health and its economic implications. They showed that much of economists' attention centered on healthcare supply, particularly on the application of standard cost-benefit analysis for healthcare services and outputs. Barbu (2023) biblimetric analysis confirmed this trend on the basis of 1,620 articles mentioning the term "health economics."

identify seminal works and shared theoretical foundations (Bouchard *et al.*, 2015; Aigner *et al.*, 2025), as well as collaboration analysis (examining authors, institutions, and countries) to characterize the structure of research networks (Xiang *et al.*, 2022; Barbu, 2023). Fontana *et al.* (2019) show that even in the broader economic literature, the geographical distribution of authors, even if it is slightly more diverse than in the past, remains skewed toward Europe and the United States. Recent contributions also move beyond publication and citation totals by constructing text-based measures of novelty, impact, and quality, and by relating these metrics to subsequent citations (Gschwent *et al.*, 2026, see). The next section applies these bibliometric tools to the literature on health inequality in economics, mapping its evolution over time and identifying its main themes, influential contributions, and collaboration networks.

3 Bibliometric analysis

Bibliometric analyses are typically drawn on major scientific databases—primarily Web of Science and Scopus—to extract corpora of relevant publications, subsequently applying quantitative tools to map the evolution of the literature (Fontana *et al.*, 2019; Barbu, 2023; Aigner *et al.*, 2025). The present analysis was conducted using Scopus, an authoritative source of multidisciplinary bibliographic records (Baas *et al.*, 2020), with all records extracted in July 2024. To capture the literature on health inequality within economics, we executed a Boolean-structured query over titles, abstracts, and author keywords:

```
("health") AND ("inequality") AND ("economy" OR "economics" OR
"economic")
```

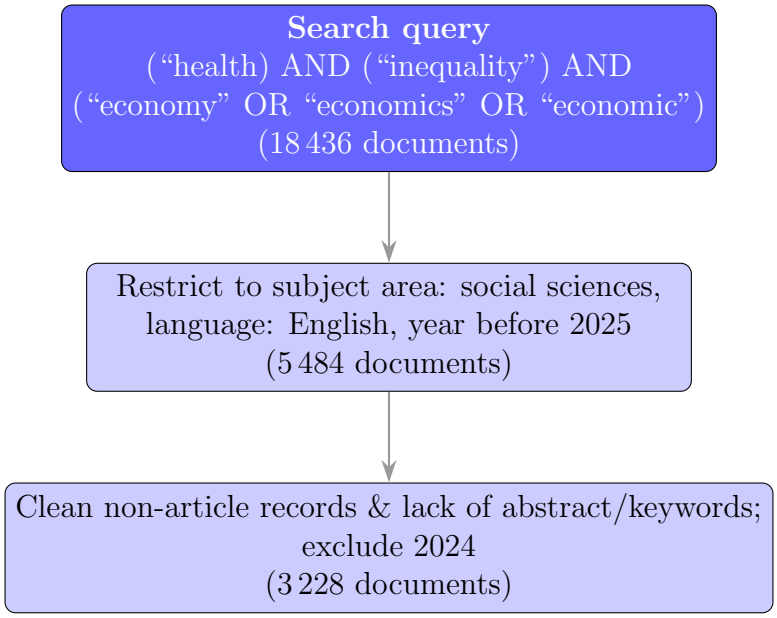
This search initially retrieved more than 18,000 documents of various types (articles, reviews, book chapters, and conference papers). After restricting results to the social sciences subject area, English-language publications, and documents published before 2025, the corpus comprised 5,484 documents.[11]

[11] Recognizing that Scopus's retrospective coverage may be incomplete, we interpret early-period trends—particularly those from the 1980s and 1990s—with caution.

To ensure analytical rigor, we implemented a two-stage cleaning protocol. *(i)* Document-type and metadata filters: We excluded non-article records (e.g., editorials, errata) and entries lacking abstracts or keywords. *(ii)* Temporal filter: We excluded 2024 publications due to partial indexing at the time of extraction.

The resulting corpus of 3,228 peer-reviewed articles, published between 1986 and 2023, formed the basis for our bibliometric analysis. The complete retrieval and data-preparation process is illustrated in Figure 1. Additionally, we assigned country-level indicators by matching each author's country affiliation to its corresponding World Bank income group. Journal-level fields were mapped using the SCImago Journal Rank classification, matched to the source of each paper.[12]

Figure 1: PRISMA flow chart for bibliometric analysis

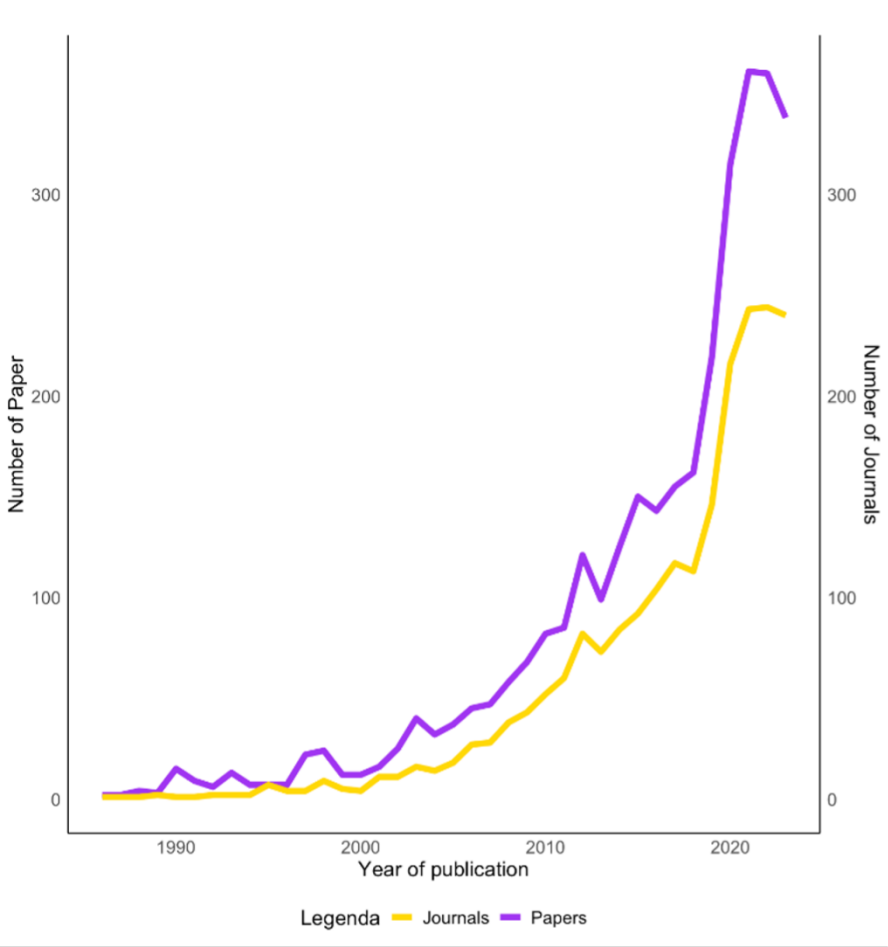


Note: Numbers indicate records at each screening stage; the final corpus includes peer-reviewed journal articles (1986–2023).

