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RESEARCH ARTICLE

Field, capital, and habitus: The impact of Pierre Bourdieu on bibliometrics

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ABSTRACT

This study is a critical review aimed at assessing the reception received in bibliometric research by the theories and concepts developed by the sociologist Pierre Bourdieu. The data set consists of 182 documents, including original articles, editorial material, review articles, conference papers, monographs, and doctoral dissertations. A quantitative analysis was used to establish the authors and countries that most frequently make use of Bourdieu's theories, as well as the most popular concepts, which were identified as “field,” followed by “symbolic capital” and “social capital.” Then, the article discusses the impact of Bourdieusian key concepts such as “field.” Among the findings, the following are noteworthy: the integration of his field theory into pre-existing bibliometric conceptualizations of research fields, especially when power relations are problematized; the use of “symbolic capital” in connection with citation analysis and altmetrics; and greater interest in Bourdieu's theories compared to his methods, although some sources have used Bourdieu's preferred statistical method, correspondence analysis. Moreover, Bourdieu's theoretical impact is noticeable in research on journals, university rankings, early career researchers, and gender. The paper's conclusions point to future research paths based on concepts less used in the bibliometric literature, such as “delegation.”

1. INTRODUCTION

1.1. Background

Pierre Bourdieu is one of the most influential sociologists in history, and his theories have been, and are, used extensively across a broad spectrum of fields (da Silva, 2021; Korom, 2020). The sociology of science is one of the fields in which Bourdieu, primarily through *Homo academicus* (1988), has had a significant influence, and his works have also been cited in the field of bibliometrics.

The influence of Robert K. Merton, another impactful sociologist of science, has attracted the attention of scholars in the field of quantitative science studies (e.g., Crothers, Bornmann, & Haunschild, 2020; Desrochers, Paul-Hus et al., 2018), and, more specifically, his influence on research in bibliometrics (and related metrics field) has been amply discussed, most notably by Eugene Garfield (2004, 2009) as well as others. Similarly, we aim to provide a systematic analysis of how Bourdieu's theories and concepts have been applied within bibliometric research and to propose and discuss the further potential of Bourdieu's theories in the field.

For this purpose, the present literature review includes a synopsis of the sociologist's key ideas, followed by a section on the paper's data sources and methods. The text then moves to a critical review of the sources, supported by their content analysis and network visualization, and structured according to the conceptual triad constituted by "field," "capital," and "habitus." The last section discusses the sociologist's overall impact on bibliometrics and future lines of inquiry.

1.2. An Overview of Bourdieu's Life, Works, and Theories

Pierre Bourdieu (1930–2002) was born in Denguin, a small town in southwest France. His career has been effectively summarized as the trajectory of an anthropologist who became a sociologist without ever forgetting his roots in philosophy, which was his formal academic background (Jenkins, 2014). At the beginning of his career as a scholar, he taught at the University of Algiers and undertook anthropological field research in colonial Algeria (Yacine, Wacquant, & Ingram, 2004). Later in life, he was appointed to the chair of sociology at the Collège de France, this country's most senior academic position in that field (see also Wacquant, 2002).

A general overview of Bourdieu's numerous works is accessible elsewhere (Golsorkhi & Huault, 2006), and in particular through the lens of his critics (Jenkins, 2014; Sismondo, 2011), collaborators (Wacquant, 2002), and even Bourdieu's own (Bourdieu & Wacquant, 1992). Several works are nevertheless particularly relevant to the scope of this review and worthy of mention.

In the first period of his career, Bourdieu lived in Algeria and wrote anthropological work concerning its society in the wake of the war of independence. Later, in the book *Distinction* (2010), first published in 1979, he analyzed the social conditions that influence the appreciation of artistic works and other cultural objects, a theme resurfacing in later works (Bourdieu, 1980, 1993). In *Homo academicus*, Bourdieu (1988) studied the French university system, and in particular the power struggles between scholars with more status and resources or the "dominant" fraction, and the "dominated" ones that have more limited availability of the necessary means to succeed in the field. The theme of power and status in academia reappears in his book on philosopher (and university manager) Martin Heidegger (Bourdieu, 1991c) and in *State nobility* (Bourdieu, 1996b).

Bourdieu's oeuvre has addressed many topics, as this brief recollection of some of his major works can testify. However, his interest in the sociology of science has been long-lasting (1975b, 1988, 1991b, 2004). Bourdieu's (2000) analysis of the scholarly field, as well as any other social field, hinges on the triad formed by the concepts "field," "capital," and "habitus."

Bourdieu's thought is broader than this triad, as one of his former collaborators pointed out (Wacquant, 2014). However, for an assessment of Bourdieu's impact in a scientific field, the triad deserves particular attention because of the popularity of Bourdieu's sociology gained via the utilization of its three concepts. According to Wacquant, nevertheless, the success of the triad has sometimes been accompanied by the "fetishization" of these concepts and their overuse (Wacquant, 2018).

Against Alfred Schütz's social phenomenology, deemed by Bourdieu (1975a, p. 45, note 41) as too subjectivist and politically "neutral," and the formalism of Structuralists, he treats scientific and artistic fields as being two types of the intellectual *champ* (1996a). Moreover, as with the instances of "fine" and "popular" art—which are valued differently in society—scientific fields are conceived as "distinct" (Bourdieu, 2010), with some science being more

prestigious than others. The cases of the higher status of economics and the “pariah science,” sociology (Bourdieu, 2005), are both examples of the “social hierarchy of the faculties” (Bourdieu, 1988, p. 37). In any case, the scientific field is a type of social field and, as such, is a “social space” (Bourdieu, 1985b) inhabited by several components: the social agents (individuals and groups), their positions, relations, and conflicts; the institutions that grant access to the field and legitimize the exercise of power; and the assets available to the agents (Bourdieu & Wacquant, 1992). The genesis and development of fields correspond to the agents’ struggles to secure a position or acquire a more advantageous one. Eyal (2013) has argued that Bourdieu’s field theory is more beneficial for studying relations within fields than between fields. Bourdieu has indeed been more concerned with the history and organization of individual fields, such as sociology (Bourdieu, 2002) and philosophy (Bourdieu, 1991c), than the interactions between scholarly domains or their interdisciplinarity. Such limitation of his field theory, pointed out also by Sismondo (2011), could be understood if one considers Bourdieu’s strong beliefs in an “established hierarchy of the disciplines” and his emphasis on the relative “autonomy” of scientific fields from each other and from societal structures such as the market (Bourdieu, 1975b, p. 34). According to Burawoy (2018), an overestimation of the autonomy of social fields led Bourdieu to consider the “capitalist university”—the university influenced by neoliberalism and New Public Management—more independent from external market pressures than it was (and in Burawoy’s view, still is).

Nevertheless, a significant share of Bourdieu’s legacy derives from an innovative analytical toolbox based on the concept of “capital.” Bourdieu (1986a) identifies three primary forms of capital: economic capital, or the assets that can be readily marketed and monetized; social capital, or the intangible assets constituted by relations and networks; and cultural capital, or an agent’s knowledge assets. Moreover, following Max Weber’s sociology (Wacquant, 2018), Bourdieu (1991a) also theorized the “symbolic capital,” which consists of other intangible assets (i.e., prestige, authority, and status). In addition to these primary forms of capital—found across many social fields—Bourdieu also conceptualizes other types that are “legal tender” only within specific social fields, as in the case of academic capital and scientific capital. Although intertwined, these two types of capital have different meanings and are used slightly differently by Bourdieu. The former concept emphasizes academic institutions’ bureaucratic roles (e.g., universities as degree-granting institutions). The latter means prestige or symbolic capital that individual researchers and collective agents, such as universities, acquire in a field.

Whereas a distinction and tension characterize Bourdieu’s theory—between primary capital and field-related ones such as the scientific capital—the third pillar of the triad, habitus, always exists as habitus-of-a-field. Drawing upon David Hume’s dispositional account of human agency, Bourdieu (1977) defined the habitus as those conscious and unconscious dispositions that drive an agent’s behavior, are shaped by the field’s practices, and consolidate such practices (Bourdieu, 1991c). Humans develop the habitus typical for the field through socialization processes, which, in turn, reinforces the reproduction of the social order (Bourdieu, 1991a, p. 251).

