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Conceptual paper

An overview of qualitative comparative analysis: A bibliometric analysis

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ABSTRACT

This study is organized in two parts. We conduct a general analysis of the use of qualitative comparative analysis (QCA), and a bibliometric study of the use of QCA to analyze the specificities of the research publications that apply this methodology. Our results show the differences in quantitative terms of the three variants of this methodology: fsQCA, csQCA, and mvQCA.

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Una visión general del analísi comparativo y cualitativo: Un análisis bibliométrico

RESUMEN

El estudio está organizado en dos partes: La primera parte consiste en un análisis general del uso del Análisis Cualitativo Comparado (QCA); en la segunda parte se presenta un

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análisis bibliométrico del uso del QCA que examina las especificidades de las publicaciones científicas que aplican esta metodología. Nuestros resultados muestran las diferencias en términos cuantitativos de las tres versiones de la metodología: fsQCA, csQCA y mvQCA.

Introduction

Social science is aimed at helping us understand the reality surrounding us so that we can improve it. Different fields of study have adopted a systems approach (Kast & Rosenzweig, 1972), which has become one of the predominant paradigms. A basic principle of Systems Theory is *equifinality* which generates the need to identify the various configurations of the system elements which lead to a desired state or outcome, while allowing understanding of the critical factors or necessary conditions explaining the presence or absence of that outcome or state.

However, social science, in an attempt to emulate its seniors, the pure sciences, has adopted increasingly sophisticated and powerful methodologies and algorithms. These are geared toward establishing and quantifying causal relationships between the variables, and underestimate the importance of analyzing the complex interactions produced in social science which allow for several alternatives to achieve the same end.

In recent years, the adoption of qualitative comparative analysis (QCA), which uses Boolean logic, has been growing, substituting traditional correlation methods to establish causal conditions related to a particular result (Ragin & Fiss, 2008; Ragin, 1987; Ragin, 2000; Ragin, 2008; Vis, 2012; Woodside, 2016). Aside from its application to case studies, QCA currently focuses on analysis of empirical data to generalize the analysis, taking account of possible replication in subsequent studies, and constructing logical propositions following the qualitative study of the phenomenon in question (Ragin, 1987; Ragin, 2000; Woodside & Zhang, 2012). This method is effectively and parsimoniously able to address the challenges described in the previous paragraph, and offers results which complement and enrich the state of the art.

This article provides a detailed description of the characteristics of published research that employs QCA. Specifically, the study aims to identify quantitative differences among its variants, to provide a global perspective of the state, scope, and impact of published research. The objective is to spread within the academic community, an analytical method that is able to complement and extend research programs. To achieve this, we provide a bibliometric analysis of the research contributions to date.

Based on this analysis, the present article provides information on the following aspects: (1) the number of studies per research field; (2) the number of articles published per year; (3) the number of articles that use each variant of QCA and the number of articles of each QCA variant published in JCR journals; (4) citations per field and average number of citations; most cited QCA articles; (5) the journals publishing the highest number of articles using QCA. Accompanying a description of the data, we explain the circumstances which possibly led to this evolution.

The study is structured as follows: '*Qualitative Comparative Analysis*' section reviews the evolution of QCA; '*Bibliometrics*' section provides a bibliometric analysis of the use, application, main authors, and impact of QCA; '*Conclusions*' section discusses the main conclusions and suggests future directions of research on QCA.

Qualitative comparative analysis

QCA (Ragin, 1987; Ragin, 2000) is an analytic technique which combines quantitative and qualitative methodologies. The technique originally focused on small samples but further development has allowed its application to broader contexts.

QCA was developed from Mill's (1843) canons, to establish causal relationships through systematic comparisons. Particularly relevant are the methods of agreement and difference. According to the method of agreement, if two or more examples of the phenomenon under investigation have just one circumstance in common, the circumstance common to these examples is the cause or effect of the given phenomenon (Mill, 1843). According to the method of difference, if there is a circumstance when the phenomenon under investigation occurs, and another when it does not occur, this difference is the cause or effect or a necessary part of the phenomenon. Mill (1843) combined these methods in what came to be known as the "method of agreement and difference". This method, although less consistent than previous methods, advanced application of these theories to real circumstances, and laid the foundation for the development of QCA (Vassinen, 2012).

