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Nobel laureates and new institutional economics: a bibliometric analysis of Douglass North, Ronald Coase, Elinor Ostrom, and Oliver Williamson

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Abstract: This article proposes a bibliometric analysis of the literature on new institutional economics (NIE). The analysis employed the Web of Science database and the software tools VOSViewer and Sci² from 1956 to 2023. The results revealed that the USA has the highest involvement in NIE literature concerning citations and co-authorship. Moreover, US universities demonstrate significant representation in this field of knowledge, occupying eight out of the top 10 positions among the most relevant institutions in NIE literature. Among the most cited authors, economist Elinor Ostrom stands out, and the most cited publication is ‘*The Problem of Social Cost*’ by Ronald Coase. This study elucidates the preeminent academic institutions that serve as benchmarks within the field of NEI research. Additionally, it undertakes the task of mapping representing publications, catering to individuals aspiring to make substantive contributions to cognate topics within this realm in prospective scholarly investigations.

Keywords: new institutional economics; NIE; North; Coase; Ostrom; Williamson; institutions; bibliometric; Nobel laureates; institutionalism; governance; contract; economic theory.

JEL codes: B25; D02; I23.

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1 Introduction

The new institutional economics (NIE) significantly shapes our understanding of economic and social institutions. The NIE and the original institutionalism are (or were) internally highly heterogeneous regarding their assumptions and methods (Hodgson, 2014). Within this academic domain, the seminal contributions of esteemed Nobel laureates in Economics, namely Douglass North, Ronald Coase, Elinor Ostrom, and Oliver Williamson, have been pivotal in formulating this analytical framework. Douglass North’s scholarly framework posits that economic transactions involve transactional and transformational costs. He argues that the intricate collaboration among agents is

explicated through a nexus of informal rules intertwined with cultural norms alongside formal rules reflecting societal organisation and labour division intricacies. North's endeavour cultivates a theoretical construct emphasising the paramount role of institutions in elucidating economic transactions. In his view, the neoclassical paradigm aligns with developed economies and financial market analyses; however, he challenges the notion that all actors' decision-making uniformly conforms to rational choice (North, 1990).

The seminal discourse on transaction costs, a pioneering facet, stems from the intellectual contributions of Ronald Coase. Coase's works stand as veritable milestones, providing significant insights into the pivotal role of institutions in underpinning economic functionality. Ronald Coase's body of work, *'The Nature of the Firm'* (Coase, 1937), holds a distinctive position, where he made substantial contributions to understanding how firms strategically reallocate internal resources to ameliorate transaction costs. Another seminal contribution emerges from his notable work, *'The Problem of Social Cost'* (Coase, 1960). Within this treatise, Coase posits that predicaments stemming from externalities need not invariably necessitate government intervention for an optimally efficient resolution but can be addressed through bilateral agreements among individual actors. Coase's profound insights culminated in the Coase Theorem, postulating that involving parties can create an arrangement that maximises collective welfare under well-defined property rights and minimal transaction costs. Coase's pivotal investigations into transaction costs profoundly influenced the conceptual evolution regarding the economic cost structure of firms. His elucidation of the operational dynamics of firms and their potential to mitigate transactional expenditures has played an instrumental role in the maturation of institutional economics, economic, and organisational paradigms.

Oliver Williamson made notable and substantial contributions to transaction costs, emphasising organisational economics and contract theory (Williamson, 1979). His scholarly endeavors introduced the pioneering concept of incomplete contracts, positing that the complete anticipation and specification of all prospective contingencies within a contract are unattainable. Williamson accentuated the pivotal role of governance mechanisms, notably the establishment of enduring contractual agreements and property rights frameworks, in facilitating dispute resolution and accommodating contract adjustments necessitated by shifting circumstances (Williamson, 1975). By introducing the paradigm of incomplete contracts, Williamson shed light on the inherent limitations of formalised contractual instruments in grappling with the myriad potential future scenarios, thereby underscoring the imperative of fostering adaptability and flexibility within contractual constructs. His seminal contributions have played an instrumental role in advancing the horizons of our comprehension, elucidating how organisations strategically configure their transactions and how contractual relationships dynamically metamorphose in response to mutable conditions and the nebulous realm of uncertainties.

Elinor Ostrom's substantial scholarly contributions have significantly shaped the discourse surrounding the governance of common resources, standing in deliberate contrast to the paradigm posited by Hardin (1968). Ostrom provocatively interrogated the conventional premise that common-pool resources are inexorably susceptible to overexploitation, asserting that numerous communities worldwide have adeptly administered shared resources with enduring efficacy (Ostrom, 2000). Ménard and Shirley (2014) noted the influence of common resources in NIE. Ostrom's scholarly

investigations underscored the salience of collective action, collaborative endeavours, and community-centre.