[12]All subsequent analyses—including descriptive metrics, country collaboration networks, and thematic evolution—were performed in R using the `bibliometrix` package, selected for its combined statistical rigor and visualization capabilities (Aria and Cuccurullo, 2017; Arruda *et al.*, 2022).

Research on health inequality has grown markedly over time. Figure 2 presents the annual distribution of publications and journals from 1986 to 2023. Output remained negligible throughout the late 1980s and 1990s, began to rise around 2000, and accelerated substantially after 2010. By the 2010s, both the number of published articles and the number of journals addressing health inequality had increased considerably, suggesting that the field experienced significant expansion and diversification. Notably, the parallel growth in journals and articles indicates that new publication venues emerged alongside this research wave, reflecting the increasing scholarly attention devoted to the topic.

Figure 2: Distribution of articles and journals over the period 1986–2023



Note: The figure reports annual counts of articles in the study corpus and the number of distinct journals publishing them.

Results in table 1 show that the most productive authors are social epidemiologists. The only economist in the top-ten list is in fact Johan Costa-i-Font from the London School of Economics. These findings align with those of Xiang *et al.* (2022) and Barbu (2023), as well as regarding leading journals.[13]

[13]Johan Mackenbach, public health professor at the Erasmus University Medical Center of Rotterdam, is a leading scholar in the study of social and health inequality especially across European countries, and closely engaged with the development of policies from the 1990s onwards.

Table 1: *Top 10 Authors by Number of Publications*

Author	**Number of Publications**
Mackenbach JP	15
Bambra C	13
Borrell C	13
Kawachi I	11
Muntaner C	10
Subramanian SV	10
Costa-Font J	9
Kunst AE	8
Lahelma E	8
Li Y	8

Note: Counts are raw article totals (n) per author in the study corpus, based on bibliographic metadata.

The results presented in Table 2 align with the findings of Xiang *et al.* (2022) and Barbu (2023), who identified *Social Science & Medicine* among the leading journals in this field. In our corpus, this journal accounts for more than 16% of total publications.[14] Furthermore, Figure A2 in the Appendix illustrates publication trends among the top journals in our collection, revealing that *Social Science & Medicine* experienced a steady increase in output over time.

[14]This interdisciplinary journal had been established in 1967 by Peter J. M. McEwan when he was director of Harvard University's Family Research Unit.

Table 2: *Top 10 Journals by Number of Publications*

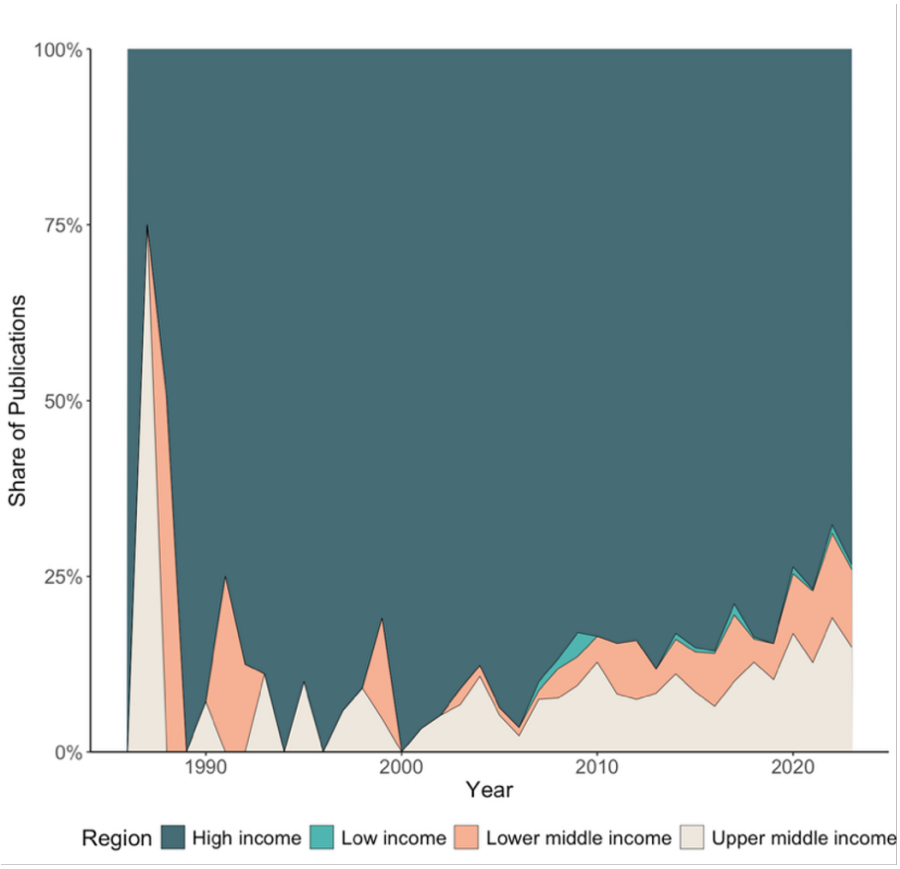
Journal	**Number of Publications**
Social Science and Medicine	538
SSM – Population Health	73
Health and Place	70
Sustainability (Switzerland)	56
Social Indicators Research	50
Economics and Human Biology	44
Sociology of Health and Illness	40
Health Promotion International	35
Ageing and Society	29
World Development	28

Note: Values represent raw counts (n) of articles assigned to each journal based on bibliographic metadata in the study corpus. Counts reflect the number of publications indexed during the study period.

Geographically, research output has gradually become more inclusive. Figure 3 displays publication shares by World Bank income group.[15] High-income nations have historically dominated scholarly production, particularly during the early stages of the field's development. However, this dominance has gradually diminished over time. Upper-middle-income economies have increasingly asserted their presence since the turn of the century, steadily expanding their share of the literature. Lower-middle-income countries, albeit at a slower pace, have also increased their contributions, thereby broadening the geographic base of research. Conversely, low-income regions remain marginalised, contributing a negligible proportion to overall output. Taken together, these patterns suggest a gradual yet discernible democratisation of publishing activity, with the centre of gravity in scholarship progressively shifting beyond the wealthiest nations.

[15]The World Bank website provides information on country classification criteria.

Figure 3: *Share of publications over the period 1986 – 2023 by Country Income Level*



Note: Shares are computed from article counts by authors' country income group (World Bank classification).

As illustrated in Table 3, the top ten affiliations by publication output are predominantly based in the United States and the United Kingdom. The only exceptions are the University of Toronto and the University of Helsinki, which are nonetheless located in North America and Northern Europe, respectively.