Some of the disadvantages of Mill's (1843) principles are: (1) The complexity involved in identifying a common difference or circumstance, and (2) that this difference should be the determining cause of the phenomenon. In other words, Mill's canons do not allow for multicausality of the phenomenon. Furthermore, the method of the agreement is applicable only to phenomena with positive results.

Applications of QCA were initially focused on case studies. The drawback to these methods is the impossibility of generalizing the results to other similar cases. However, currently, in addition to being based on case studies QCA focuses on analysis of empirical data for the generalization of analyses taking into account possible replication in subsequent studies, and constructing logical propositions as a result of

the qualitative study of the phenomenon in question (Ragin, 1987; Ragin, 2000; Woodside & Zhang, 2012).

Ragin (2008), which is founded in configurational analysis, allows comparison between cases, and at the same time, offers a detailed understanding of the complexity of each case, particularly in small or medium sized samples (Rioux & Ragin, 2009). Although historically QCA has been used for small- or medium-N, Emmenegger, Schraff, and Walter (2014) maintain that the method is applicable to research using survey data. To avoid the disadvantages of such samples, the authors recommend analyzing the strength of the results and propose a technique to achieve this. The most common procedure to ensure reliability of the results is the simultaneous implementation of the entire process by two researchers working together using the same data and selections. For their part, Fiss, Sharapov, and Cronqvist (2013) propose integrating the regression analysis framework with QCA to avoid eliminating possible drawbacks such as the omission of variables.

QCA uses Boolean logic instead of the traditional correlation methods to establish causal conditions strongly related to a particular outcome (Ragin & Fiss, 2008; Ragin, 1987, 2000, 2008). The basis of QCA's configurational approach is the analysis of sufficient and necessary causes to produce an outcome.

A condition is necessary if it is present in all instances of the outcome. One condition will suffice if a particular outcome emerges whenever the condition is present (Ragin, 2008; Schneider & Wagemann, 2012). However, there may be other conditions which lead to the same result, in other words, there may be multiple sufficient causes (Ragin, 2008).

There are two key concepts related to QCA: consistency and coverage. Consistency refers to the percentage of causal configurations of similar composition which result in the same outcome value. If the consistency of a configuration is low, it is not supported by empirical evidence. Therefore, it should be considered less relevant than other configurations with higher consistency. Coverage refers to the number of cases for which a configuration is valid. Unlike consistency, the fact that a configuration coverage is low does not imply less relevance. In cases where a result occurs through multiple causal configurations a single configuration can have low coverage but nevertheless be useful to explain a set which causes a particular outcome (Ragin, 1987, 2000; Woodside & Zhang, 2012). To organize the different causal configurations which lead to a particular outcome, truth tables are used (Ragin, 2009; Fiss, 2011). Every row in the table represents a configuration of the conditions that produce a particular outcome. The number of rows in a truth table is defined by 2^k, where k is the number of causal conditions. Frequency thresholds can be set to determine the conditions that are part of the research and those that are not, according to their relevance, as we discuss later.

The two most common variants of QCA are presented below: fuzzy-set (fsQCA) and crisp-set (csQCA).

crisp set (csQCA)

CsQCA is the first variant of QCA designed by Charles Ragin and Kriss Drass in 1987. The objective of this variant was to simplify, using Boolean logic, complex configurations, and to discover configuration models of multiple causal configurations.

CsQCA uses categorical conditions based on a dichotomy, assigning the values 1 – full membership, or 0 – full non-membership, to each condition. Since the objective is to find combinations of conditions that produce an outcome (or its absence), the researcher constructs a Boolean expression for each configuration.