Statistical methods are necessary to analyze a field as a “whole” (Bourdieu, 2010). From the middle 1970s onwards, Bourdieu used the statistical method of correspondence analysis developed by the mathematician Jean-Paul Benzécri (2006), with whom Bourdieu entertained a long-lasting personal and intellectual relationship (see also Le Roux & Rouanet, 2010). At the same time, Bourdieu acknowledged the potential limitations of quantitative analyses, particularly their possible reinforcement of the “biographical illusion” (Bourdieu, 1986b). According to this fallacy, information about individuals is considered constant in time and space rather

than being ever-developing. Because the agents are always caught in practices that develop historically, the statistical analyses have to be grounded in history. Inversely, historical analyses of social fields require a bird's-eye view of the field provided by statistical approaches.

Although the emphasis on history in Bourdieu's sociology is well known (Calhoun, 2013), far less mentioned is its "probabilistic" nature, an essential aspect that Strand and Lizardo (2021) have recently pointed out. The practices of the human agents that are more likely to occur (e.g., because of power structures) become, with time, consolidated characteristics of a field. In this perspective, power structures are conservative. In contrast, the struggles for capital and better positions in hierarchies introduce change and variability into social practices, such as the production of scientific knowledge. In intellectual fields, be they scientific or artistic (Bourdieu, 1975a), social and cognitive relations are intertwined. Amid such relations, power structures in society legitimize certain fields rather than others, generating and reinforcing hierarchies between "dominant" and "dominated" fields, as with the case of the "fine" and "popular" forms of art, or between established scientific fields and other emerging or declining ones."

2. DATA SOURCES AND METHODS

The review type of this study, the critical review, seeks in the sources it assesses their "conceptual contribution to embody existing or derive new theory" according to the typology created by Grant and Booth (2009, p. 94) which Price (2022) has lately considered as having "stood the test of time." According to two more recent surveys of review types, the critical one belongs to the "traditional" review family (Sutton, Clowes et al., 2019), and it seeks "to critically analyze and examine the literature and the main ideas and relationships of an issue" (Snyder, 2019, p. 336).

The relevant documents for the present review article were identified through a multistep approach based on the workflow illustrated in Figure 1. The Web of Science Core Collection was used to identify documents published in the core journals. Their keywords were subsequently used to search for the additional literature constituting the review's final data set, which is available in Appendix A of the Supplementary material.

2.1. Data Sources

In Step 1 of the data collection, an initial data set of documents was identified using the function Cited Reference Search in all the citation indexes of Web of Science Core Collection (Clarivate Analytics). A search for all documents that cite any works authored by Bourdieu (on January 31, 2022) and published between 1960 (when his scholarly contributions began to be printed) and 2021 (the last complete year at the time of writing) resulted in 15,167 hits. In Step 2, the data set of core literature for the field ($n = 76$) was identified by looking for documents (of any type) in core journals in bibliometrics (and related metrics), according to the study by Milojević and Leydesdorff (2013), whose findings Maltseva and Batagelj (2020) have more recently confirmed. In Step 3, six documents not pertinent to the bibliometrics field (all published in the *Journal of the Association for Information Science and Technology*) were excluded. The full texts of the resulting 70 documents were downloaded in Step 4. At this stage, moreover, the R package for science mapping bibliometrix (Aria & Cuccurullo, 2017) was used to analyze the 70 documents and explore the characteristics of this initial literature set, such as the most productive and cited authors, the core documents, and the most recurring author-assigned keywords that is, the keywords present in the original documents and not algorithmically generated in the database's environment (on how to utilize bibliometrix in

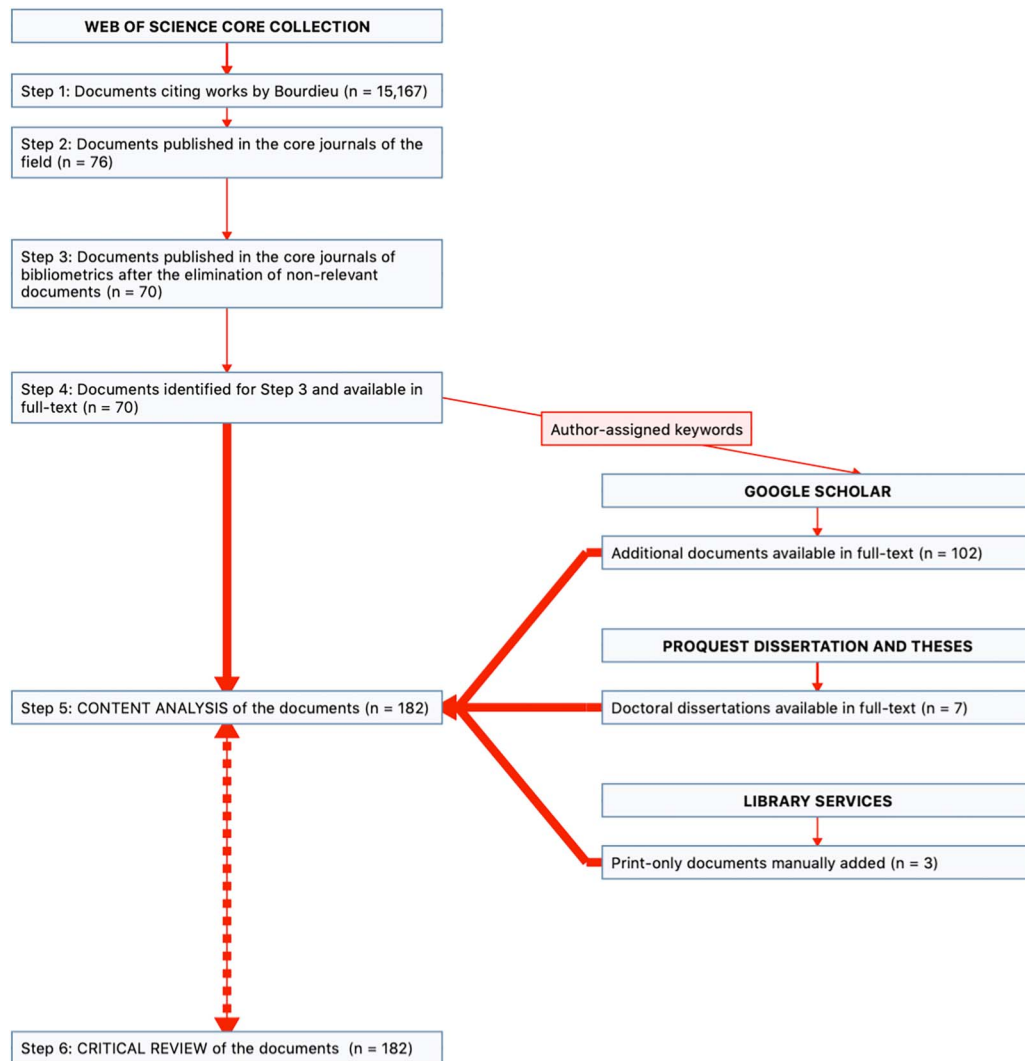


Figure 1. The workflow of the study. *Note:* The core journals of bibliometrics in Step 2 were identified based on the study by Milojević and Leydesdorff (2013). The identification of the author-assigned keywords (for building the search query in Google Scholar) and of the core authors (for searching additional documents for the content analysis in Step 5) was a bibliometric analysis of the documents ($n = 70$) in Step 4 performed with the R package bibliometrix (Aria & Cuccurullo, 2017).