Red governance in perpetuating the sustenance of common-pool resources. Her rigorous research dismantled the entrenched presumption that government regulation or privatisation represents the exclusive panacea to avert the specter of the ‘tragedy of the commons.’ Instead, she proffered a mosaic of design principles and contributory factors that lend credence to the efficacy of locally rooted, self-governing mechanisms within communities in stewarding shared resources. Ostrom’s intellectual legacy reverberates through the contours of institutional analysis, accentuating the potential potency of decentralised, community-derived solutions in grappling with the multifaceted challenges attendant to environmental and resource management.

The contributions of the four authors are intricately interwoven across manifold dimensions. The oeuvres of Ostrom, North, Williamson, and Coase converge upon the pivotal theme of interpersonal cooperation, wherein their respective theories concerning contract enforcement manifest an inherent interdependence. This cooperative paradigm resonates within the context of market exchanges and the comportment of individuals in their reciprocal engagements. Such exchanges, in their essence, become imbued with an aura of uncertainty, wherein transactional costs emerge as pivotal determinants that invariably impinge upon the realisation of contractual undertakings to varying extents. In this intricate web of scholarly discourse, institutions emerge as a seminal mechanism aimed at mitigating these inherent uncertainties while concurrently engendering collaborative endeavors to attenuate or amplify the transactional costs that cast their influence upon the market dynamics (Coase, 1960; North, 1990).

To date, there is a lack of studies on the NEI using bibliometric studies and its study boundaries. This article aims to conduct a meticulous bibliometric analysis focusing on the seminal contributors Douglass North, Ronald Coase, Elinor Ostrom, and Oliver Williamson. This analysis is essential because it provides a panoramic view, unraveling the intricate interplay of authors, institutions, and intellectual trends shaping this scholarly domain. This article contributes to the understanding of students and researchers about the NEI, and its seminal contributors about the most relevant themes (and with the greatest tendency to grow), serving as a guide for new publications. Among the corpus of analysed works, a conspicuous prevalence is observed within peer-reviewed articles, constituting 67.10% of the total, followed by conference papers comprising 21.66%. The outcomes of this inquiry unveil the preeminent role assumed by the USA in the NIE scholarship. Elinor Ostrom is paramount, with the highest co-citation count and 41,458 citations. Strategic keyword analysis reveals the most frequently cited terms. New Institutionalism, NIE, Institutions, Governance, and Organisation are notable among these.

2 Research methodology

This study employed bibliometric analysis to effectively synthesise and categorise an extensive scholarly output within NIE. By leveraging bibliometrics, this approach offers a comprehensive perspective on influential publications, discernible research lacunae, and prevailing patterns within intellectual contributions. The accessibility of a robust academic production repository, such as the *Web of Science*, facilitates the execution of bibliometric analysis (Donthu et al., 2021). Bibliometrics, as a methodological tool,

operates within an interdisciplinary framework to systematically amalgamate and consolidate existing academic publications on a specific subject matter. The overarching goal of this methodology is to derive both quantitative and visual outcomes (Ball, 2018).

2.1 Bibliometrics and clustering

Various software options are available for conducting bibliometric analysis, including VOSviewer, CiteSpace, Sci², Histcity, and Bibexcel (Hu et al., 2022). This study employed the VOSviewer software (version 1.6.19) to create visual maps illustrating interconnections within scientific production networks. VOSviewer was chosen because it has an intuitive interface and allows a detailed analysis of the clusters. Additionally, Sci² was utilised to track the temporal evolution of keyword usage (van Eck and Waltman, 2009). In this software, the visualisation of this tracking is clearer compared to VOSviewer. These tools facilitated the assessment of literature progress and the identification of emerging trends.

The progression of this bibliometric analysis adhered to the following sequence: initial preparation of research keywords, extraction of data from the *Web of Science* via the Coordination for the Improvement of Higher Education Personnel (CAPES) Portal of Periodicals, and subsequent utilisation of the *Web of Science* publication database for VOSviewer analysis. Quantitative data of publications and their typologies were then acquired, as detailed in Section 4. The VOSviewer tool was subsequently employed to explore outcomes across various dimensions, including co-authorship, cocitation, citation, and co-occurrence of keywords. The ensuing analysis encompassed countries, authors, journals, and keywords. The conclusion of the analysis of the results encompassed identifying keyword usage trends by applying Sci² software.