As is always the case in QCA, the number of cases or configurations is equal to 2^k, where K is the number of conditions (variables) included in the study. The key process in the calculation of configurations is Boolean minimization. This process consists of detecting irrelevant conditions to achieve a simpler expression. Thus, if two expressions that are identical in all but one condition lead to the same result then that condition is irrelevant, since its presence or absence in no way affects the result.

The popularity of this method is countered by the problem of its practical applicability in real situations. In response to the limitations of the method to assign values to gradual conditions occurring in the social reality such as quality, satisfaction, etc., fsQCA was developed (Ragin, 2000, 2008).

fuzzy-set QCA: fsQCA

Among the three variants of QCA, fuzzy-set QCA (fsQCA) has attracted the most attention in terms of amount of research. According to data provided by Compasss (compasss.org) which compiles all published work using QCA method variants, the number of studies using fuzzy sets has grown exponentially with respect to the previous versions (crisp-set and multivalue QCA). Despite being originally designed for the analysis of countries, fsQCA has been used in numerous fields other than social science although its use in the latter is more frequent as discussed in section 3.

The original version of fsQCA described in *Fuzzy Set Social Science* (Ragin, 2000) was not applied as a version of QCA. The current version of fsQCA (Ragin, 2008) applies the fuzzy set to QCA. This allows for the transformation of qualitative information to quantitative values while maintaining original distinctions.

Furthermore, fsQCA allows the combination of various statements in a single instrument. Similarly, fsQCA enables asymmetrical causal relationships, that is, the fact that a condition 1 causes a condition 2, does not to imply that the condition 2 is related in the same way to condition 1 (Vassinen, 2012).

Following Ragin (2008), fsQCA assigns membership values to conditions on a scale from 0.0 (non-membership) to 1.0 (full membership), with 0.5 as the cross-over point or point of maximum ambiguity. This allocation is known as set calibration. Each configuration of causal conditions can be represented as a corner in a graphic space. Thus, a configuration with high values for all its conditions in a representation of a table with 2^2 rows will occupy a point near the upper-right corner of a chart with four quadrants. However, in a representation which includes configurations, some of the corners can be empty since some causal condition configurations do not occur in the reality they represent.

One of the main tasks to be undertaken before establishing the causal configurations is the definition of the conditions. Researchers must ensure that these conditions are relevant to

the study of an outcome based on the theory and the studies conducted so far in the field of expertise. Additionally, the selected conditions must be validated for all or most of the population constituting the study, and the evaluation criteria must be applicable to them. One (or the only) characteristic of csQCA which fsQCA does not exceed is that it detects contradictions, which can be considered a separate line of research.

If a contradiction appears, it indicates to the researcher that the case and the theory available to find errors or imperfections in the proposed model must be reviewed.

The fsQCA variant, unlike the csQCA, was not designed originally to detect and analyze contradictions in the causal configurations. In csQCA, the conditions with low levels of consistency or coverage with respect to the sufficient conditions are eliminated given that their value is always 0 (Ragin, 1987, 2000; Woodside & Zhang, 2012). FsQCA accepts the conditions with low levels of membership to a condition. This characteristic allows the solutions from application of QCA to be based on irrelevant conditions.

In other words, to calculate the consistency or coverage in the formula for the csQCA variant, the inclusion of irrelevant conditions for consistency or coverage becomes less important since these conditions do not change the result (which is always 0). However, the irrelevant conditions in fsQCA for the calculation of consistency and coverage can take values different from 0 but less than 0.5. Thus, this changes the result.

Rubinson (2013) proposes using a new software called *Kirq*, which allows identification of the contradictions in fsQCA. The author describes how these contradictions can be detected manually without resorting to the use of special software.

The problem of irrelevant conditions leads to consideration of false positives.

Following the example in Schwellnus (2013), a table of individual consistency values close to zero but similar to one another, appears in first position in the fsQCA truth table (Fiss, 2007; Ragin, 1987, 2000, 2008). However, in csQCA the consistency of the configuration will be 0. Moreover, according to Rubinson (2013), establishing a consistency threshold can lead to incorrect conclusions. For example, by setting a threshold of 0.8, a condition with 0.75 consistency will be dismissed, and the other conditions will be understood as sufficient to cause the result. If the threshold is set at 0.75, the condition could be validated and would suffice to cause the result even in the absence of a supporting reasoning. This is the main limitation of fsQCA, and is the subject of several recent studies.