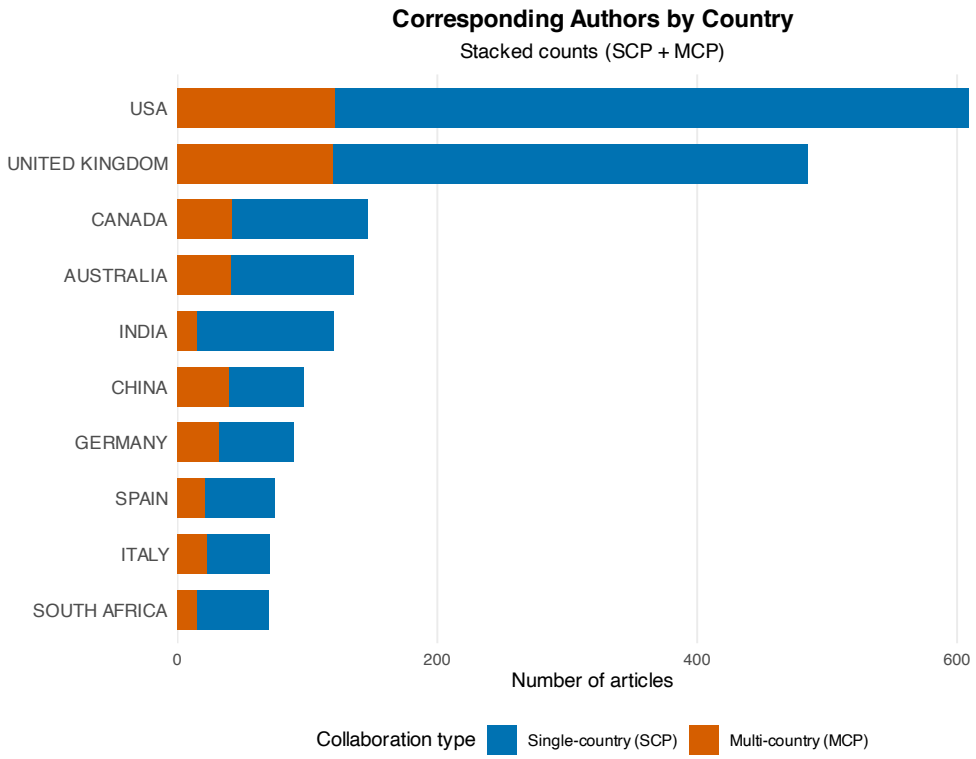
Table 3: *Top 10 Affiliations by Fractional Count*

Affiliation	**Fractional Count**
University of California	30.90617
University College London	28.58474
University of Glasgow	22.23333
University of Oxford	21.43016
University of Toronto	16.60119
London School of Hygiene and Tropical Medicine	15.49167
University of Helsinki	15.01905
University of Michigan	14.78571
University of Manchester	14.71667
University of York	14.62778

Note: Fractional counts allocate each multi-authored article proportionally across authors' listed affiliations (summing to one per article).

Furthermore, Figure 4 presents the number of publications distinguishing between single-country publications (i.e., papers authored exclusively by researchers from the same country) and multiple-country publications (i.e., papers involving authors from at least two different countries). The preponderance of publications from the United States and the United Kingdom is evident, followed by Canada, Australia, and China. Three European countries (Germany, Italy, and Spain) and one African country (South Africa) also play a role among the top contributors.

Figure 4: *Most productive countries over the period 1986 – 2023*

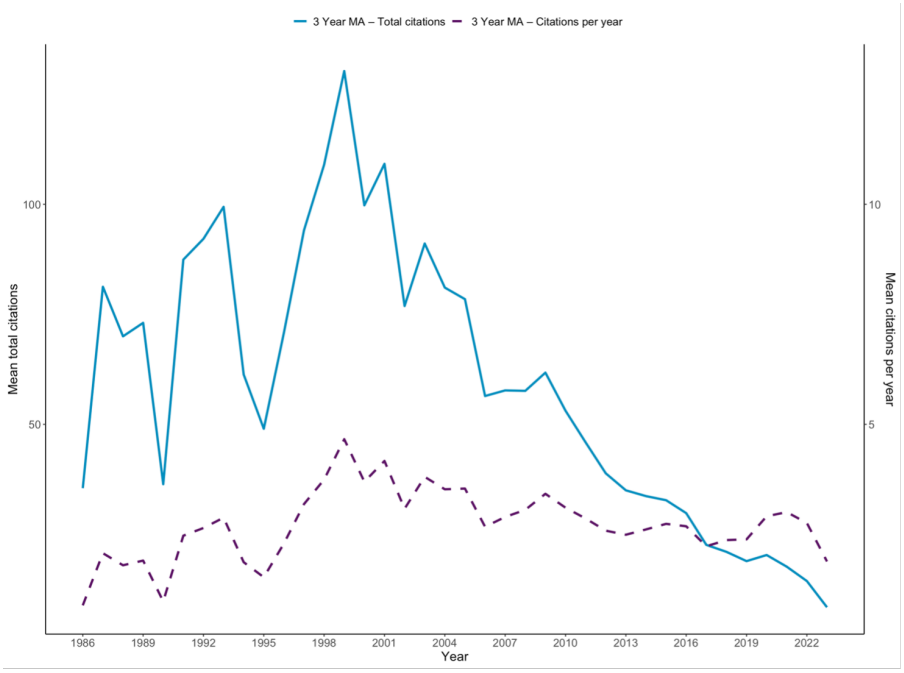


Note: Bars split total publications into single-country articles (all author affiliations in one country) and multi-country collaborations (affiliations spanning ≥ 2 countries).

Citation patterns follow expected cohort trends. Figure 5 displays citation counts by publication year cohort using a three-year moving average. Older cohorts (i.e., earlier publication years) have accumulated more total citations than recent ones, simply because they have had more time to be cited. When citations are normalised by paper age (i.e., dividing total citations by years since publication), citation rates increased sharply in the earlier years of our dataset, then reached a peak around the 2000s, and decreased in the most recent years. This pattern reveals the importance of adjusting for time when comparing impact across cohorts. Taken toghether, these trends illustrate how raw citation counts are influenced by paper age, thereby highlighting

the necessity of per-year normalisation to ensure unbiased comparisons across different publication cohorts.

Figure 5: *Distribution of articles' Citations over the period 1986 – 2023*

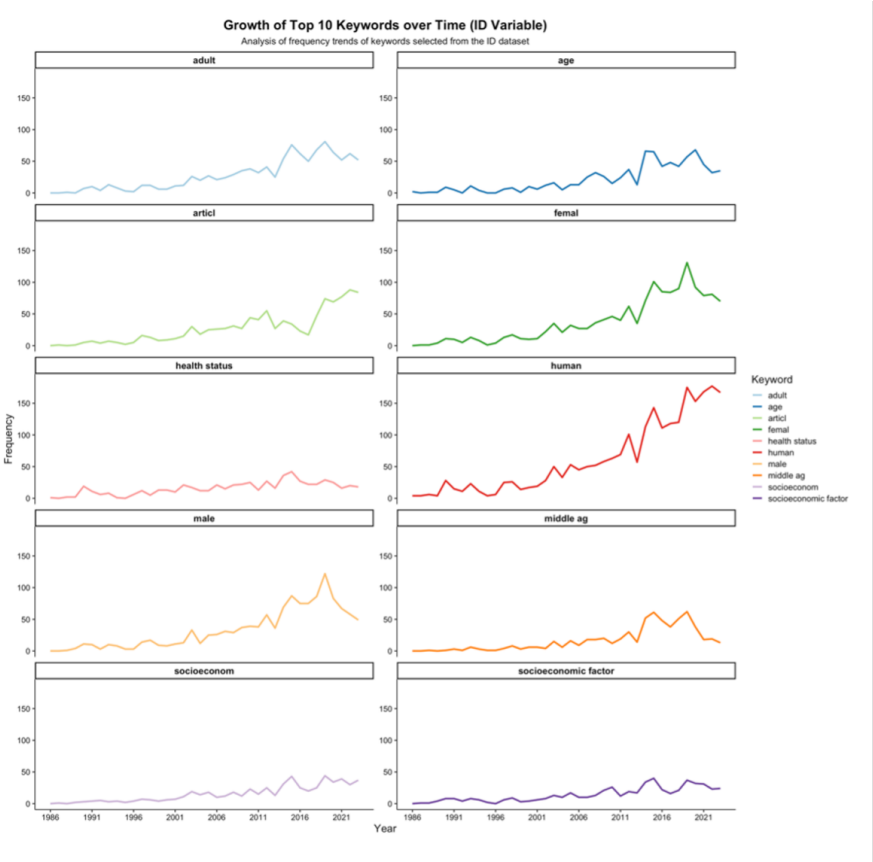


Note: Points show the mean citations per article by publication year (3-year moving average); the dashed series reports citations per year (citations normalized by time since publication).