The selection of the *Web of Science* database stems from its comprehensive repository of academic literature spanning diverse domains of knowledge (Paule-Vianez et al., 2020). Utilising cluster analysis, a Multivariate Statistics technique, enables the categorisation of documents sharing akin attributes, thus facilitating the coherent grouping of distinct fields of inquiry. Establishing a distance matrix serves as a depiction of the relational interconnections between data points. Within the scope of this study, distinct clusters are visually demarcated through varying colours, an approach that augments their discernibility and identification (Santos et al., 2020).

2.2 Literature compilation

The judicious selection of keywords is paramount in retrieving pertinent outcomes within the examined research domain (Hu et al., 2022). The pursuit of relevant publications was undertaken through a search query comprising the following terms: ('new institutionalism' OR 'NIE' OR 'neo-institutionalist theory' OR 'North, DC' OR 'North, Douglass C.' OR 'North, D. C.' OR 'Coase, RH' OR 'Coase, R. H.' OR 'Coase, Ronald H.' OR 'Ostrom, Elinor' OR 'Ostrom, E' OR 'Ostrom, E.' OR 'Williamson, OE' OR 'Williamson, Oliver E.' OR 'Williamson, O.E.'). This search encompassed titles, abstracts, and keywords of articles. The chosen keywords consider the varied terminologies used to denote the research field and reference the authors' names.

3 Results¹

This section will present the results obtained through the methodology described in the previous sections. They are arranged as follows: quantitative data analysis, co-authorship analysis, cocitation analysis, citation analysis, and keyword analysis.

3.1 Quantitative data analysis

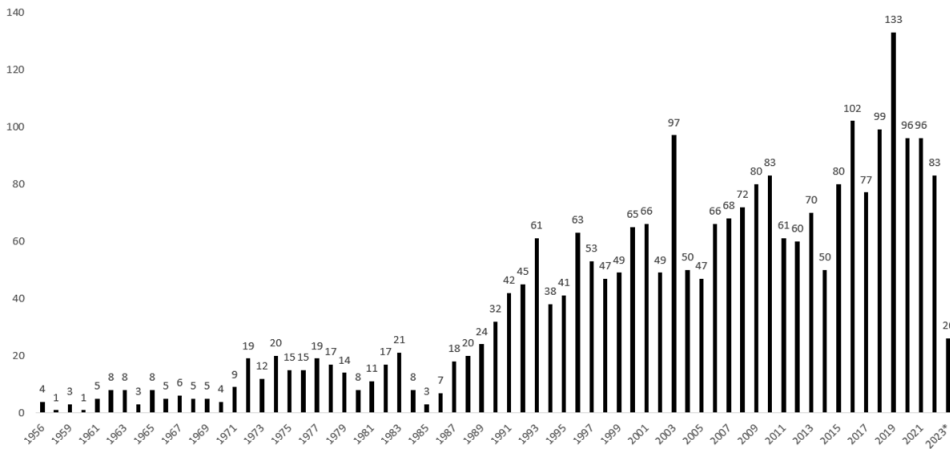
The examination of *Web of Science* search results revealed a notable concentration of scholarly output in the realm of international trade and environmental regulation within journal articles, constituting approximately 67.10% of the current scholarly landscape. Additionally, *Conference Proceedings and Articles of Literary Criticism* contribute to a lesser extent, comprising around 35.68% of the aggregate theoretical production. The remaining documents encompass a range of formats, including summaries, book chapters, and news items. Table 1 provides a comprehensive overview, presenting the total count of records for each document category and the corresponding percentage relative to the overall publication count. A total of 2,590 publications were amassed, characterised by their distribution as delineated in Table 1.

The evolutionary trajectory of theoretical production is aptly depicted in Figure 1, which graphically portrays the annual publication count from 1956 (first publication) to June 20, 2023.

Table 1 Types of documents

<i>Type of document</i>	<i>Count of register</i>	<i>% de 2.590</i>
Article	1738	67.10%
Conference paper	561	21.66%
Literary criticism	363	14.02%
Editorial material	87	3.36%
Review article	85	3.28%
Letter	32	1.24%
Early access	22	0.85%
Note	15	0.58%
Meeting summary	12	0.46%
Book chapters	10	0.39%
Bibliographic item	4	0.15%
Correction	3	0.12%
Discussão	3	0.12%
Discussion	2	0.08%
News item	2	0.08%
Reprint	1	0.04%
Total	2940*	100%

Notes: *The record count is greater than that of documents due to the possibility of being registered in more than one document type. This count is generated in the core collection of the Web of Science.

Figure 1 Number of publications per year

Notes: (*) quantity obtained on June 20, 2023, for the same year.