To resolve this problem, Schwellnus (2013) proposes a method for the calculation of consistency and coverage which excludes these values.

Braumoeller (2015) warns against the lack of a goodness-of-fit test specific to the characteristics of fsQCA logic. Without such measures, a solution might rely completely on chance, and a causal condition might appear above the diagonal $(X \geq Y)$. That is, a condition might be presented as a necessary cause in a configuration by emerging in the same cases in which the true necessary cause would appear had it been considered in the study.

According to Schwellnus (2013), the proportional reduction in consistency (PRI) is the best option for fsQCA since it was developed by Ragin and has been applied to fsQCA. According to Braumoeller (2015), the solution to the false positives is an adaptation to a swap test of QCA's requirements, by adjusting the error Type 1 index (false positive) of each individual test in order to include the multiple hypotheses tests and assuring a FWER (family-wise error rate) in accordance with the standards of the field of investigation.

However, the PRI method, as the author indicates, might not rule out all irrelevant conditions. Moreover, the formula proposed by the author, the calculation of relevant consistency and coverage, departs from assigning the value 0 to consistency values close to 0. Ragin (1987) advises against this measure due to the consequences for the drawing of conclusions, which question its validity.

Rubinson (2013) links the problems of contradictions and false positives and proposes the use of the *Kirq* software, which avoids reductions of the truth table when it identifies contradictions. Rubinson suggests three options: modifying the data, codifying the column of results, or modifying the parameters of the analysis.

Thus, fsQCA is overtaking its predecessors (csQCA and mvQCA) due to the advantages it offers for configuring causal conditions based on the degree of membership rather than on categorical memberships as in csQCA and mvQCA. As previously established, recent work on the disadvantages of fsQCA offers various ways of correcting them and obtaining reliable results while reinforcing the usefulness of this method in several areas of study.

Bibliometrics

The concept of bibliometrics, or bibliometric analysis, was introduced by Alan Pritchard in 1969. However, the study of bibliography in a particular field dates back to the 19th century (Osareh, 1996). The field has grown exponentially since the advent of the Internet which facilitated communication among researchers around the world, and has enabled faster access to the contributions in a given area.

The present analysis collects data from publications on a given subject to identify factors of interest. These include authors or most frequently cited authors, scientific journals with the highest number of publications in the focal subject area, and the evolution of the subject area in terms of number of publications. Bibliometric analysis can also be focused on a particular journal to identify which subjects are most frequent, which authors publish most frequently in a certain journal, and which are the most cited articles (e.g., Merigó, Mas-Tur, Roig-Tierno, & Ribeiro-Soriano, 2015). Applications of bibliometric analysis vary as much as the factors that are analyzed with the result that the method has been applied in multiple subject areas including corporate social responsibility (de Bakker, Groenewegen, & Den Hond, 2005), international scientific cooperation (Glänzel, Schubert, & Czerwon, 1999), knowledge management (Gu, 2004), and medicine (Soteriades & Falagas, 2006). However, the analysis of topics or subject areas is not the only goal of bibliometric analysis. This study uses the technique to explore the relevance of an analytic method to identify cause and effect relationships: QCA. We exploit information from the Compasss database.
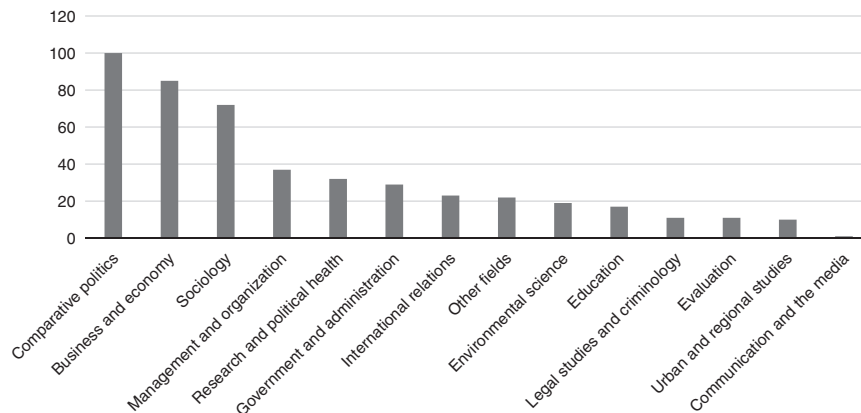
Fig. 1 – Number of articles in accordance with the area of study.