Topic analysis reveals both stable and emerging themes. We applied a stemming algorithm to normalise each keyword to its root form (for example, "inequality," "inequalities," and "inequitable" were all reduced to "inequality"), thereby ensuring that morphologically related variants were consolidated. We examined two sets of keywords: Scopus index terms (ID) and author-supplied keywords (DE). Figure 6 illustrates the evolving prominence of the ten most frequent Scopus ID keywords across articles. The term "human" is predominant in this field, having emerged in the mid-1990s and increased markedly in frequency during the latter years of the 20th century, surpassing all other terms in popularity. The gender markers "female" and "male" follow roughly parallel trajectories, suggesting a growing emphasis on sex-based analyses. Life-stage

descriptors such as "age," "adult," and "middle age" all gained traction after the early 2000s, with "adult" rising most steeply among them. Conversely, health status features more modestly, exhibiting only marginal growth. The token "article," presumably an artefact of indexing conventions, also displays a steady upward trend. Finally, socioeconomic identifiers—including "socioeconom" and "socioeconomic factor"—remain at the lower end of the frequency spectrum but have shown a gradual increase in recent years, suggesting a growing interest in social and economic determinants.

Figure 6: *Top 10 articles' Keywords (ID) over the period 1986 – 2023*

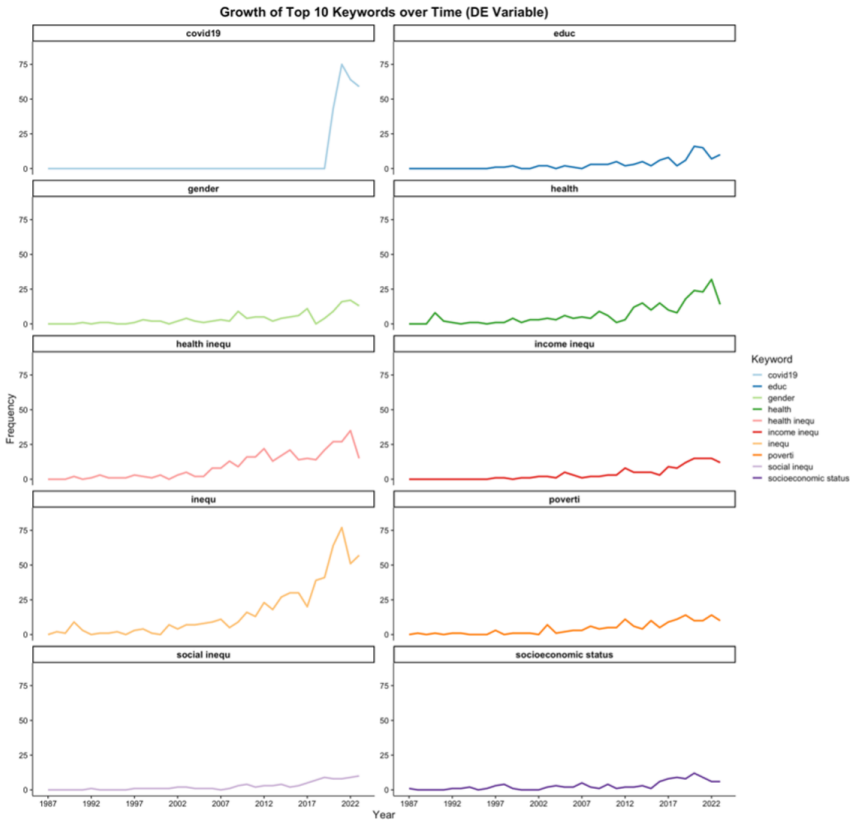


Note: Lines show annual frequencies of the ten most common Scopus index keywords (ID) in the study corpus.

Author keywords (Figure 7) illustrate the shifting prominence of the top

ten author-assigned keywords. During the initial phase, most of these terms remained at relatively low levels. However, beginning in the early 2000s, a cluster of inequality-related keywords—including "income inequality," "inequality," and "health inequality"—experienced a consistent upward trend, with income-focused terms demonstrating the most pronounced increase. In contrast, "gender" and "health" follow a more gradual upward trajectory throughout the period, reflecting their enduring centrality to the field, while "education" exhibits steady growth over the entire time span. "Poverty" and "social inequality" register moderate gains, whereas "socioeconomic status" remains the least frequently used term. Notably, the keyword "covid-19" appears only during the pandemic years, rising sharply before declining in the most recent data. Collectively, these trends suggest the field's growing focus on various dimensions of inequality, the increasing significance of gender and health-related issues, and the rapid impact of major global events on research agendas.

Figure 7: *Top 10 articles' Keywords (DE) over the period 1986 – 2023*

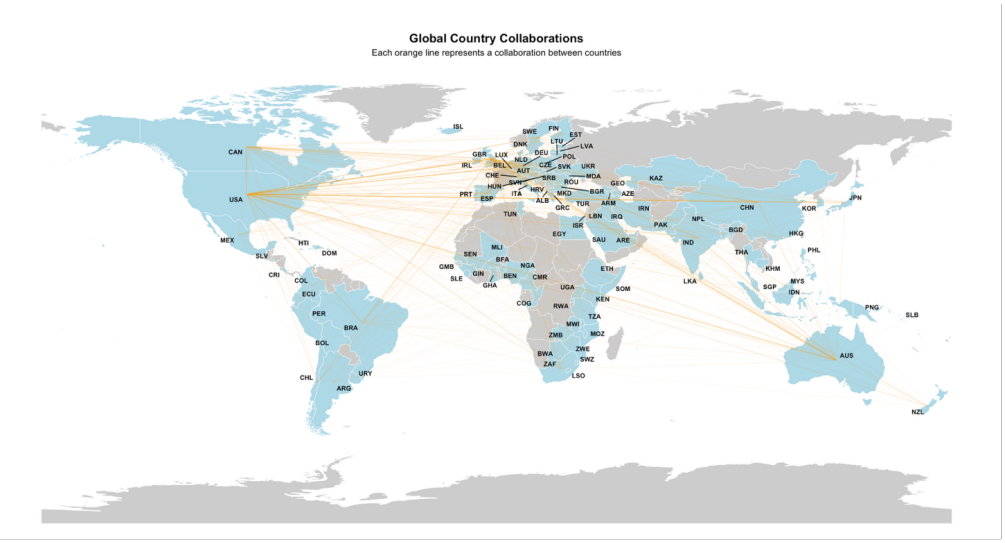


Note: Lines show annual frequencies of the ten most common author-provided keywords (DE) in the study corpus.