Source: Prepared by the authors using data from the Web of Science index

3.2 Co-authorship analysis

Employing co-authorship analysis provides a systematic means to evaluate the extent of collaborative engagement among institutions, researchers, and nations within a specific academic discipline. This analytical approach centres on delineating patterns of authorial collaboration within scholarly and scientific endeavours. This analytical lens gives us insights into the intricate dynamics of cooperation across countries, institutions, and individual authors. The country-level analysis elucidates the breadth and depth of collaborative efforts across nations in generating these scholarly outputs. Delving into institutional affiliations unveils the organisational entities that substantively contribute to the field of research. Employing the ‘authors’ unit of analysis within co-authorship analysis furnishes insights into the preeminent researchers within the field of knowledge and the contours of their collaborative networks in scientific inquiry. These collaborative endeavours mitigate information asymmetry and foster heightened productivity in generating scholarly articles, books, and other manifestations of scientific output (van Eck and Waltman, 2009).

3.2.1 Countries and regions²

Co-authorship analysis for countries and regions entails a comparative evaluation of the volume of scientific publications within a particular nation and the collaborative interactions between nations. This analysis is based on information extracted from authors’ affiliations as indicated in published articles, facilitating an assessment of each country’s scholarly and research influence. Table 2 delineates the ten most prolific countries, collectively yielding 1,685 documents. Notably, numerous publications result from collaborations among authors from different countries, potentially leading to an inflation of the document count per country (Hu et al., 2022). Furthermore, the sample encompasses an aggregate of 905 records, constituting 34.94%, representing several additional countries with relatively modest participation in the co-authorship analysis. In

Table 2, the ACD (average citations per document) and C.T. (total citations) columns serve as tools for gauging each country's impact within the research domain, thereby enabling an appraisal of the influence of these publications within the scientific community. In the context of this analysis, it is notable that while the USA holds the highest document count and average citations, the average citations of Sweden (81.53) and Canada (94.21) are nearly approximate that of the USA (95.53).

Table 2 The ten most relevant countries in co-authorship in the literature on NIE

<i>Rank</i>	<i>Country</i>	<i>Documents</i>	<i>Documents (%)</i>	<i>CT</i>	<i>ACD</i>
1	USA	751	29.00%	71,746	95.53
2	Germany	244	9.42%	3,593	14.73
3	England	186	7.18%	6,450	34.68
4	China	126	4.86%	3,756	29.81
5	Australia	67	2.59%	1,886	28.15
6	Sweden	66	2.55%	5,381	81.53
7	Netherlands	65	2.51%	2,057	31.65
8	Spain	62	2.39%	968	15.61
9	France	61	2.36%	1,594	26.13
10	Canada	57	2.20%	5,370	94.21
-	Outros	905	34.94%	12,882	-

Source: Prepared by the authors based on data collected in Web of Science

The USA holds the foremost position in the ranking, contributing to 29.00% of the documented output, followed by Germany (9.42%), England (7.18%), and China (4.86%). The cumulative representation of the remaining countries listed in Table 2 amounts to 49.54%, underscoring a concentration of publications and citations within the upper echelon of the ranking.

3.2.2 *Institutions*³

Analysis of institutional collaboration is a methodology utilised to identify clusters and entities that exert notable influence within a specific subject area. The subsequent findings illuminate academic institutions that make significant contributions to scholarly discussions. The analysis results indicate that Indiana University (155 documents) demonstrates a substantial scholarly output, following the University of California at Berkeley (50 documents), Arizona State University (41 documents), the University of Washington (39 documents), and the University of Pennsylvania (35 documents). The results also highlight a strong collaborative relationship of Indiana University with allied institutions, including the University of California at Berkeley, the University of Pennsylvania, and Yale University.

3.2.3 *Author analysis*

The co-authorship analysis focusing on authors allows for discerning noteworthy contributors to the academic output within the NIE domain. The quantitative indices of document count and citations indicate productivity and influence within the scholarly

realm. Table 3 encapsulates the ten most prolific authors within the NIE sphere and provides each author's H-index – a widely accepted metric that gauges impact and productivity. Notably, the top three authors in the ranking possess a distinct advantage in document count, citations, and H-index compared to their counterparts. Elinor Ostrom⁴ leads the list with 208 documents, Douglass North with 114 documents, and Oliver Williamson with 114 documents. It is paramount to underscore that the significance of citations and H-index is on par with, if not more pertinent than, the sheer document count. Furthermore, this analysis underscores a compelling convergence of importance among the three productivity metrics – documents, citations, and H-index.