We found 469[1] articles on the Compasss website which includes the QCA methodology in its three variants (fsQCA, csQCA, and mvQCA). COMPASSS (COMParative Methods for Systematic cross-caSe analySis) is a global network which brings together researchers and professionals who share the same interest in theoretic, methodological, and practical advances related to a systematic comparative research approach to the use of configurational logic, the existence of multiple causality, and the importance of defining universes carefully. The project began in 2003, and its management was reorganized in 2008 and 2012 to accommodate the growing needs in the field.

The website's main objective is to advance development of systematic comparative analysis as an original and consolidated strategy to study diverse phenomena. It prioritizes the development and application of methods based on comparative configuration and theory sets (csQCA, mvQCA, fsQCA, and other related methods and techniques).

The platform provides a space for dialog and fruitful confrontations between qualitative (case-oriented) and quantitative (based on variables) methods, and a stage for the integration of these methods to progress in the development and application of approaches, methods, and original techniques, all aimed at developing a comprehensive approach to systematic comparative analysis of sets.

Alongside organization of this international resource platform, the main group in COMPASSS arranges seminars, manages a data file, publishes research, and participates in the development of software for the application of this methodology.

The objective is to make the platform a place of exchange among researchers from a variety of disciplines in the social sciences and psychology, among others.

Focusing on the bibliometric analysis, of the 469 articles based on the QCA methodology, 236 use csQCA, 222 use fsQCA, and 11 use mvQCA.

It is particularly striking that the articles based on fsQCA were mostly published between 2010 and 2015 while work exploiting the csQCA methodology started in 1991 and most was published in the 1990s.

In relation to the area of study, Compasss distinguishes the following applications: in urban and regional studies (10), in government and administration (29), in sociology (72), in business and economy (85), in environmental science (19), in education (17), in legal studies and criminology (11), in evaluation (11), in research and health policies (32), in management and organization (37), in comparative politics (100), in international relations (23), plus some applications in other fields (see Fig. 1).

Fig. 1 shows the huge differences in the number of articles using QCA in different areas of study. Comparative politics accounts for the largest number, followed by business and economics, and sociology. Currently, 54% of articles using the QCA methodology are published in these three areas. Other areas such as environmental science and education tend to prefer other methods. The popularity of QCA in comparative politics is logical since the method was designed primarily for this discipline. In areas such as education and legal studies, qualitative methods are common since these disciplines involve human characteristics in contrast to economics and sociology where statistical data weigh more heavily in the description of reality.

Regarding publication years, one of the articles was published in the 1980s, 44 in the 1990s (all utilizing csQCA), and the remaining 425 articles were published after 2000 (Fig. 2).

In 2003, the first article using the fsQCA variant was published. It was authored by Paul Pennings and appeared in the *European Journal of Political Research*. Note in particular that since 2010 more than 300 (of the 469) articles use QCA in both its csQCA and fsQCA versions.

In general, Fig. 2 shows that the number of published articles employing QCA as the method of analysis was relatively low between 1987 and 2001. During this period, the method was being progressively refined. However, since 2001, the number of articles published using this method has increased exponentially from 5 to almost 20 in three years, and to more than 70 in 2015, to a total of 134 articles published in (2014 and first half 2015).