a review study, see also Secinaro, Calandra et al., 2021). In Step 5, these author-assigned keywords were included in a search query used for collecting additional sources available from the search engine Google Scholar (Alphabet). Broad terms such as *research* or out-of-scope ones such as *physics* were excluded, whereas additional ones derived from the study by Bar-Ilan (2008) such as *informetric* and *webometric*, were included. The characteristics of the search engine make it redundant to key in the Boolean operator AND in the search box and to specify both the singular and plural form of the terms. The following Google Scholar query also included the term “Bourdieu” (because a web page that has a reference to a work by Bourdieu must include the word “Bourdieu” in its text) and was structured with the search operator allintext:

allintext:Bourdieu (scientometric OR bibliometric OR webometric OR informetric OR altmetric OR “citation analysis” OR citation OR “network analysis” OR authorship OR

citation OR "citation network" OR co-authorship OR interdisciplinarity OR "international academic awards" OR "research agenda" OR "research collaboration" OR "research performance" OR "scientific collaboration")

The data set of full-text documents in English retrieved comprised journal articles (including review articles), conference papers (standalone or printed in proceedings), monographs, textbooks, book chapters, and doctoral dissertations published between 1960 and 2021. Those documents had to fit the theoretical or methodological scope of bibliometrics (and related metrics), and Bourdieu's concepts had to be explicitly mentioned. The relevance to the field of bibliometrics (and related fields) was evaluated based on the document's title, abstract, and keywords and by accessing the full-text version whenever these metadata fields did not suffice and the full text was available. In Step 5 still, more full texts were retrieved using the software Publish or Perish version 8.2 (<https://harzing.com/resources/publish-or-perish>) through citation searches for Bourdieu's works in Google Scholar. Besides all the documents retrieved with the abovementioned steps in Google Scholar ($n = 102$), doctoral dissertations ($n = 7$) were retrieved from the database ProQuest Dissertations and Theses A&I (ProQuest), and print-only documents were accessed through library services ($n = 3$).

The review's final data set obtained through these steps consisted of 182 documents. Their metadata information was imported into the reference management software EndNote (<https://endnote.com>) for manually cleaning the data and obtaining the RIS format file used for the network visualizations based on their publication data (see Section 2.2). Their full texts were imported into the text analysis software NVivo for the content analysis (see Section 2.3). Lastly, Step 6 corresponds to the detailed reading of these sources and their critical review, which builds on the content analysis in Step 5. Conversely, the reading of the resulting documents in the critical review stage of the study strengthened the content analysis.

2.2. Network Visualizations

Two network maps based on data from the 182 documents were generated in the visualization software VOSviewer version 1.6.18 (van Eck & Waltman, 2010). The first map was based on the coauthorship relations extracted from an RIS format file created with EndNote. The fractionalization approach was used to normalize the links' strength. Nodes in the network were weighted according to the number of documents (van Eck & Waltman, 2022). Furthermore, the RIS file, which included all the author-assigned keywords manually curated, was imported into the VOSviewer environment (van Eck & Waltman, 2010). A text-mining network was generated with the software's default settings and an additional VOSviewer thesaurus file (van Eck & Waltman, 2011).

2.3. The Content Analysis

According to Krippendorff's (2019) typology of content analyses, the approach pursued in the review is problem driven rather than text driven or method driven—with the research problem being the impact of Bourdieu's concepts. Thus, the full-text documents were imported into the text-analysis software NVivo (<https://www.qsrinternational.com>), read, and coded (Jackson & Bazeley, 2019). Print-only documents had to be added manually. The content analysis combined quantitative elements (e.g., the frequency of the occurrences of the concepts in the corpus) with qualitative ones (e.g., the significance of these concepts in the context of bibliometrics). The paragraphs of the individual documents were treated as the data's "emergent units" (Krippendorff, 2019, p. 286). The coding scheme through which these "conceptual

units" (Lacity & Janson, 1994, p. 143) were identified is provided in Appendix B of the Supplementary material. Bourdieu's conceptual framework was used to determine the codes. Additional notions not found in Bourdieu's work but still useful for the data analysis were included in the coding scheme. One example of this latter case is "ego's network size," which Abbasi, Wigand, and Hossain (2014) utilize to study the social capital of scholars. Certain terms can be associated with other theoretical perspectives than the Bourdeusian one, for instance, "field" or "discipline" (Hammarfelt, 2020; Sugimoto & Weingart, 2015). Thus, a mention of at least one of Bourdieu's works in the paragraph was required to associate the text with that specific code. A unit of analysis—the paragraph—was treated as "multi-valued data," that is, multiple codes could be associated with the same coded text (Krippendorff, 2019, p. 287).

I performed coding, although the coding process and data analyses were discussed with two senior researchers in bibliometrics who are also knowledgeable of Bourdieu's works. The coding and interpretation of the units were conducted through an iterated reading of the data, according to which a concept was added to the coding scheme based on its first occurrence in the data set. Following an abductive standpoint to content analysis, this process was repeated until sufficient "empirical grounding" (Krippendorff, 2019, p. 39) was reached. With me as the only coder, the repeated reading of the sources and my continued debriefing with the two experts mitigate the lack of statistical tests for assessing intercoder reliability. In addition, the mixed-methods nature of the content analysis granted an element of triangulation in virtue of which qualitative and quantitative approaches strengthened reciprocally their respective findings.

3. RESULTS

This results section begins with Bourdieu's influence seen through the quantitative findings of the content analysis and the network visualizations. Thereafter, this initial picture of his legacy will be followed by a more fine-grained assessment of sources based on the qualitative analyses.

3.1. A Quantitative Overview of the Corpus

Five of the most productive authors in the data set are associated with a Canadian university (Vincent Larivière, Adèle Paul-Hus, Yves Gingras, Philippe Mongeon, and Nadine Desrochers). The countries associated with the most documents (according to the authors' affiliations) are the United States ($n = 54$) and Canada ($n = 40$), followed by the Netherlands ($n = 23$), Germany ($n = 13$), Spain ($n = 12$), and Brazil ($n = 9$).

Figure 2 presents different colors corresponding to the chronology of the documents on which the network is based. The map thus highlights the pioneering role of the U.S.-affiliated Blaise Cronin (author of 14 documents) and the Canadian Yves Gingras (author of nine documents). The color of these two authors' nodes is found at the left end of the color spectrum, indicating early publications. Although the Soviet scientometrician Haitun (1982) is the first to cite Bourdieu, the book on the field of Canadian physics by Gingras (1991) has been paramount in introducing Bourdieu in bibliometrics research. Vincent Larivière, a former PhD student of Gingras, is the most productive author (with 20 documents). The map also shows Cronin's centrality in the network, and Cassidy R. Sugimoto (with eight documents), a former PhD student of his, is also among the most prolific authors. The other authors who have published the most documents are Adèle Paul-Hus and Rodrigo Costas (nine documents), Loet Leydesdorff, Nadine Desrochers, and Philippe Mongeon (seven documents), and Björn Hammarfelt and Jacqueline Leta (five documents). In particular, Figure 2 shows the pivotal role in the network of Leydesdorff, Desrochers, and Costas.