Collaboration networks are dominated by high-income countries but are becoming increasingly global. Figure 8 maps country-to-country co-authorship links. Each orange line traces co-authorship connections between nations, while the intensity of shading reflects the volume of joint publications. As the map illustrates, high-income countries—most notably the United States, the United Kingdom, and several Western European nations—serve as central hubs, establishing partnerships with a wide array of collaborators across every continent. Emerging economies such as China, India, Brazil, and South Africa also appear as important nodes, connecting both within their regions and to leading research centres in North America, Europe, and Australia. Collaborations

among lower- and middle-income countries are evident but more geographically clustered, reflecting regional research networks in Latin America, Sub-Saharan Africa, and Southeast Asia. Overall, these patterns underscore the increasingly interconnected nature of scholarly work, with cross-border partnerships playing a critical role in advancing scientific knowledge. Further details are presented in Table 4 and Figure A1, which reveal that the majority of collaborations involve the United States and the United Kingdom, with the partnership between these two countries being the most frequent in our corpus.

Figure 8: *Countries' collaborations over the period 1986 – 2023*



Note: Links indicate at least one co-authored article between two countries (based on author affiliations) highlighted countries are those with at least one collaboration in the corpus.

Table 4: *Top 10 Country Collaborations*

Rank	Country 1 (ISO3)	Country 2 (ISO3)	Number of Collaborations
1	GBR	USA	54
2	CAN	USA	36
3	CHN	USA	30
4	AUS	GBR	27
5	DEU	USA	23
6	ESP	GBR	23
7	DEU	GBR	20
8	AUS	USA	19
9	GBR	NLD	19
10	CAN	GBR	18

Note: Collaborations count co-authored articles with author affiliations spanning both countries (ISO3 codes), based on the study corpus.

4 Impact of Austerity on Health Inequalities Research in Economics

In this section, we examine how external political and economic shocks can shape academic research, focusing on the case of the European *Fiscal Compact* austerity measures. The Fiscal Compact enforced strict budgetary discipline across several EU countries, leading to substantial public spending cuts in countries facing sovereign-debt crises. To analyze the impact of this shock on research related to health inequalities, we implement a difference-in-differences (DiD) approach. Specifically, we compare trends in health-inequality-related publications between countries that underwent severe austerity after the Fiscal Compact (e.g., Greece, Italy, Spain, Portugal, Ireland) and those that did not experience comparable fiscal constraints (e.g., countries with more stable finances or outside the treaty). This quasi-experimental design allows us to control for common time trends and isolate the effect of austerity on research output.

The European Union's 2012 Fiscal Compact imposed strict budget discipline on countries like Portugal, Italy, Greece, and Spain (the "PIGS"), triggering far-

reaching austerity measures. This major policy shock not only squeezed public expenditures but also altered the landscape for academic research funding and priorities. We can think of it as a "natural experiment" in how research incentives and outputs respond to a sudden, externally imposed funding crunch. A difference-in-differences perspective is useful: PIGS experienced the austerity "treatment" after 2012, while other countries (controls) did not face the same shock. Comparing trends in economics research (especially on health inequality topics) before vs. after 2012 between these groups can illuminate how policy changes shape academic behavior. Against this backdrop, we expect academic economists in PIGS to adapt their research agendas differently than peers in unaffected countries.

Policy decisions and societal crises can influence the agenda of academic research drawing attention to health inequalities, generating greater societal concern and urgency around these issues. For instance, the austerity programs in Southern Europe during the early 2010s led to measurable deterioration in health outcomes and access to care for vulnerable populations. In Italy, a cost-containment plan in the health sector (a response related to the broader austerity regime) succeeded in reducing deficits but also coincided with a 3% rise in avoidable mortality and reduced healthcare capacity(Arcà *et al.*, 2020).

Another important factor is the reallocation of research funding and priorities in response to the crisis. When major shocks occur, governments and institutions often channel resources into studying the problems at hand (for example, special grants or calls targeting the health impacts of the recession and austerity). Under normal circumstances, most scientists tend to stick to established research trajectories, and truly novel, high-risk projects are relatively rare because the expected rewards often do not outweigh the risk of failure (Myers, 2020). However, exceptional circumstances—like a public health crisis triggered by economic austerity—can alter this calculus. Foster *et al.* (2015) empirically analyze researchers' strategies in biomedical chemistry and find that conservative research strategies, akin to little novelty and deepening knowledge, are more widespread than risky strategies. Heightened public and policy interest in health inequalities, coupled with targeted funding

opportunities, likely lowered the barriers to entry for researchers to engage with these topics. In essence, the external shock created both a demand for new knowledge and supply of resources to investigate it, making it more feasible and rewarding for scientists to pivot toward health equity research. This aligns with recent findings that when there is a strong demand or mandate for certain knowledge, researchers will respond, provided the support is there (Carnehl and Schneider, 2025).

To assess the role of austerity in the research outputs this study employs a difference-in-differences (DiD) approach to examine the impact of the implementation of the Fiscal Compact in 2012 on the volume of health inequality research, as quantified by the number of publications. By focusing on the differences in trends before and after the implementation of the policy, DID analysis provides a robust framework for understanding whether the observed variations can be attributed to the Fiscal Compact or to other confounding factors. Through this method, we gain valuable insights into the policy's impact on academic output and can identify whether its influence is consistent across different groups of countries or varies based on their economic or institutional characteristics.

Treated Group (PIGS Countries): Portugal, Italy, Greece, and Spain are collectively referred to as the "treated" group because they were not only directly affected by the Fiscal Compact but also faced significant economic pressures during the broader European debt crisis Carrieri *et al.* (2017); Arcà *et al.* (2020). This context potentially makes them more sensitive to policy changes. Control groups are defined as follows: The remaining countries in the dataset constitute the primary comparison group (*All Countries*). European countries are included to control for shared regional frameworks and policies (*European Countries*), while countries formally adhered to the Fiscal Compact to control for the direct influence of the agreement itself (*Fiscal Compact Signatories*) [16].

The outcome variable, defined as the number of publications, is a non-negative variable with a substantial mass at zero. A longstanding concern in

[16]The complete list of countries utilized in each control group is reported in Table A1.

empirical economics is how to specify regression models for such outcomes $y \geq 0$ when a nontrivial fraction of observations are exactly zero. A common approach is to apply a monotonic transformation f to y and estimate a linear model

$$f(y) = x'\beta + \varepsilon, \tag{1}$$

which can make the assumptions of the linear regression model (e.g. homoscedasticity) more plausible and reduce the impact of outliers and extreme values on coefficient estimates (Wooldridge, 2016, p. 172). Among possible choices for f, we use the inverse hyperbolic sine (IHS) transformation,

$$\operatorname{asinh}(y) = \ln\left(y + \sqrt{y^2 + 1}\right), \tag{2}$$

which behaves similarly to the natural logarithm for large y but is defined at zero (and negative) values. This allows us to retain observations with zero publications while mitigating right-skewness in the positive tail (Burbidge *et al.*, 1988; Bellemare and Wichman, 2020; Aihounton and Henningsen, 2021). The IHS transformation has been used in applications with similarly skewed, zero-inflated outcomes such research impact measures (Hospido and Sanz, 2021). Related modeling challenges arise in health economics when analyzing healthcare use and expenditures, which are likewise nonnegative and highly skewed (Mullahy, 1998; Manning *et al.*, 1987; Deb and Norton, 2018).