Table 3 Top-10 most relevant authors in the NIE

<i>Rank</i>	<i>Author</i>	<i>Documents</i>	<i>Citations</i>	<i>H-index</i>
1	Ostrom, Elinor	208	41,023	81
2	North, Douglass C.	114	13,818	26
3	Williamson, Oliver	114	24,012	44
4	Coase, Ronald H.	35	11,956	27
5	Engel, Christoph	26	23	4
6	Schweizer, Urs	24	28	4
7	Richter, Rudolf	13	42	3
8	Noone, Kevin J.	12	582	10
9	Haller, Tobias	9	147	4
10	Valentinov, Vladislav	9	164	23

Source: Prepared by the authors based on data collected on the Web of Science. The selection criteria for the H-index was based on the Web of Science Core Collection Metrics. The words 'North, DC'; 'North, Douglass C.' and 'North, D.C.' were concatenated and replaced by the word 'North, Dc'. The words 'Ostrom, Elinor'; 'Ostrom, E' and 'Ostrom, E.' were concatenated and replaced by the word Ostrom, Elinor. The words 'Williamson, OE'; 'Williamson, Oliver E.' and 'Williamson, O. E.' were concatenated and replaced by the word Williamson, Oe. The words 'Schweizer, Urs'; 'Schweizer, U' and 'Schweizer, U'. They were concatenated and replaced by the word Schweizer, Urs

3.3 Cocitation analysis

Cocitation analysis facilitates the discernment of documents frequently cited in conjunction. This analytical approach allows scrutinising the delineation of the scientific domain by gauging the regularity with which disparate studies reference a common pair of authors. The outcomes of this analysis extend to delineating clusters of interrelated articles, often referred to as 'co-cited clusters' (Small, 1973). Moreover, the frequency and contextualisation of cocitations furnish a means to gauge the significance of specific works, authors, countries, or journals within the academic milieu. This inquiry holds pragmatic value for researchers who aim to identify pertinent literature to inform the construction of their scholarly endeavors (Donthu et al., 2021).

3.3.1 Periodicals⁵

The analysis conducted highlighted the top ten journals in the NIE landscape, led by the *American Economic Review* with 1,834 citations, followed by *The Journal of Law and Economics* (879 citations), *American Political Science Review* (813 citations), *American Journal of Sociology* (808 citations), *Journal of Political Economy* (790 citations), *Journal of Institutional Economics* (657 citations), *American Sociological Review* (632 citations), *Administrative Science Quarterly* (593 citations), *Academy of Management Review* (571 citations), and *The Quarterly Journal of Economics* (554 citations).

3.3.2 Cocitation of authors⁶

Cocitation is the phenomenon where multiple authors are concurrently referenced within the bibliographies of academic publications. It serves as a mechanism for discerning preeminent scholars within a specific field of knowledge and illuminates collaborative interconnections among them. The recurrent citation of authors within a particular research domain signifies their pertinence (Small, 1973).

The ten most influential authors identified from this co-citation analysis are North, Douglass C. (1,529 citations), Williamson, Oliver (1,485 citations), Ostrom, Elinor (1,373 citations), Coase, Ronald H. (882 citations), DiMaggio, Paul (378 citations), March, James G. (339 citations), Meyer, John W. (318 citations), Simon, Herbert A. (305 citations), Hodgson, Geoffrey M. (279 citations) and Greif, Avner (229 citations).

3.4 Citation analysis

Citation analysis assumes a pivotal role in discerning the preeminent research within the scientific literature, as it affords a means to gauge the potency and sway of published articles through an appraisal of their citation frequency. This analytical endeavour strives to unveil the frequency with which distinguished researchers, documents, journals, countries/regions, or institutions reference each other. Consequently, it unveils the potential to unearth significant contributors to the field who may not be readily apparent through a limited inquiry (Fahimnia et al., 2015).

3.4.1 Document citation analysis⁷

Citation analysis is a tool for discerning seminal works that influence a particular research domain. The compilation of the ten most frequently cited documents within the NIE sphere is presented in Table 4, accompanied by their respective citation counts, year of publication, and DOI codes. Articles by Ronald Coase, Douglass North, Oliver Williamson, and Elinor Ostrom emerge as the foremost citational cornerstones in the neo-institutionalism discourse (Coase, 1960; North, 1991; Ostrom, 2009; Williamson, 1979).

Ronald Coase's seminal work, *'The Problem of Social Cost'* (1960), claims the foremost position in the hierarchy, delving into the intricacies of social costs intertwined with externalities. Coase posits that the parties ensnared within an externality imbroglio can forge private pacts that optimise resource allotment, irrespective of the initial property rights assignment. Douglass North's magnum opus, *'Institutions'* (1991), secures the second echelon, underscoring the pivotal role of institutions in orchestrating societal frameworks and propelling economic advancement. North expounds upon how

institutions imprint their imprint on resource allocation, incentive propagation, and a society's acumen for innovation and adaptation. Occupying the third slot is Oliver E. Williamson's comprehensive treatise (1979), dissecting the terrain of transaction costs theory and its application in dissecting contractual affiliations. Williamson traverses the labyrinth of how transaction costs influence the architecture and governance of exchanges. Elinor Ostrom's seminal inquiry (2009) commandeers the fourth stance, proffering a constellation of principles and concepts illuminating the assessment of socioecological system sustainability. Her study accentuates the pivotal roles of vigilant monitoring, accountability, equitable distribution, and adaptive prowess.