This increase could be due to several factors. First, in 2000, Charles Ragin, author of the method, published a book on
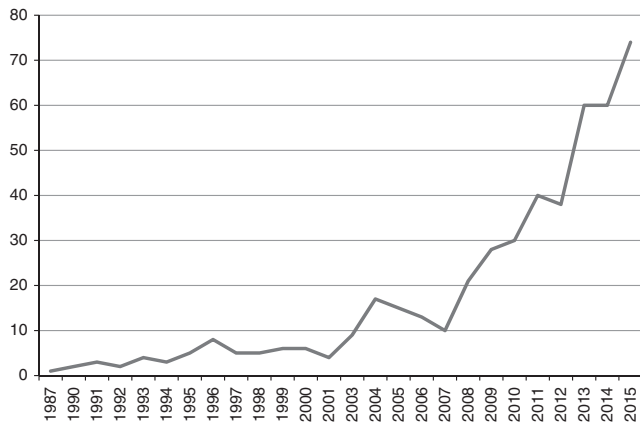
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[1] Accessed January 2016.

Fig. 2 – Number of articles published with QCA per year.

application of fuzzy sets in the social sciences. This method represented a huge advancement with respect to its predecessor, csQCA. Second, the development and expansion of use of the Internet and computers has favored research by allowing access to information previously not easily available to researchers.

CsQCA is the most method in these articles. However, use of fsQCA is not far behind (Fig. 3). What differs is the length of time since each method was introduced. CsQCA was introduced in 1987 when there was no similar method in existence. FsQCA was introduced in 2001 as an alternative to csQCA with fewer limitations. The limited popularity of mvQCA is based on its introduction as a modest alternative to csQCA which improved some aspects related to rigidity but did not resolve them completely.

Comparison of the articles published shows that mvQCA accounts for a marginal proportion (3%), while fsQCA (47%) and csQCA (50%) are of similar proportions, although the latter was introduced much earlier.

Regarding the quality and impact of the journals in which the articles were published, of the 469 articles analyzed, approximately 80% were published in journals indexed in the Social Science Citation Index of the Journal Citation Index (JCR). Only 21% were published in non SCI journals. Thus, it can be concluded that the methodology is relevant in the scientific field, given the academic prestige of the journals publishing these contributions.
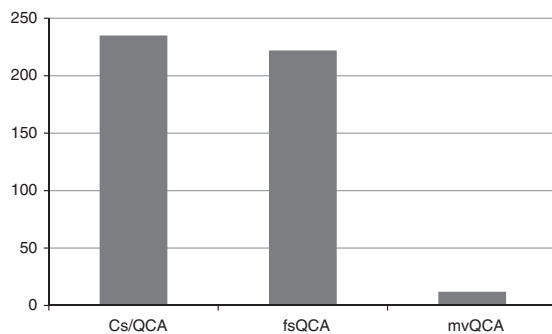

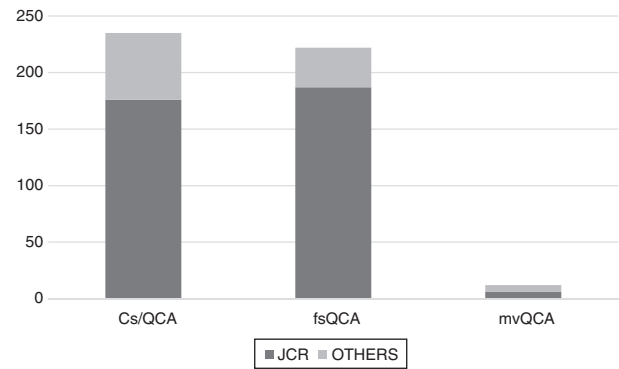**Fig. 3 – Number of articles using the different QCA methodologies.**

Fig. 4 – Methodologies used and indexation of the journals.

Fig. 4 depicts the number of articles published based on different versions of QCA, in SCI and non-SCI journals. It shows that although there is a high number of published articles using the csQCA method, the number using fsQCA published in indexed journals is even higher. In the case of mvQCA, the data are insignificant and only a little more than half of the articles published were in SCI journals.