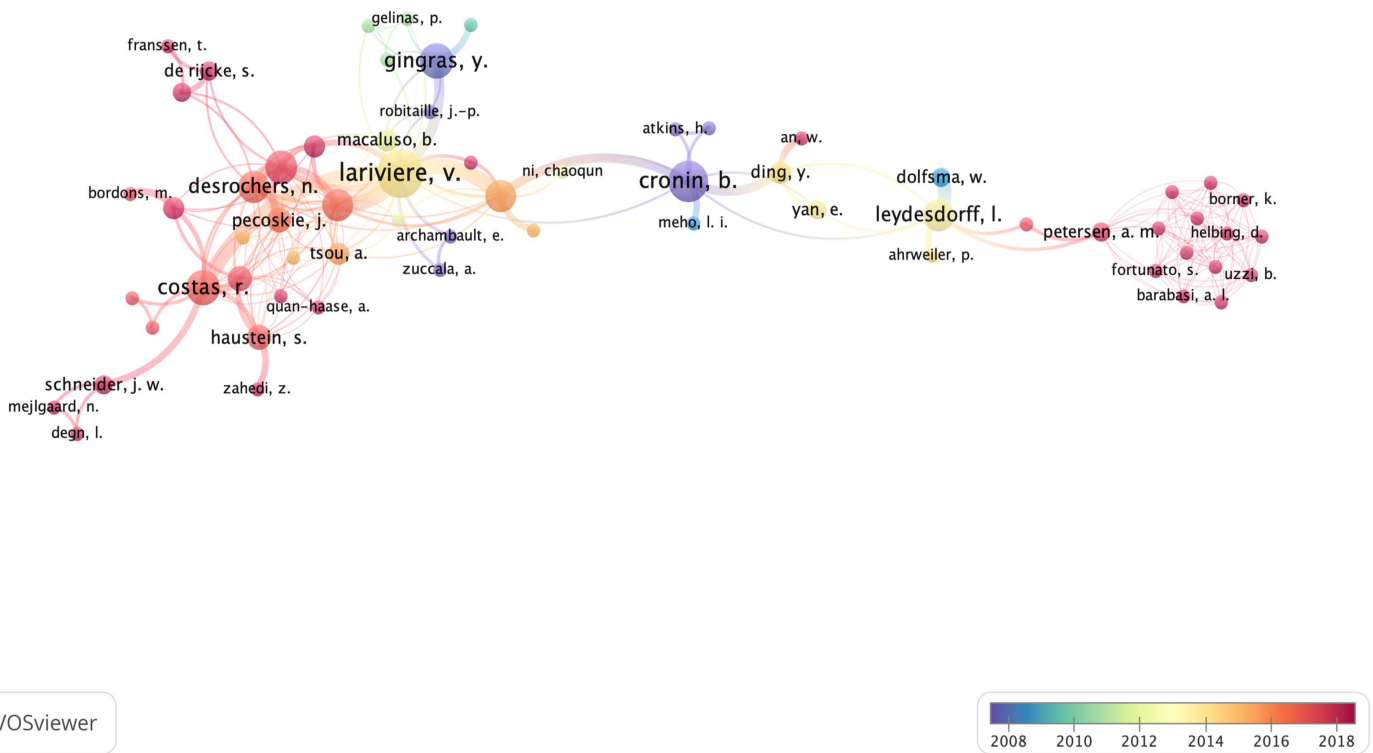


Figure 2. The coauthorship network of the authors of documents in the data set.

Figures 3(a)–(c) show the most frequent concepts according to their mention in the data set (Figure 3(a)), the number of documents (Figure 3(b)), and the types of capital (Figure 3(c)). In Figure 3(a), the concept of “field” ranks first, followed by “capital” and “habitus,” whereas Figure 3(b) shows that the most mentioned types of capital are the symbolic and the social. Figure 3(b) confirms the assertion made by Wacquant (2018), according to whom Bourdieu’s concepts are often parsed and used individually. Occurrences of more than one type of capital in the same text are rare, with a few exceptions where both social and symbolic capital are mentioned (Abbasi et al., 2014; Desrochers et al., 2018), and in sources that report both “scientific capital” and “symbolic capital” to specify that the former is a subtype of the latter, that is, symbolic capital in the field of science (Champely, Fargier, & Camy, 2017; Desrochers, Paul-Hus, & Pecoskie, 2017; Jiang & Liu, 2018).

Figure 4 shows the connections between the author-assigned keywords associated with the documents. The overlay visualization functionality of the software adds a chronological dimension: terms associated with more recent documents appear in a color closer to the right end of the color spectrum. Among them, the nodes “sociology of sociology,” “social capital,” “sociology of science,” and “field theory” would suggest that sociological thinking, broadly speaking, has impacted the conceptual organization of the review’s corpus. Other terms, such as “gender gap,” “evaluation,” and “ranking,” are to be re-encountered later in the review.

3.2. The Impact of Bourdieu’s Triad on the Corpus

Emirbayer and Johnson (2008) and Malsch, Gendron, and Grazzini (2011) have effectively put to use this “conceptual triad (field-capital-habitus)” as a vantage point to gauge Bourdieu’s

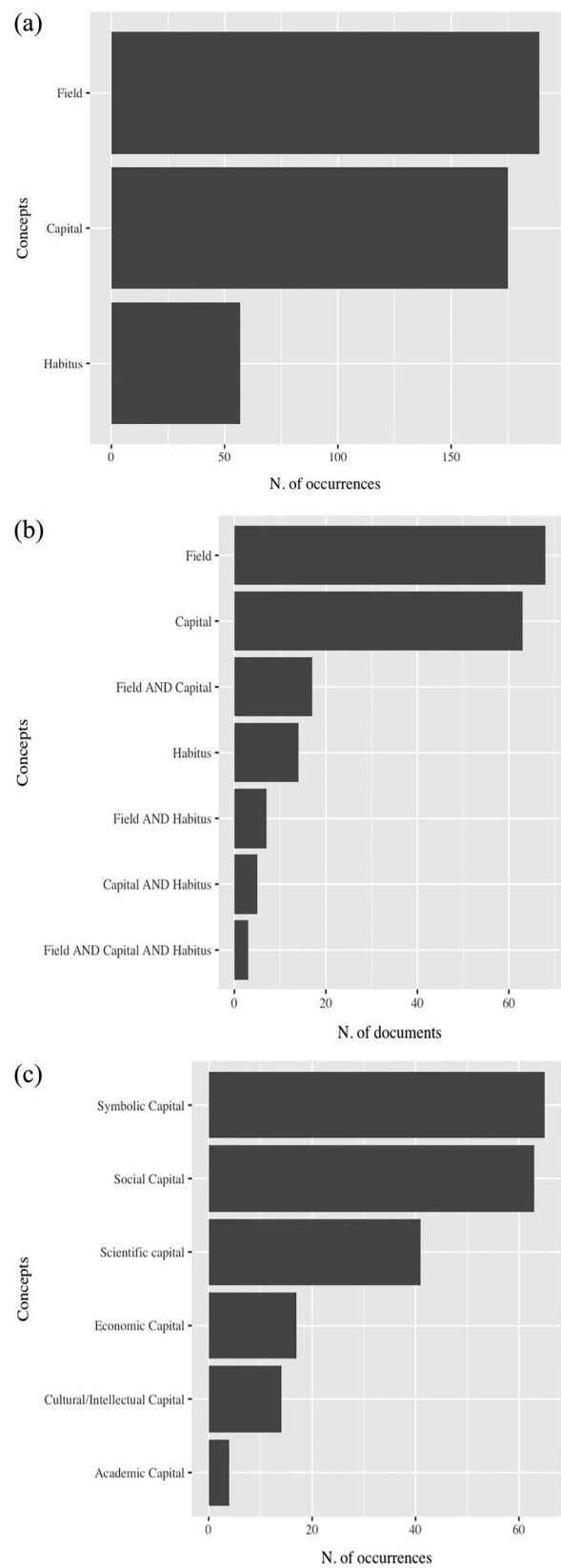


Figure 3. (a) Bar chart of Bourdieu's triad according to occurrences of the codes. (b) Bar chart of Bourdieu's triad according to the number of documents. (c) Bar chart of Bourdieu's triad according to occurrences of the concept *capital* in the data set.