The empirical model specified with binary treatment (Imbens and Wooldridge, 2009; Baker *et al.*, 2025) is as follow:

$$\mathit{Publications}_{i,t} = \theta_i + \lambda_t + \delta\left(D_i \times \mathrm{Post}_t\right) + \beta X_{it} + u_{it} \tag{3}$$

where:

i indexes countries and $t \in \{1986 - 2023\}$ indexes years;

$\mathrm{Publications}_{i,t}$ is the annual number of health inequality publications for country i at time t; transformed using the inverse hyperbolic sine (asinh).

D_i is a binary variable indicating whether country i is in the treated group

(PIGS = 1; otherwise = 0);

Post_t is a binary variable indicating whether the observation occurs after 2012 (post-treatment = 1; pre-treatment = 0);

θ_i are country FEs;

λ_t are year FEs;

X_{it} is a vector of time-varying controls, with coefficients β;

$D_i \times \text{Post}_t$ is the standard 2×2 DiD interaction; δ is the causal DiD-estimate of treatment on Y_{it};

u_{it} is the error term in this specification.

A statistically significant δ would indicate that the Fiscal Compact has exerted an influence on the trajectory of health inequality publications in PIGS countries, in comparison with the control group. Conversely, a non-significant estimate would imply that any observed differences might be attributable to chance or other unaccounted factors.

The DiD approach, by integrating all countries in the dataset and emphasizing the PIGS countries as the treatment group, provides a rigorous framework for detecting the impact of the Fiscal Compact on scholarly output regarding health inequality. The incorporation of multiple subsamples enables the probing of the robustness of our findings across different contexts, thereby strengthening the validity of any inferences drawn.

This analytical strategy provides valuable insight into how large-scale policy developments may reshape academic priorities and production in the field of health inequality research.

4.1 WDI control variables

To isolate the causal impact of the policy intervention on scientific output, we include a comprehensive set of country-level controls that the literature has shown to be systematically associated with research performance and

capacity (e.g., Crespi and Geuna, 2008; Bornmann *et al.*, 2014; Cimini *et al.*, 2014; Riccaboni and Verginer, 2022; Ahrabian *et al.*, 2024). We draw all covariates from the *World Development Indicators* database of the World Bank, the premier collection of internationally comparable development statistics compiled from officially recognized sources retrieved using WDI R package (Arel-Bundock, 2023).[17] Using WDI ensures harmonized measurement across economies and transparent, citable metadata for each series. Specifically, we condition on: (i) human capital in research, proxied by *Researchers in R&D (per million people)*, which captures both the availability of qualified scientific personnel and the intensity of research activity, a key channel through which structural differences across countries could bias estimates if uncontrolled; (ii) economic and demographic scale, measured by the natural logarithms of *GDP (current US$)* and *Population*, since larger and more populous economies tend—purely by scale effects—to generate more publications independent of policy; (iii) the average level of development, captured by the natural logarithm of *GDP per capita (current US$)* to absorb cross-country heterogeneity in income, living standards, and fiscal/administrative capacity that may co-move with advanced research infrastructure and institutional quality; (iv) investment in education and educational breadth, via *Government expenditure on education, total (% of GDP)* and *School enrollment, secondary (% gross)*, which together mitigate the risk that long-run differences in educational attainment confound observed research productivity; (v) global integration, using *Trade (% of GDP)* to reflect openness that facilitates cross-border flows of knowledge, technology, and skilled labor; and (vi) macroeconomic stability, using *Inflation (annual %)* to account for price dynamics that can distort intertemporal allocation and raise the cost of long-horizon R&D commitments. By jointly conditioning on research labor supply, economic and demographic scale, average development, educational investment and breadth, global integration, and macroeconomic stability, the model substantially reduces the risk that estimated effects capture structural cross-country differences rather than the causal impact of the policy intervention of interest, following established cross-country studies on the

[17] See World Development Indicators (WDI) database for additional information.

determinants of scientific production and competitiveness (Crespi and Geuna, 2008; Bornmann *et al.*, 2014; Cimini *et al.*, 2014) and recent work on shocks and resilience in science (Riccaboni and Verginer, 2022; Ahrabian *et al.*, 2024). Descriptive statistics for all variables are reported in Table 5.

Table 5: WDI descriptive statistics

Variable	N	Mean	SD	Min	P25	Median	P75	Max
R&D researchers per million	2812	1950.574	2039.493	10.727	173.932	1113.641	3314.084	9434.762
log(GDP)	2812	25.389	1.967	19.826	23.935	25.425	26.709	30.953
log(Population)	2812	16.765	1.545	12.402	15.868	16.720	17.769	21.087
Public education spending (% GDP)	2812	4.602	1.666	0.000	3.678	4.479	5.394	44.334
Trade openness (% GDP)	2812	75.806	45.871	0.021	45.251	65.774	91.462	412.177
Secondary enrolment (gross, %)	2812	81.350	33.126	3.618	57.368	91.410	102.236	164.080
Annual inflation	2812	24.057	169.212	-28.760	1.985	4.580	9.793	4107.297
log(GDP pc, USD)	2812	8.625	1.648	3.133	7.337	8.722	10.054	11.813

Note: The table reports descriptive statistics from the World Development Indicators (WDI) for the full sample. N denotes the number of non-missing observations. Mean and SD are the sample mean and standard deviation. Min and Max are the sample extrema. P25 and P75 are the 25th and 75th percentiles, and Median is the 50th percentile. Data were retrieved following the procedure in Arel-Bundock (2023).

5 Results

We examine whether the 2012 Fiscal Compact foster research outputs on health inequality in the PIGS countries (Portugal, Italy, Greece, and Spain) using a two-way fixed-effects difference-in-differences (DiD) design with *asinh*-transformed publication counts as in Eq. 3.

Table 6 reports estimates. Each column re-estimates the baseline specification on a different comparison set—(i) all countries, (ii) Fiscal Compact signatories, and (iii) European countries only—so as to assess how sensitive the results are to the choice of sample. Across all three comparison sets, the coefficient on *Post* $\times$ *Treated (2012)* is positive and highly statistically significant, indicating an increase in scientific outcomes for treated countries after 2012 relative to the corresponding control group. Panel A reports specifications without covariates. Panel B adds country–year covariates; the point estimates attenuate but remain positive and statistically significant in all three samples.

The pattern of ancillary coefficients is broadly plausible. The stock of R&D personnel is positively associated with publications, population loads positively and strongly in the signatories and European subsamples, and GDP per capita is positive and significant in Europe. Trade openness is negatively signed and significant in the signatories and European samples, suggesting composition effects among smaller, highly open economies. Education spending and inflation are not precisely estimated. The negative coefficient on total GDP in the European sample likely reflects multicollinearity when GDP, population, and GDP per capita enter jointly.