Table 4 Top-10 most relevant references in the NIE literature

<i>Rank</i>	<i>Reference</i>	<i>Citations</i>	<i>Year</i>	<i>links</i>	<i>DOI</i>
1	Coase	8,340	1960	114	10.1086/466560
2	North	7,178	1991	70	10.1257/jep.5.1.97
3	Williamson	4,153	1979	51	10.1086/466942
4	Ostrom	3,994	2009	19	10.1126/science.1172133
5	Williamson	3,137	1991	62	10.2307/2393356
6	Williamson	2,769	1981	25	10.1086/227496
7	Williamson	2,535	2000	100	10.1257/jel.38.3.595
8	Dietz	2,371	2003	35	10.1126/science.1091015
9	North	2,162	1989	28	10.1017/S0022050700009451
10	Liu	2,074	2007	3	10.1126/science.1144004

Source: Prepared by the authors based on data collected on the Web of Science

Table 5 Top-10 cited countries in new institutionalism literature

<i>Rank</i>	<i>Country</i>	<i>Documents</i>	<i>Citations</i>
1	USA	751	71,746
2	England	186	6,450
3	Sweden	66	5,381
4	Canada	57	5,370
5	China	126	3,756
6	Germany	244	3,593
7	Norway	32	2,167
8	Netherlands	65	2,057
9	Australia	67	1,886
10	France	61	1,594

Source: Prepared by the authors based on data collected on the Web of Science

3.4.2 Countries⁸

The country analysis yields significant insights by spotlighting the primary contributors to publications concerning NIE. Moreover, it elucidates the countries exerting notable

influence within this domain of study. Table 5 delineates the top ten nations garnering the highest citations for NIE research.

As depicted in Table 5, the USA holds the foremost position with 71,746 citations, trailed by England with 6,450 citations, securing the second spot. Sweden, with 5,381 citations, occupies the third position. The remaining countries in the top 10 ranking include Canada, China, Germany, Norway, Netherlands, Australia, and France.

3.5 *Keyword analysis*

A keyword analysis is pivotal in discerning the prevalent terms utilised within a designated research domain. Such analysis offers insights into emerging trends, central themes, and prominent research concepts.

3.5.1 *Co-occurrence analysis*

The keywords extracted through VOSviewer are drawn from the documents’ titles, abstracts, or contents. These keywords enable us to delve into the core concepts advanced within a specific domain of expertise, offering a means to probe forthcoming trends and potential frontiers of investigation. In Figure 2, the map depicting keyword co-occurrence can be scrutinised by clusters. The magnitude of nodes denotes the frequency of occurrence of each key term across the compiled documents. This visualisation reveals the presence of distinct clusters encompassing interlinked diverse themes.

Figure 2 Atlas of visualisation of the co-occurrence analysis of keywords (see online version for colours)