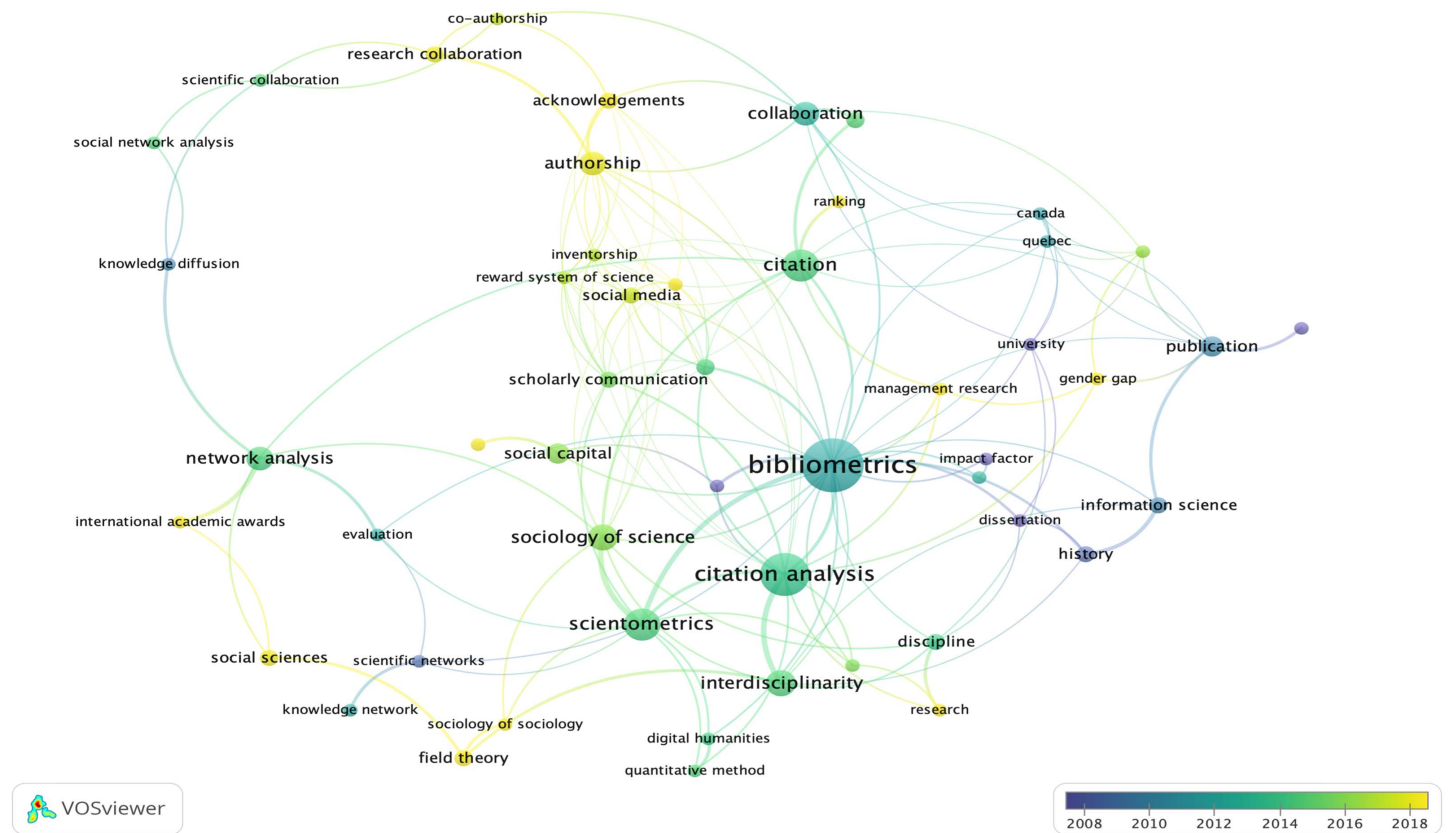


Figure 4. Text mining network based on the co-occurrence of author-assigned keywords.

impact on other fields (the fields of organizational analysis and accounting, respectively). More recent studies (Doblytė, 2019; Millar, 2021) also employ this perspective of the triad. Similarly, the content analysis and the detailed reading of documents ground this section, which focuses on how the key concepts in the triad have been used. Bourdieu's thought is broader than the triad, and "it rests not on three but on six conceptual pillars (the triad plus doxa, symbolic power, and reflexivity)" (Wacquant, 2014, p. 125). Besides the triad, these three other concepts have therefore been used to code the texts (together with other concepts that have emerged from the data). However, because "field," "capital," and "habitus" occur with significant frequency in the corpus of the present review, the discussion of the results is structured in sections corresponding to the elements of the triad.

3.2.1. Field

Spatial metaphors are not uncommon in bibliometrics (Hammarfelt, 2020), which is a crucial factor for understanding how Bourdieu has been received in this field. In Bourdieu's conceptual framework, social fields are spaces that possess three dimensions (Salö, 2020): (a) the physical and material dimension (i.e., a geographic space that human agents inhabit and the materiality of their practices); (b) a social dimension (i.e., the relations between agents in the field); and (c) a semantic dimension (i.e., the meanings exchanged through communication). The bibliometrics literature has focused on (b) and (c), often combining his field theory with theoretical approaches established in this research domain. Bourdieu's idea of a "social topology" based on the relations between agents is translated into a topology of relations between documents or, less often, authors. The organizational (Whitley, 2000) and the

cybernetic (Leydesdorff, 2011) approach in science studies have played a key role in reinterpreting Bourdieu's topology according to bibliometric terminology and therefore deserve special mention. According to Whitley (2000), scientific fields are work organizations with a cognitive dimension characterized by degrees of "task uncertainty" and a social dimension determined by the "mutual dependency" of the scientists upon each other in performing their everyday work tasks and in making a decision (e.g., where to publish their research). Several studies have associated the Bourdieusian conceptualization of the scientific field with Whitley's organizational account of science (Gómez-Ferri, González-Alcaide, & Llopis-Goig, 2019; Hammarfelt, 2011, 2018; Hyland, 2003; Prpić, 2007; Sheble, 2017). The connection between Bourdieu and Whitley is perhaps most evident in the works of Loet Leydesdorff, who combines Bourdieu's idea of the relative autonomy of the scientific fields with a cybernetic perspective. From this standpoint, a research field is a relatively autonomous subsystem in the system of science, which is a subsystem within society. Further down in the hierarchies of systems, a field is a "self-organization of cultural constructs" that follows the cybernetic principle of autopoiesis (Leydesdorff, 2011, p. 398). According to Bourdieu (1975b), social fields (the scholarly field being one of them) possess relative autonomy, which agrees with the conceptualization of scientific fields as self-sustained work organizations (Whitley, 2000) or cybernetic systems that evolve based on their internal feedback (Leydesdorff, 2011). The idea of the relative autonomy of fields—or "spaces of meanings," to use Leydesdorff's phrasing—also appears in the literature dedicated to the institutionalization of fields and the conceptual identification of disciplines (Dolfsma & Leydesdorff, 2010; Hammarfelt, 2020; Pierce, 1992; Sugimoto & Weingart, 2015). In fact, according to Bourdieu (1985a), a discipline is a scientific *champ* that has undergone "institutionalization." In other words, the *champ* has its formally accepted "means of knowledge production," such as specialized "associations, meetings, journals," the rights to grant academic degrees and titles, and to choose "official representatives" (Bourdieu, 2004, p. 50). Sociology is a discipline because of its established means of knowledge production, even if it is intellectually "scattered" by diverse points of view and schools of thought (Bourdieu, 2002). This discipline is, at least to Bourdieu's eyes, a "pariah science that is always under suspicion for its supposed political leanings" (Bourdieu, 2005, p. 10). However, sociology is also less interesting for the agents of the political *champ* than the higher status "state science" of economics (Bourdieu, 2005, p. 10). Subsequently, the risk of losing autonomy from the political *champ* is higher for the latter than for the former. In the data set identified for this review, Bourdieu's view on "discipline" is mentioned concerning the "strong connection between discipline and power" and contrasted with the work of Bourdieu's colleague at the Collège de France, Michel Foucault (Hammarfelt, 2020, p. 246). In the paper by Sugimoto and Weingart (2015), Bourdieu's conception of "discipline" is associated with the social connotation of disciplinarity, which is based on personal relationships and networks, a shared habitus, and common interests. A noteworthy element is that, according to Bourdieu (2004), the description of the struggles between physicists and engineers for identity and resources portrayed in the book by Gingras (1991) is emblematic of the social and power component of the discipline as institutionalized *champ*.

Several sources have focused on the interdisciplinarity of science fields and their disciplinary boundaries (Hammarfelt, 2018; Horta & Santos, 2020; Shibayama & Wang, 2020; Sugimoto & Weingart, 2015). This literature could be read as a sign of bibliometric research's more pressing interest in the interaction between fields compared with Bourdieu's original sociology of science—if the criticisms of Bourdieu's emphasis on the autonomy of scientific fields, discussed in Section 1.2., are considered (Burawoy, 2018; Eyal, 2013). On this topic, however, it is crucial to remember that several bibliometrics papers emphasize the relative

autonomy of the domain of journals from the actual relations between authors (Katchanov & Markova, 2017; Katchanov, Markova, & Shmatko, 2016; Leydesdorff, 2011).