Table 6: DiD Model Results

Dependent variable: *Publications* (asinh)

	All Countries	Fiscal Compact Signatories	European Countries
Panel A: Without Covariates			
Post × Treated (2012)	0.882***	0.755***	0.824***
	(0.122)	(0.131)	(0.127)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	2,812	836	1,178
Panel B: With Covariates			
Post × Treated (2012)	0.720***	0.527***	0.633***
	(0.123)	(0.129)	(0.123)
R&D researchers per million	0.0002***	0.0001	0.0001**
	(0.00003)	(0.00005)	(0.00004)
log(GDP, USD)	-0.572	-1.779	-3.700**
	(0.400)	(1.662)	(1.279)
log(Population)	0.074	5.043**	6.406***
	(0.396)	(1.544)	(1.205)
Public education spending (% GDP)	0.003	0.007	-0.002
	(0.013)	(0.046)	(0.038)
Trade openness (% GDP)	-0.002**	-0.009***	-0.007***
	(0.001)	(0.002)	(0.001)
Secondary enrolment (gross, %)	-0.005***	-0.004	-0.001
	(0.001)	(0.003)	(0.002)
Annual inflation	0.00004	0.0001	0.0001
	(0.0001)	(0.0004)	(0.0001)
log(GDP per capita, USD)	0.536	1.618	3.506**
	(0.402)	(1.617)	(1.247)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	2,812	836	1,178

Note: Dependent variable: asinh(*Publications*). Treated countries are Portugal, Italy, Greece, and Spain. All specifications include country and year fixed effects. Panel A excludes covariates; Panel B includes the country-year controls listed in the table. Standard errors (in parentheses) are clustered by country. *p<0.05; **p<0.01; ***p<0.001.

To address potential confounding from the COVID-19 pandemic (which spurred many publications globally), we re-estimated excluding years from 2020 and after due to the uprising of the covid-19 pandemic. To probe sensitivity to the pandemic-era publication surge, Table 7 re-estimates the models excluding

years from 2020 onward. The DiD coefficients remain positive, and statistically significant across all estimations. The modest reduction in magnitude relative to Table 6 is consistent with the pandemic amplifying publication volumes after 2020, as also represented in Figure 2, but the core association between the Fiscal Compact period and PIGS research output remains intact. Covariate patterns mirror the baseline results.

Table 7: DiD Model Results — Before 2020.

Dependent variable: *Publications* (asinh)

	All Countries	Fiscal Compact Signatories	European Countries
Panel A: Without Covariates			
Post × Treated (2012)	0.783***	0.654***	0.694***
	(0.127)	(0.141)	(0.135)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	2,516	748	1,054
Panel B: With Covariates			
Post × Treated (2012)	0.655***	0.483***	0.538***
	(0.128)	(0.141)	(0.132)
R&D researchers per million	0.0002***	0.0001	0.0001**
	(0.00003)	(0.0001)	(0.00004)
log(GDP, USD)	-0.327	-0.812	-1.266
	(0.442)	(1.626)	(1.257)
log(Population)	-0.134	3.468*	4.022***
	(0.435)	(1.504)	(1.174)
Public education spending (% GDP)	0.010	0.037	0.008
	(0.012)	(0.047)	(0.038)
Trade openness (% GDP)	-0.001	-0.007***	-0.007***
	(0.001)	(0.002)	(0.001)
Secondary enrolment (gross, %)	-0.005***	-0.004	-0.0002
	(0.001)	(0.003)	(0.002)
Annual inflation	0.00005	0.0001	0.0001
	(0.0001)	(0.0004)	(0.0001)
log(GDP per capita, USD)	0.318	0.730	1.214
	(0.442)	(1.580)	(1.224)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	2,516	748	1,054

Note: Dependent variable: asinh(*Publications*). Treated countries are Portugal, Italy, Greece, and Spain. The estimation sample is restricted to pre-2020 observations (through 2019). All specifications include country and year fixed effects. Panel A excludes covariates; Panel B includes the country-year controls listed in the table. Standard errors (in parentheses) are clustered by country. *p<0.05; **p<0.01; ***p<0.001.

Across specifications, samples, and time windows, we find a robust and meaningful increase in scientific output for PIGS countries relative to other countries after 2012. While the inclusion of rich covariates reduces the estimated effects, they remain positive and statistically significant, suggesting that the results are not driven by observable cross-country differences in scale, human capital, openness, or macroeconomic conditions. These findings are consistent with a sustained post-2012 divergence in research output for PIGS, subject to the usual DiD identification assumptions. More generally, this interpretation is consistent with evidence from the science-of-science tradition that researchers' topic choices respond to incentives, career constraints, and the prevailing research environment (Fortunato *et al.*, 2018), and with findings that mission-oriented calls can steer research agendas toward targeted themes, affecting funded applicants (Mancuso and Broström, 2026). Incentive structures within research funding can also influence the direction of scientific exploration more broadly (Azoulay *et al.*, 2011).

At the same time, beyond changes in the volume of publications and the thematic focus of the field, heightened policy salience may also shape how researchers pursue these topics. In particular, Borjas and Breznau (2026) argue that, under tight time and effort constraints, researchers may "satisfice" by settling on an appealing result rather than exhaustively probing the full space of reasonable alternatives. In our context, periods of austerity and intensified policy debate may therefore influence health-inequality scholarship by reorienting attention toward specific topics and, potentially, by shaping the pathways through which evidence on these topics is produced. Accordingly, we interpret our event-study evidence primarily as capturing shifts in scholarly attention and topic prioritization following policy shocks, while leaving a systematic analysis of within-field thematic reorientation and longer-run research trajectories to future work.

6 Conclusions

This study provides a comprehensive bibliometric portrait of health inequality research and highlights how economic context can shape scholarly activity. The bibliometric results show a striking expansion of the field since the early 2000s. Publication output and journal venues have grown in tandem, indicating that the community of scholars and outlets has diversified. Although high-income countries remain central hubs, emerging economies are contributing more over time, suggesting a gradual broadening of authorship. The topic analysis reveals that inequality has become a prominent theme, while major events like the COVID-19 pandemic produce short-lived spikes in interest.

Importantly, our event analysis suggests that fiscal policy shocks can spur academic attention and topic prioritization. The increase in publications by PIGS countries after 2012 implies that the Fiscal Compact may have prompted researchers to focus more strongly on this topic. This could reflect increased funding for relevant studies, raised public concern, or an urgency to analyse the social impacts of austerity.

In essence, researchers appear to have responded to the changing policy environment by producing more work on health inequalities. This finding underscores a feedback loop between socioeconomic conditions and research priorities: large-scale economic policies can realign scholarly agendas. For policymakers and research funders, these insights have relevant implications: the growing body of health inequality research—now engaging economists alongside public health and social scientists—suggests that the field is maturing and ready to inform policy. At the same time, the sensitivity of research output to fiscal events indicates that supporting research capacity during and after downtime may be crucial. Future work could examine the content of post-2012 publications to see if study findings or policy recommendations shifted. It would also be valuable to apply similar methods to other shocks (e.g. the 2008 financial crisis) or to analyze citation impact and funding patterns. By understanding what drives academic focus, stakeholders can better anticipate and encourage research in areas of societal need.