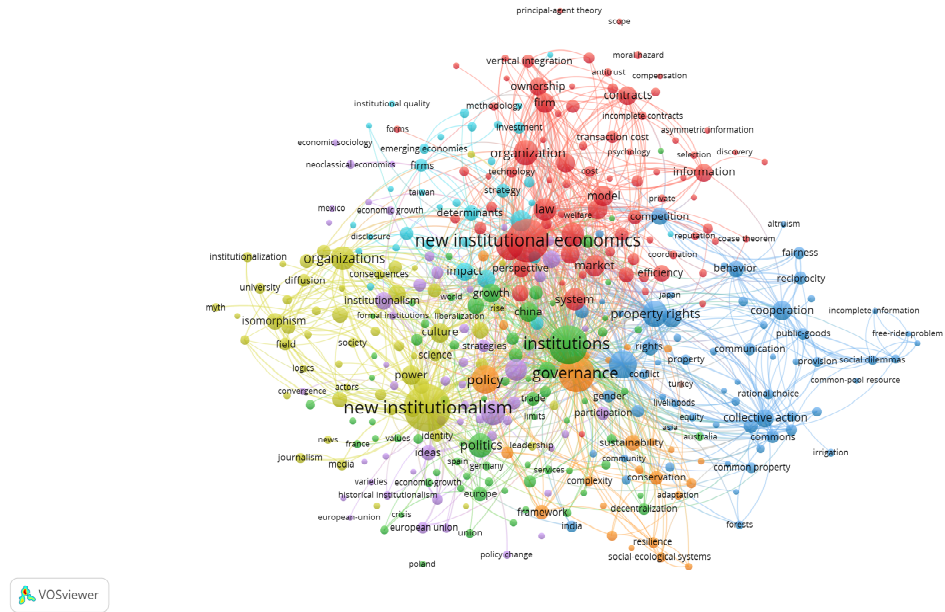


Figure 2 illustrates the clustering of keywords, with ‘institutions,’ ‘new institutionalism,’ ‘NIE,’ and ‘governance’ forming distinct clusters represented by the colours blue, yellow,

red, and orange, respectively. The keyword ‘Institutions’ is closely associated with management, cooperation, behaviour, collective action, and systems. ‘New institutionalism’ is interconnected with terms such as education, culture, organisations, and sociology. ‘NIE’ is predominantly linked to the market, contracts, cost, property, information, externality, and firm. Meanwhile, ‘governance’ exhibits stronger connections with property rights, politics, sustainability, structure, and biodiversity.

3.5.2 Research frontiers

Using Sci² for keyword identification enables examining cited terms and their temporal prominence. Table 6 showcases the 15 keywords that exhibited an impactful surge between 1991 and 2023. These keywords were selected via the New ISI keywords, from which Sci² derives the KeyWords Plus values (Garfield, 1990). KeyWords Plus encompasses index terms automatically generated from titles of cited articles incorporated into *Web of Science* records, encompassing articles and conference proceedings from 1991 onward. The keywords were initially subjected to normalisation, addressing variations in capitalisation, suffixes, and plural forms. Subsequently, keyword explosions were scrutinised, with strength assessed using Sci²’s criterion. A graphical representation was then constructed to denote the timeframe of intensified keyword prevalence, exemplified in Figure 5.

Table 6 Top 15 keywords ranked by citation burst

<i>Rank</i>	<i>Keywords</i>	<i>Strength</i>	<i>Begin</i>	<i>End</i>
1	size	48.50	1998	2001
2	behaviour	42.91	1999	2004
3	contract	9.92	1991	1999
4	integr	8.83	1991	2000
5	dilemma	6.55	1998	2003
6	strategi	5.05	2011	2017
7	common	4.91	2000	2005
8	reciproc	4.83	2003	2003
9	cooper	4.83	2000	2003
10	perform	4.82	2016	2020
11	impact	4.81	2018	
12	respons	4.72	2012	2018
13	isomorph	4.68	2020	
14	europ	4.37	2017	
15	good	4.35	2000	2004

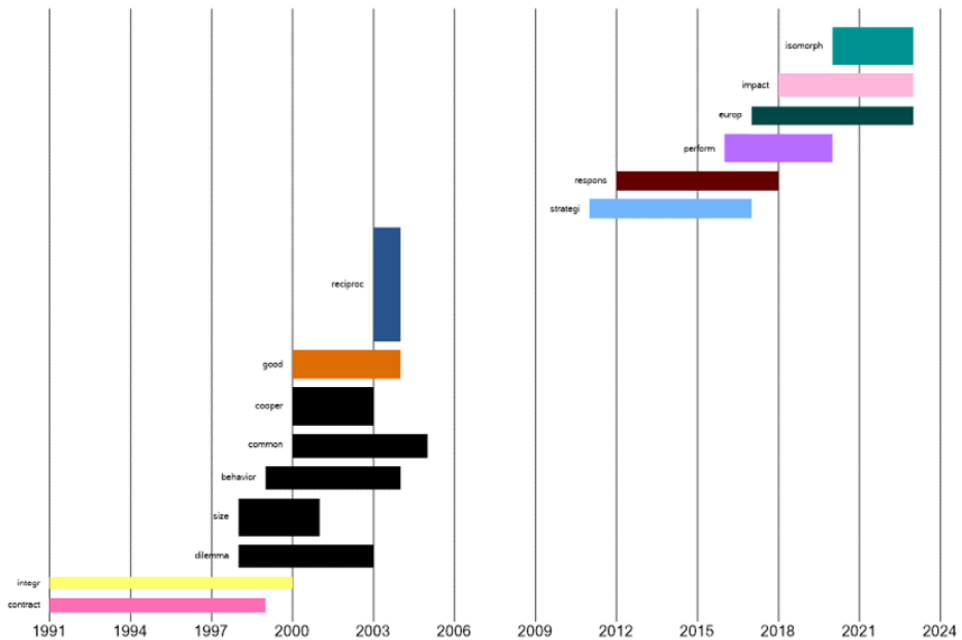
Source: Prepared by the authors based on data collected on the Web of Science. Blank spaces in the end column indicate that the keyword was still in ‘explosion’ when the data was collected

Table 6 furnishes the initiation and culmination of the explosion interval, along with the intensity calculation denoted by the strength column. The strength value indicates the frequency of keyword occurrence throughout the specified period. Notably, keywords may surface more frequently within a condensed duration, as depicted graphically by

denser or vertically elongated bars, as evidenced in Figure 3. The total bar area corresponds to the weight value (Strength). Thus, a higher weight value may result in a relatively narrower bar compared to a lower weight value if the former explosion spanned a more extended interval than the latter.