Bourdieu's topology of fields is intrinsically social and cognitive. Separating the cognitive organization of intellectual—scientific and artistic—fields from their social organization is, for Bourdieu (1985a), a fallacy because this operation legitimizes existing power relationships, as the field of German philosophy exemplifies (Bourdieu, 1991c). The traditional emphasis on the cognitive dimension of Martin Heidegger's philosophy (i.e., his theories and concepts) disentangles intellectual from social relations. According to Bourdieu, Heidegger's view of philosophy as the foundation of any other type of knowledge stems from his position as a professor at the dawn of the Third Reich, when the role of philosophy professors was declining because of the competition brought forward by emerging social sciences. Interpreting research fields as sociocognitive structures is also a perspective rooted in the bibliometrics tradition (Hammarfelt, 2018), as shown by the sources using the term *sociocognitive* (Díaz-Faes & Bordons, 2017; Gingras, 2008; Sheble, 2017). In particular, Díaz-Faes and Bordons (2017) consider acknowledgments as sociocognitive reflections of a scholarly community, and Gingras (2008, p. 78) proposes the study of cocitation relations as a historical "socio-cognitive analysis" of the collective citation behavior of physicists.

Scientific fields are spaces of power struggles for the control of the means of knowledge production, that is, for scientific authority as embodied in "technical capacity" and "social power" (Calabrese, 1992, p. 208). The Bourdeusian theme of asymmetric power relations has emerged in studies focused on the skewness of publication and citation patterns. Even before Bourdieu's most popularized works were published, he was cited in a paper on "scientometric patterns" (Haitun, 1982). Studies on distributions and normality (Ivancheva, 2001), models of knowledge diffusion (Vitanov & Ausloos, 2012), and citation distributions (Katchanov & Markova, 2015) are also focused on the skewed nature of publication and citation patterns.

Bibliometric literature has referred to Bourdieu's concept of power as the creation or consolidation of asymmetric relations in the field and has focused on topics as diverse as gender inequality (Olinto & Leta, 2011), language bias in evaluating research (Frey & Pommerehne, 1988; Vasconcelos, Sorenson et al., 2009), disparities between senior and junior researchers (Larivière, 2012), and the ranking of scientists, journals, and universities (Gingras, 2016).

Bibliometrics scholars have used Bourdieu's methods far less frequently than his concepts. They have often reinterpreted his field theory as connections between authors (e.g., coauthorship), references, or citations, e.g., cocitation and bibliographic coupling, or words in the text (e.g., topic modeling and cword analysis) (Yan, 2014). In their study on Russian physics, Katchanov et al. (2016) replicate the approach of *Homo academicus* (Bourdieu, 1988), although employing multidimensional scaling rather than multiple correspondence analysis. On this topic, mathematicians (and Bourdieu's former collaborators) Brigitte Le Roux and Henry Rouanet wrote that multidimensional scaling dominated multiscale statistics, whereas correspondence analysis was left "underutilized" (Le Roux & Rouanet, 2004, p. 14). In the literature set of this review, however, correspondence analysis has been applied in the article by Paul-Hus, Díaz-Faes et al. (2017) to investigate acknowledgment practices. Other examples of the use of correspondence analysis are found in the paper by Pandiella-Dominique and Bautista-Puig (2018) on sustainability research, the article by Brahimi and Fordant (2017) on the citation impact of the social theorist Edward Said, and the more recent paper by Schwemmer and Wieczorek (2020) on the divide between quantitative and qualitative methods in sociology.

More generally, methodological diversity reigns among the studies that refer to Bourdieu. Coauthorship is used as a proxy for collaboration (Forte, 2017). Coauthorship *and* mentions in

blogs (Roth & Cointet, 2010) but also cocitation (Zeng, Shen et al., 2019) are used for community detection. Scholarly journals as “spaces of meanings” are studied through factor analysis by Leydesdorff (2011), whereas Roth and Cointet (2010) analyze the field as the space defined by the relations between agents—a specific community of scientists—rather than those between journals. Moreover, in bibliometrics, there have been various conceptualizations of “field.” As mentioned by one reviewer of the present article, it suffices to consider the discussion regarding “field-normalization,” a topic discussed in the review’s data set in several sources (Costas, Perianes-Rodríguez, & Ruiz-Castillo, 2017; Leydesdorff, 2021; Lietz, 2020; Sugimoto & Larivière, 2018). Discussing the concept of “field” in bibliometrics without referring to Bourdieu’s *champ* might be more appropriate for the research questions driving that specific line of inquiry, which also holds for documents that include references to Bourdieu. In fact, the review’s data set comprises documents that have utilized Bourdieu’s framework to a more significant extent—the case of *Physics and the rise of scientific research in Canada* (Gingras, 1991) is emblematic, as discussed earlier on in this section—but also other sources in which a reference to Bourdieu’s *champ* appears to be just one among the many, as, for instance, in the paper by Sheble (2017). These latter cases are nevertheless helpful in gauging the influence of Bourdieu because they still suggest an interest in his works.

In sum, Bourdieu’s field theory has been used connected with the topic of the socio-cognitive organization of the sciences and, from the methodological perspective, mediated by established bibliometric approaches, such as semantic analyses of texts or coauthorship.

3.2.2. Capital

The concept of capital is associated in the literature with both “evaluative spheres” of a field (Åström & Hammarfelt, 2019), that is, the institutional sphere of formal research evaluation and the sphere of scholars’ reputation in their communities. Bourdieu (1988) considered citations as proxies for symbolic capital, a view shared by Cronin (1998) and Gingras (Gingras & Wallace, 2010), the two pioneers of the review’s literature set, as mentioned earlier. In this perspective, achievements based on citations and citation indexes convey a scholar’s symbolic capital, a driving force in the reward system of science. Cronin (1998) regarded Bourdieu’s stance on citations as symbolic assets as a stable ground for a “metatheory of citation,” responding to Leydesdorff’s (1998) call for a broader conceptual standpoint for theorizing citation patterns. Hyland (2003) pointed out that Bourdieu’s (1991a) theory of symbolic capital in *Language and symbolic power*—a book also influential in Cronin’s (2005) interpretation of citations as symbolic capital—has contributed to the success of the “market metaphor” that presents citations as the assets of academia.

Fuchs Epstein (2010) has regarded Bourdieu as indebted to Merton’s theory of cumulative advantage. Nevertheless, on several occasions, Bourdieu (Bourdieu, 1975b, 2000; Bourdieu & Wacquant, 1992) criticized Merton’s approach as a simplified account of the scientific field based on the ideal of the scientific norm. In his last lectures at the Collège de France (2001b), Bourdieu mitigated his criticism of Merton. On the one hand, Bourdieu considered the conflicts or “war” (in French *guerre*, see Bourdieu, 2001b, p. 93) between agents as the driving force of science, rather than the scientific community’s pursuit of common goals as theorized in Merton’s sociology. On the other hand, for Bourdieu, the norms sanctioned by a scientific community still regulated which weapons were allowed on the scientific battlefield. Thus, Bourdieu’s position towards Merton is more contradictory than he would have liked to admit. He criticizes Merton but includes the perspective of the Mertonian norm into his view of socialization through the habitus of the field. In other words, Merton’s scientific norms add to Bourdieu’s theory a stable framework in which the conflicts emerge and find solution,