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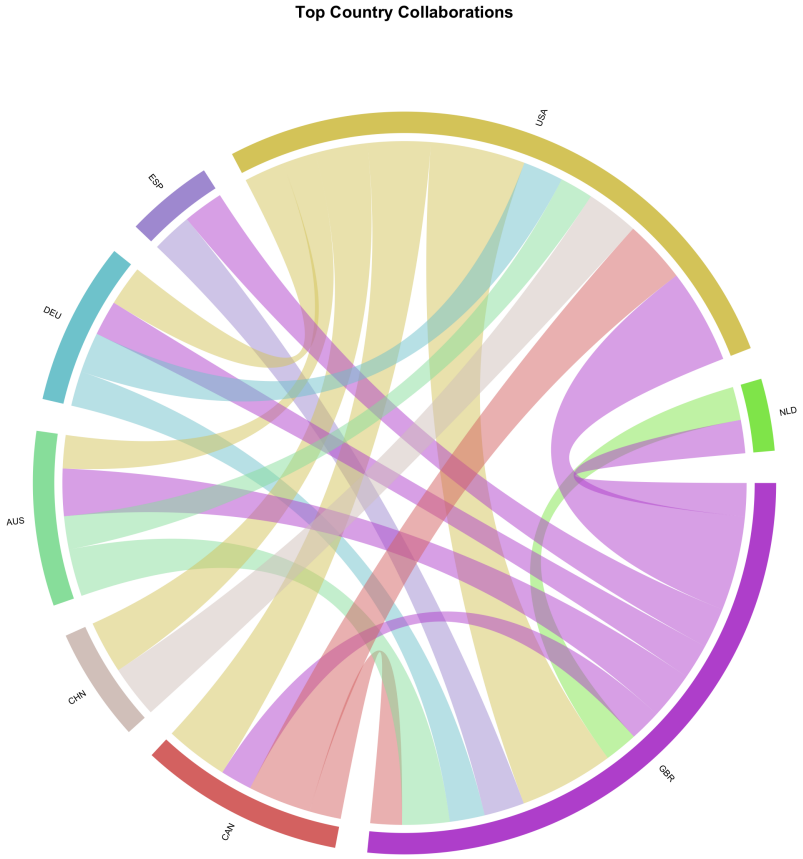
Appendix

A.1 Additional figures and tables

Figure A1: *Top countries coolaborations*



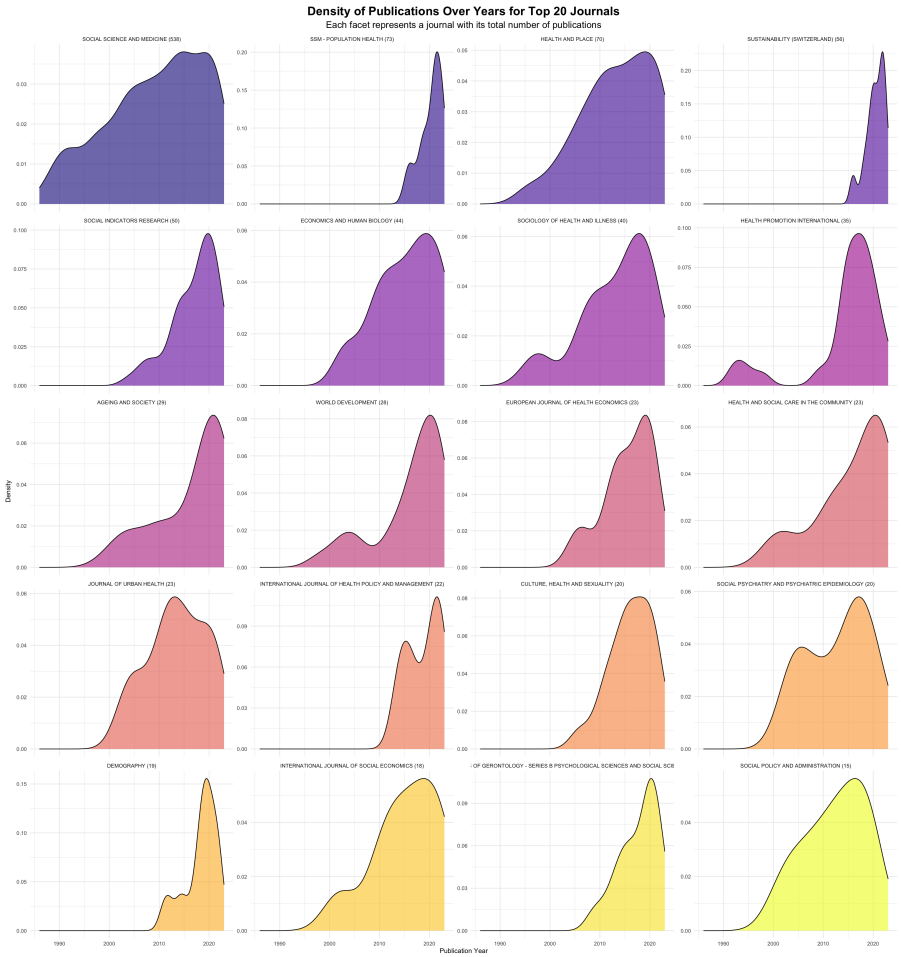
Note: The figure shows a chord diagram of international research collaborations in the publication sample. Countries are identified by ISO-3 codes. Ribbons connect country pairs and their width is proportional to the number of co-authored publications involving affiliations in both countries (aggregated over the sample period). The length of each outer arc represents a country's total collaboration volume within the set shown. Only the most frequent collaborating countries/links are displayed for readability.

Table A1: Country Samples

All Countries	Fiscal Compact Signatories	European Countries
Argentina, Armenia, Australia, Austria, Belgium, Botswana, Brazil, Bulgaria, Burkina Faso, Canada, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Ecuador, Egypt, Estonia, Ethiopia, Finland, France, Germany, Ghana, Greece, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Italy, Japan, Kazakhstan, Kenya, Korea, Lithuania, Luxembourg, Malaysia, Mexico, Morocco, Mozambique, Nepal, Netherlands, Norway, Pakistan, Philippines, Poland, Portugal, Romania, Rwanda, Senegal, Serbia, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Tanzania, Thailand, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Zambia, Zimbabwe	Austria, Belgium, Bulgaria, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden	Austria, Belgium, Bulgaria, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Armenia, Croatia, Czech Republic, Iceland, Norway, Serbia, Switzerland, Ukraine, United Kingdom

Note: The table reports the country composition of the three samples used in the DiD analysis. "All Countries" is the baseline global sample. "Fiscal Compact Signatories" includes countries that signed the 2012 Fiscal Compact (Treaty on Stability, Coordination and Governance). "European Countries" denotes the within-Europe comparison set (signatories plus additional European countries). Country membership is fixed across specifications within each sample.

Figure A2: *Density of publications for top 20 Journals*



Note: The figure plots kernel density estimates of publication years for the 20 journals with the highest number of publications in the sample. Each panel corresponds to one journal; the number in parentheses in the panel title reports the total publication count for that journal. Densities are normalized within journal (area under each curve equals one), so the vertical scale reflects the concentration of publications over time rather than absolute output. The horizontal axis reports publication year.