The analysis of keyword explosions offers insight into the temporal fluctuations of terms associated with a specific subject, concept, or idea. As demonstrated in Table 6 and Figure 3, the term ‘contract’ emerges with higher frequency, potentially influenced by the work of Douglass North, who emphasises the role of transaction costs in shaping contractual arrangements (North, 1990, 1991). Starting from the year 2000 onward, prominent terms such as ‘common,’ ‘cooper,’ and ‘good’ align with Elinor Ostrom’s contributions. Her work delves into the dynamics of cooperative resource management among agents known as ‘commons,’ aiming to prevent resource depletion (Ostrom, 2000).

Figure 3 Temporal bar graph by keywords burst of NIE (see online version for colours)



Source: Prepared by the authors based on data collected on the Web of Science

The contemporary trends illustrated align with Richter’s discourse (2016) on the European Union, represented by the term ‘europ.’ Like the European Union, international agreements can be likened to corporate mergers, thus warranting an examination through the lens of transaction costs, akin to Oliver Williamson’s framework. Consequently, the trajectory of NIE studies gravitates toward the concept of ‘unified governance,’ akin to vertical integration in corporate contexts (Richter, 2016). This orientation paves the way for prospective investigations into NIE concerning international agreements, particularly those in Europe and other global regions, seeking efficient governance structures.

4 Final remarks

This bibliometric analysis aims to be a valuable resource for students and researchers aiming to understand the landscape of NIE. It offers a ranking-based approach alongside graphical visualisations, insights into pivotal journals, influential authors, prolific countries, and potential collaborative synergies. The findings reveal that the USA exhibits the highest scientific contributions, evidenced by its predominant representation among the top cited and co-cited institutions. Among the most cited works in the literature are Ronald Coase's '*The Problem of Social Cost*' (1960), Douglass North's '*Institutions*' (1991), Oliver Williamson's '*Transaction-Cost Economics: The Governance of Contractual Relations*' (1979), and Elinor Ostrom's '*A General Framework for Analysing Sustainability of Social-Ecological Systems*' (2009) stand out. Notably, '*The Journal of Law and Economics*' plays a significant role in publishing works by Coase and Williamson, establishing itself as a cornerstone for NIE-related publications. Future lines of research on the NEI can be carried out based on keyword analysis based on what was presented in session 3.5.2 (Research frontiers).

Furthermore, this research delineates the prominent universities engaged in NIE studies, identifies leading journals in the domain, and offers a comprehensive mapping of publications – a beneficial resource for future research endeavours. A limitation of the study is that we cannot address the NIE in a generalised way because it is heterogeneous in terms of the perspective of the different authors who address the NIE. Therefore, an approach to NIE from the perspective of the four seminal authors was chosen to maintain fidelity to the origins of NIE. Future lines of research on the NEI can be carried out based on keyword analysis based on what was presented in session 3.5.2 (Research frontiers). Ultimately, the study provides a comprehensive insight into the key keywords associated with NIE inquiries, shedding light on established and emerging research trends.

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Notes

- 1 In this section, we present the bibliometric analysis, including co-authorship, co-citation, citation, and keyword co-occurrence. The bibliometric analyses with additional tables and figures from VOSviewer can be found in the supplementary material.
- 2 The supplementary materials illustrate collaborative networks among nations in the field of NIE literature, emphasising the significant role played by the USA.
- 3 The supplementary material contains a table showcasing the 15 most prominent academic institutions in the field of NIE literature, along with a collaborative network established among them.
- 4 In addition to being the most frequently cited, Ostrom exerts influence on several clusters in the cluster analysis, as depicted in the supplementary materials.
- 5 Additional details regarding collaboration among academic institutions can be found in the supplementary materials.
- 6 The supplementary materials showcase the clusters that have formed around the primary authors in the field of NIE.
- 7 Within the supplementary materials, you will find a figure that illustrates the citation analysis of documents, including the clusters of prominent authors.
- 8 The supplementary materials include a visual map that delineates the USA's role in facilitating connections with other nations.