strengthening Bourdieu's (2001b) argument against views on science he deemed relativist (such as that of Bruno Latour and David Bloor, among others). In the review's data set, references to Merton's book *The sociology of science* (Merton & Storer, 1973) and his paper on the Matthew Effect (Merton, 1968)—cited by 62 and 44 documents, respectively—show the coexistence of Bourdieu's concept of capital and Merton's conception of science as a reward system self-regulated through its norms. This coexistence emerges in papers on citations (Cronin, 2000; Cruz-Castro & Sanz-Menendez, 2021; Larivière & Costas, 2016), acknowledgments in the reward system of science (Paul-Hus, Mongeon et al., 2020), and journal acceptance rates (Sugimoto, Larivière et al., 2013). In particular, the article by Desrochers et al. (2018) discusses the reward system of science from the perspective of Merton's and Bourdieu's distinct sociological standpoints and their presence in Cronin's works. From such a vantage point, Desrochers et al. (2018) deliver a picture of the state of the art of scholarly communication research as more and more inclusive in terms of which activities and achievements generate academic rewards—from authorship, contributorship, and inventorship to citations, acknowledgments, and social media metrics. As also pointed out on several occasions in the literature set analyzed in the present review, symbolic capital can have other proxies besides citations: distinctions, promotions, web hits, media mentions (Cronin & Shaw, 2002), scientific prizes (Bégin-Caouette, 2017; Cronin & Shaw, 2002; Ding & Cronin, 2011; Gingras, 2008; Gingras & Wallace, 2010), the place in the author byline of coauthored publications (Larivière, Desrochers et al., 2016; Mongeon & Larivière, 2016), mentions in an article's acknowledgments (Desrochers et al., 2017), social media mentions (Díaz-Faes, Bowman, & Costas, 2019), and invitations to take part in popular science activities such as TED Talks (Sugimoto, Thelwall et al., 2013).

For Bourdieu, symbolic capital depends on *illusio*, or “the set of rules that defines a field and legitimizes its existence” (Desrochers et al., 2018, p. 225). The rules that govern fields are *illusio* if seen from the perspective of the field and *doxa* from the agent's perspective. This latter concept, mentioned in the data set of the review by Bjerregaard (2010), means a belief system that guides the social agents to act according to the correct behavior for the field (Bourdieu & Wacquant, 1992). Altmetrics (or alternative metrics) exemplify how new criteria for prestige (besides those of traditional metrics) may affect the *illusio* of the field and arguably the mindsets of social agents, their *doxa*. If, or when, alternative metrics become part of the “rules of the game” of science, agents such as authors or research evaluators might follow those rules even if they are not forced to do so by formal practices, such as research assessment exercises and workplace requirements (Desrochers et al., 2017; Díaz-Faes & Bordons, 2017).

Regarding the method aspects, bibliometricians have reinterpreted the symbolic capital using their field's data collection and analytical tools. For instance, Gingras and Wallace (2010) move beyond Bourdieu's (1975b) reservations about the idea of one scientific community (and its underlying Mertonian assumption). The two authors operationalize the concept of “global symbolic capital” with the total number of citations received in the citation index. An author's “local” dominance in a field corresponds, instead, to the centrality of publications in a cocitation network and the number of citations received from other authors in that field. In another example of how symbolic capital has been reinterpreted according to bibliometric notions, Ding and Cronin (2011) differentiate symbolic capital as popularity (to be mentioned by any paper, regardless of its citation score) and prestige (to be mentioned by highly cited papers).

Various aspects related to coauthorship appear in the literature that refers to symbolic capital. Cronin (2005) points out that the significant number of authors typical of highly collaborative fields where expensive apparatus is shared—the phenomenon of “hyperauthorship”—

complexifies the relation between the symbolic capital gained through authorship and the corresponding rewards. The sharing between coauthors of the loss of symbolic capital or “negative capital obtained when a discovery is found to be fraudulent” is the topic of the paper by Mongeon and Larivière (2016). From a large-scale analysis of contributorship statements Larivière et al. (2016) find that “technical” contributions are most often performed by junior academic staff. In contrast, senior researchers conduct more typically “conceptual” tasks, indicating a “shift from technical work to more conceptual work as researchers age and rise in the hierarchy of science” (Larivière et al., 2016, p. 426). Moreover, the study’s findings would support the practice of contributorship statements to increase the transparency of scientific knowledge production, including the accountability for one’s work that comes with being an author.

For Bourdieu (2010), statistics are crucial to the success of sociology as a science. Yet, they may reproduce established ways of classifying social phenomena and reinforce power hierarchies. From such a perspective, citation indexes and bibliometric indicators—that Bourdieu (1988) mentioned in *Homo academicus*—possess an “ambiguity” (Bourdieu, 2000, p. 187) similar to the one he ascribes to the official statistics in sociological work. Publishing research output in top-ranked journals is a decisive “rule of the game” of science, one key strategy to secure a position in the field (Gingras, 2016). Similarly, Ordorika and Lloyd (2015) consider university rankings as social constructs that transform economic and social capital into symbolic capital and consolidate power inequalities in the global academic market. Nevertheless, analyses of publication and citation patterns or studies on university rankings can make the power structures more visible. For instance, university rankings can be used to operationalize the notion of “elite status,” as the paper by Siler (2013) effectively shows.

Research collaboration can generate more or less symbolic capital according to the prestige of who is involved. However, collaboration always increases social capital—the second most mentioned type of capital—although often in texts more directly relevant to a specific national context (Djuric, Dobrota, & Filipovic, 2020; Prpić, 2007; Vasconcelos et al., 2009). Some papers derived tools and methods from social network analysis applied to coauthorship (Abbasi et al., 2014; Niu, 2014). Several authors (Forte, 2017; Letina, 2016; Martín-Alcázar, Ruiz-Martínez, & Sánchez-Gardey, 2019; Rost, Teichert, & Pilkington, 2017) mention Bourdieu’s notion of social capital together with that of Robert D. Putman, James Coleman, and Ronald S. Burt (Forte, 2017; Letina, 2016; Martín-Alcázar et al., 2019; Rost et al., 2017).

Finally, the concept of “scientific capital,” that is, the symbolic capital typical of the field of science (Bourdieu, 1975b) is also mentioned in the literature (Desrochers, Bowman et al., 2015; Desrochers et al., 2017, 2018; Ernø-Kjølhed & Hansson, 2011; Olinto & Leta, 2015), although less often compared with symbolic and social capital.

3.2.3. *Habitus*

The third concept of the triad, habitus, is also found in the literature, although to a minor extent. Some authors have focused on particular aspects of habitus formation, in particular, social class background (Andersen, 2001; Chiappa & Perez Mejias, 2019), the professional habitus (Herring, 1999), gender (Olinto & Leta, 2011), and academic seniority (Larivière, 2010a, 2010b; Larivière et al., 2016). Andersen (2001) finds that access to elite positions at Danish universities is more limited for those with a working-class upbringing (even if subsequent socialization after entering the scientific field mitigates the effects of class origin). His conclusion agrees with Bourdieu’s (1988) findings on French academia and recent work on Chilean universities (Chiappa & Perez Mejias, 2019). Several studies by Larivière (Larivière,

2010a, 2010b; Larivière et al., 2016) focus on the junior staff's socialization into their role of independent researchers. In PhD programs, acquiring the habitus of the field explains the correlation between a higher number of articles written by Québécois PhD students throughout their doctoral program and their later prolificacy after completing the doctoral program (Larivière, 2012). More recently, Bes, Lamy, and Maisonnobe (2021) have provided a compelling analysis of the socialization of PhD students based on copublishing between doctoral students and members of thesis committees at a French university. The topic of gender differences in science is discussed in several papers (Larivière, Vignola-Gagne et al., 2011; Leta, Olinto et al., 2013; Sheble, 2014) and are conceptualized as habitus by Olinto and Leta (2011). In particular, Larivière et al. (2011) refer in their paper to a key aspect of Bourdieu's theory of the habitus, which is the internalization of "dominant" values and their incorporation in the habitus of the "dominated." As they write,

Given that men still occupy, more often than not, the dominant positions and participate actively in the formulation of research policies, and that many women also internalized these "dominant" values, it could happen that even in the current reconfiguration of the tasks assigned to universities, domains that are considered "significant" will remain for a long time those of "hard" and "masculine" science (Larivière et al., 2011, p. 495).