Table 1 presents the total number of citations and articles published in each of the fields of research collected by Compasss. To determine the number of citations, we exploited the Google Scholar (GS) database. Although the number differs from the number recorded in the WoS (Web of Science), the proportions are sufficient to enable comparison among authors and institutions (Bornmann, Thor, Marx, & Schier, 2016). The last column in Table 1 presents the percentage of citations per article. It can be seen that the fields registering

Table 1 – Citations depending on the field of study and average citations.

Fields	Citations	Articles	Citations/article
Applications in sociology	4073	72	56.6
Environmental science	631	19	33.2
Management and organization	1076	37	29.1
Legal studies and criminology	271	11	24.6
Applications in government and administration	622	29	21.4
Compared politics	2036	100	20.4
International relations	434	23	18.9
Business and economy	1475	85	17.4
Applications in urban and regional studies	173	10	17.3
Research and political health	466	32	14.6
Other fields	273	23	12.4
Evaluation	133	11	12.1
Education	178	17	10.5
Applications in communications and media	8	1	8.0
Total	11,849	469	

Table 2 – Most cited articles.

Authors	Title	Year	Journal	Citations
Cress, Daniel M., and David A. Snow.	The Outcomes of Homeless Mobilization: The Influence of Organization, Disruption, Political Mediation, and Framing.	2000	American Journal of Sociology	511
Ebbinghaus, Bernhard, and Jelle Visser.	When Institutions Matter: Union Growth and Decline in Western Europe, 1950–1995	1999	European Sociological Review	377
Fiss, Peer C.	Building Better Causal Theories: A Fuzzy Set Approach to Typologies in Organizational Research.	2011	Academy of Management Journal	324
Cress, Daniel M., and David A. Snow.	Mobilization at the Margins: Resources, Benefactors, and the Viability of Homeless Social Movement Organizations.	1996	American Sociological Review	314
Amenta, Edwin, Bruce G. Carruthers, and Yvonne Zylan.	A Hero for the Aged: The Townsend Movement, the Political Mediation Model, and United-States Old-Age Policy, 1934–1950.	1992	American Journal of Sociology	300
Stevenson, William B., and Danna Greenberg.	Agency and Social Networks: Strategies of Action in a Social Structure of Position, Opposition, and Opportunity.	2000	Administrative Science Quarterly	246
Amoroso, Lisa, and Charles Ragin.	Individual and Institutional Employment Patterns: Two Approaches to Understanding Control of Voluntary and Involuntary Job Shifts among Germans and Foreigners from 1991 to 1996.	1999	Quarterly Journal of Economic Research	210
Porter-Bolland, Luciana, Edward A. Ellis, Manuel R. Guariguata, Isabel Ruiz-Mallén, Simoneta Negrete-Yankelevich, and Victoria Reyes-García.	Community Managed Forests and Forest Protected Areas: An Assessment of Their Conservation Effectiveness Across the Tropics	2012	Forest Ecology and Management	196
Haworth-Hoeppner, Susan.	The Critical Shapes of Body Image: The Role of Culture and Family in the Production of Eating Disorders	2000	Journal of Marriage and the Family	177
Hodson, Randy, Vincent J. Roscigno, and Steven H. Lopez	Chaos and the Abuse of Power	2006	Work and Occupations	163
Koenig-Archibugi, Mathias	Explaining Government Preferences for Institutional Change in EU Foreign and Security Policy	2004	International Organization	158
Raunio, Tapio.	Holding Governments Accountable in European Affairs: Explaining Cross-National Variation.	2005	Journal of Legislative Studies	156
Lieberson, Stanley, and Eleanor O. Bell.	Children's First Names: An Empirical Study of Social Taste.	1992	American Journal of Sociology	156
Gjølberg, Maria.	The Origin of Corporate Social Responsibility: Global Forces or National Legacies?	2009	Socio-Economic Review	146
Roscigno, Vincent J., and Randy Hodson.	The Organizational and Social Foundations of Worker Resistance.	2004	American Sociological Review	142
Amenta, Edwin, Neal Caren, and Sheera Joy Olasky.	Age for Leisure? Political Mediation and the Impact of the Pension Movement on U.S. Old-Age Policy	2005	American Sociological Review	139
Maggetti, Martino.	De Facto Independence after Delegation: A Fuzzy-Set Analysis	2007	Regulation & Governance	135
Berg-Schlosser, Dirk, and Gisèle De Meur	Conditions of Democracy in Interwar Europe: A Boolean Test of Major Hypotheses.	1994	Comparative Politics	131
Chung, Chi-Nien.	Markets, Culture and Institutions: The Emergence of Large Business Groups in Taiwan, 1950s–1970s.	2001	Journal of Management Studies	128
Cornell, Stephen, and Joseph P. Kalt.	Where's the Glue? Institutional and Cultural Foundations of American Indian Economic Development	2000	Journal of Socio-Economics	127
Pajunen, Kalle.	Institutions and Inflows of Foreign Direct Investment: A Fuzzy-Set Analysis.	2008	Journal of International Business Studies	123
Grandori, Anna, and Santi Furnari.	A Chemistry of Organization: Combinatory Analysis and Design	2008	Organization Studies	118
Hicks, Alexander, Joya Misra, and Tang Nah Ng.	The Programmatic Emergence of the Social Security State.	1995	American Sociological Review	115
Mahoney, James.	Long-Run Development and the Legacy of Colonialism in Spanish America	2003	American Journal of Sociology	110
Rudel, Tom, and Jill Roper.	Regional Patterns and Historical Trends in Tropical Deforestation, 1976–1990: A Qualitative Comparative Analysis.	1996	Ambio	109