Together with other feedback mechanisms at play in the system of science, for example "publications lead to grants, which lead to further publications" (Larivière et al., 2011, p. 493), the authors mention this dynamic, the self-reinforcement of dominant values in the formation of the habitus, which is at the heart of Bourdieu's sociological thought, most famously in the book *Distinction* (Bourdieu, 2010) in regard to aesthetic values, and more specifically in relation to the topic of gender in *Masculine domination* (Bourdieu, 2001a). One aspect of what Bourdieu (2001a, p. 9) termed the "socially constructed division between the sexes" is the self-reinforcement of "academic gendered stereotypes" mentioned in a paper by Paul-Hus et al. (2020). The findings of this study show that "gender disparities generally found in authorship extend to acknowledgements," with women acknowledging "proportionally more women than men do" (Paul-Hus et al., 2020, p. 591). Moreover, the breaking down of the results according to the scholarly disciplines also shows differences that the authors relate to the male *vis-à-vis* female dominance in the field in terms of staff composition.

Rather than analyzing which elements influence an agent's habitus, as in the studies mentioned above, other authors associate the habitus of scientists with the topic of bibliometric indicators in research evaluation (Nielsen & Borjeson, 2019; Olinto & Leta, 2011). In particular, Alvarado and Arango (2015) discuss how bibliometric terminology has become part of the scientific habitus of researchers. In their view, attending courses in bibliometrics has facilitated the formation of a "bibliometric habitus" among Brazilian authors. This mindset appraises publication channels based on their bibliometric impact and international reach. Citizen bibliometrics (Leydesdorff, Wouters, & Bornmann, 2016) that is, the "nonprofessional use of bibliometrics by managers and researchers" (Hammarfelt & Rushforth, 2017, p. 170) could be a valuable perspective to frame Alvarado and Arango's notion of a "bibliometric habitus." The more diffused this "bibliometric habitus" is, the more needed the reflexive attitude advocated by Bourdieu becomes. Gingras (2016) provides a clear example of reflexivity when discussing the *h*-index and the journal impact factor's intrinsic weakness. However, Leydesdorff (2017) warns against Gingras' proposal of rational arguments as a countermeasure against the misuse of bibliometric indicators. These arguments might underestimate that bibliometrics has become "the subject of a political economy that its co-constructs" (Leydesdorff, 2017, p. 596). In the light of such a political economy, the need for reflexivity would seem even more pressing.

4. DISCUSSION AND CONCLUSION

To summarize the main findings, the three concepts of field, capital, and habitus have been used as a “social critique” of the asymmetric power relations and inequalities built into the system of scholarly communication. Most studies focus on one or more of the following aspects: gender inequality, junior researchers, journals and university ranking systems, and language biases in research assessment. The most common concepts in the literature are “field” and “symbolic capital.” Furthermore, Bourdieu’s concept of “field” is harmonized with other well-established theoretical viewpoints in bibliometrics, such as Merton’s sociology of science and Leydesdorff’s cybernetic approach to quantitative science studies. Furthermore, Leydesdorff’s (2021) research shows the weight of Whitley’s (2000) organizational approach in Bourdieu’s reception. Another important insight gained from the literature review is the theme of the “ambiguity” of bibliometrics methods as instruments that can both reinforce the power structures at work in science and bring such structures to the fore, as in the case of gender inequalities.

With the notable exception of Prpić (2007), the literature has not discussed what Bourdieu (1991b, p. 7) calls “delegation,” or the transfer of capital from an institution to an individual agent or a group. This notion could help interpret the transfer of capital in knowledge production based on the “*capital of social authority* in matters of science” that rest on “delegation from an institution” (Bourdieu, 1991b, p. 7; italics in the original text). In other words, if a university is “dominant” in the hierarchies of the field, the capital embedded in the institution is transferred or “delegated” to the individual researchers. When researchers are authorities or, as Bourdieu writes, possess “*capital of strictly scientific authority*, which rests upon the recognition granted by the peer competitors” (1991b, p. 7; italics in the original text), the delegation of power from the university to the researcher becomes less relevant. The connection between “elite status” and “university rankings” (Siler, 2013) encountered earlier in the review offers a direction to study the phenomenon by using the position in the university rankings as a proxy for its “dominance” in the field. Research with a standpoint in systems theory and cybernetics (Fujigaki, 1998; Leydesdorff, 2011, 2021; Leydesdorff, Petersen, & Ivanova, 2017) could also help define the dominance of a university beyond its rankings, in particular its position in the system of “university-industry-government relations” (Leydesdorff, 2021, p. 90).

In addition, although, as mentioned in the review, there have been papers that have used correspondence analysis (Pandiella-Dominique & Bautista-Puig, 2018; Paul-Hus et al., 2017), further bibliometric research could apply the statistical side of Bourdieu’s work—currently being developed in quantitative social science by some of Bourdieu’s former collaborators under the name of *Geometric Data Analysis* (Le Roux, Bienaise, & Durand, 2019)—to investigate topics not yet explored with this methodology, for instance, the power position of publishers (see Bourdieu, 2008).

On a more general note, it is challenging to establish a field’s instances of “obliteration by incorporation” (Garfield, 1975) and all the authorities who are taken for granted and thus no longer explicitly cited. On the one hand, given the more significant number of occurrences of the concept “field” in the data set of this review, one would probably need to look in that direction to gauge Bourdieusian concepts that have been “incorporated and obliterated.” On the other hand, the review has shown the presence in the literature of several documents that address “capital” and “habitus,” (see also the reading list provided as Appendix C in the Supplementary material), as well as papers that also employ correspondence analysis (Paul-Hus et al., 2017), Bourdieu’s signature method. The diffusion of a broader conceptual and methodological “toolbox” not limited to the most recurring concept of *champ* might well expand the domain of the notions which become incorporated by their progressive obliteration.

The rationale of this critical review has stemmed from the use of Bourdieu's works by bibliometric research and the need to understand in which contexts his thought has been considered relevant—an operation that Hussey (2010) has earlier pursued for research in Library and Information Science. It goes without saying that the references to Bourdieu alone do not reveal anything about the depth of the analysis of the texts that cite his works (or those that do not cite them at all). References to Bourdieu and the engagement with his thought (from more extensive discussions of the *champ* and other Bourdeusian concepts to far shorter mentions of his works) derive ultimately from the type of research questions being answered. The review has nevertheless delivered a picture of a nonnegligible portion of the research output in quantitative science studies. With its surveys of the topics, Bourdieu's triad first of all, this article has attempted to cast light on the literature that has invoked Bourdieu's framework and incorporated it through references, which are ultimately "indicators of selection processes" (Leydesdorff, 2021, p. 41). Future research could repeat this operation to look for changes in perspectives and research priorities, including possible developments in the social and cognitive relations between bibliometrics (and related fields) and the sociology of science.

Notably, the present review itself comes with limitations. The phenomenon of "obliteration by incorporation" (Garfield, 1975), according to which well-established ideas do not receive explicit references in a scientific text, might have caused the exclusion of potentially relevant literature that did not have explicit references to Bourdieu. Considering only sources available in English might have meant missing relevant sources in other languages. Data sets of literature in other languages, particularly French, could address this issue. Overall, this means that Bourdieu's thinking may well have had a larger impact on the field of bibliometrics than can be inferred by studying references to his works in the data set studied here.

To conclude, one might recall Bourdieu's (1991c) interpretation of Heidegger's idea of a premodern era before bureaucracy and technological advances—and statistics—had dehumanized human existence (the *Dasein*), reducing it to mere numbers (the *Das Man*). Thus, from a Bourdieusian perspective, statistics can reinforce power structures or provide tools to understand power relations, the first step toward social change. Therefore, acknowledging the ambiguity of statistics is essential for achieving the goal of reflexivity in quantitative science studies.

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The author has no competing interests.

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DATA AVAILABILITY

The full data set of the review (Appendix A), as well as the coding scheme (Appendix B), and a list of suggested readings based on the finding of the study (Appendix C) are available from Zenodo (<https://doi.org/10.5281/zenodo.7437298>).

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