Fig. 5 – Journals with the highest number of articles employing QCA.

the highest ratios are sociology, environmental science, and management and organization.

These data reveal greater interest in the fsQCA method from researchers in these fields of knowledge. Other factors that might explain these results include a greater tendency to cite in these areas than in areas such as pure sciences, or less codependency among authors who may focus on a variety of aspects within the same area. This is common in areas with a high degrees of interdisciplinarity.

Regarding articles with the highest impact, Table 2 presents those that use QCA as the research methodology and have more than 100 citations in Google Scholar. The most frequently cited authors are Cress and Snow, with 511 citations, followed by Ebbinghaus and Visser (377), and Fiss (324). The majority of the articles with high numbers of citations were published between the end of the 1990s and 2011, and four of the top five are in sociology.

Finally, we analyze the journals which publish the most papers using this research method. Fig. 5 depicts the titles with the highest number of published articles using this methodology. Note that the *Journal of Business Research* an economics and business journal, stands out with 26 articles published in this area, the majority in 2014 and 2015.

The next two journals publish in sociology, reinforcing the relevance of QCA in this area, with four journals in the top 10 (*American Journal of Sociology, American Sociology Review,* and *Social Forces*). The difference in the number of publications in the next ranked journals is minimal.

Conclusions

This article has conducted a bibliometric analysis of the QCA method in its three versions: csQCA, fsQCA, and mvQCA. The use of bibliometrics with a method as a subject of study is novel and makes a contribution to the literature.

The results show an increasing trend in the use of fsQCA at the expense of csQCA due to the advantages offered by the former regarding the inclusion of conditions with a degree of membership in the set. The exponential growth since 2007, in the number of publications which apply this method allows the prediction that, as new applications are discovered for QCA in other fields, the amount of research and its impact will increase. It seems that this methodology has been accepted by the scientific field, evidenced by the number of published

articles using this methodology in indexed and high impact journals.

In future research, bibliometric analysis could be applied to other methods in development to identify their evolution. In addition, the evolution of two methods used for the same purpose could be compared and their application discussed to forecast future trends. For example, it could be applied to regression methods and fsQCA. Another opportunity for future research would be to analyze the use of different methods in the field of philosophy of science; this would contribute by analyzing the degree of adequacy of each method based on a solid, rational logic which goes beyond periodic trends occurring within the scientific community.

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