

# Approaches to Qualitative Comparative Analysis and good practices: A systematic review

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## Abstract

The Qualitative Comparative Analysis (QCA) methodology has evolved remarkably in social science research. Simultaneously, the use of QCA too often lags behind methodological recommendations of good practice. Improper use is a serious obstacle for QCA to enrich the social science -methodology toolkit. We explore whether the coherence of analytic approaches can help us understand good practices in applied QCA by performing a systematic review of 86 QCA studies. Although adherence to technical GPs has improved over time, we find a high prevalence of incoherent, “hybrid” approaches. As the hybridity of a study increases, its adherence to good practices decreases. The case-oriented, realist, exploratory QCA studies do not consistently follow recommendations of good practice. Instead, the only consistently good-practice approach is case-oriented, realist, but explicitly theory-evaluating. We conclude that consistently aligning methodological choice with the underlying analytic approach and the use of theory can help foster good practices in applied QCA.

## Zusammenfassung

Qualitative Comparative Analysis (QCA) als sozialwissenschaftliche Methode hat sich in bemerkenswertem Masse entwickelt und etabliert. Dennoch hinkt die angewandte QCA-Forschung den Empfehlungen zur Sicherung guter wissenschaftlicher Praxis oftmals hinterher. Unsachgemässe

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Anwendung stellt für QCA ein ernsthaftes Hindernis dar, um die existierenden Methoden der Sozialwissenschaft gewinnbringend zu ergänzen. Diese systematische Übersicht von 86 QCA-Anwendungen untersucht, inwiefern die Kohärenz des analytischen Ansatzes, in dessen Rahmen QCA angewandt wird, mit der Einhaltung guter Praxis zusammenhängt. Obwohl sich die technische Anwendung von QCA verbessert hat, finden sich viele inkohärente, "hybride" Ansätze. Je hybrider eine Studie ist, desto mangelhafter ist die Einhaltung guter Praxis. Der fallorientierte, realistische und explorative QCA-Ansatz folgt nicht unbedingt konsistent den Empfehlungen guter Praxis. Vielmehr erfüllt einzig der fallorientierte, realistische, theorietestende Ansatz zuverlässig diese Kriterien. Um die Anwendung von QCA zu verbessern, ist eine weitreichendere Integration von Theorie hilfreich, und analytische Ziele und methodische Entscheidungen sollten besser aufeinander abgestimmt werden.

### Résumé

L'approche QCA (*Qualitative Comparative Analysis*) s'est développée remarquablement au sein des sciences sociales. Pourtant, son utilisation est trop souvent en retard par rapport aux bonnes pratiques méthodologiques, ce qui constitue un obstacle sérieux à l'enrichissement de la boîte à outils méthodologique des sciences sociales. A travers une revue systématique de 86 études basées sur l'approche QCA nous examinons si la cohérence des approches analytiques peut aider à comprendre les bonnes pratiques en matière de QCA. Bien que la conformité aux bonnes pratiques techniques se soit améliorée au fil du temps, nous constatons une forte prévalence d'approches incohérentes et « hybrides ». Plus une étude est « hybride », moins elle est conforme avec les bonnes pratiques. La seule approche constamment conforme aux bonnes pratiques est l'analyse centrée sur les cas, réaliste, mais évaluant explicitement la théorie. Les études exploratoires, quant à elles, ne suivent pas systématiquement les recommandations. Nous concluons que l'alignement systématique du choix méthodologique avec l'approche analytique sous-jacente, d'une part, et le recours à la théorie, d'autre part, peuvent encourager l'usage des bonnes pratiques en matière de QCA appliquée.

## KEYWORDS

Good practice, Qualitative Comparative Analysis, Research design, Set-theoretic methods, Systematic Review

## INTRODUCTION

This paper analyzes the evolution of and link between approaches to and good practices in published Qualitative Comparative Analysis (QCA) applications, based on a systematic review. As applied qualitative (case-based) and mixed-methods research combining different analytical methods in the social sciences is not yet as standardized as research in the quantitative tradition, it is striving to become ever more methodologically sophisticated, rigorous, and transparent (Adcock & Collier, 2001; Brady & Collier, 2010; Mahoney, 2010). Given its relative novelty and distinct logical foundations, the method of QCA (Ragin, 1987/2014) – a formalized set-theoretic approach to the comparative study of causal complexity, necessity and sufficiency relations based on intermediate to large sets of cases – offers a highly interesting case study of these developments. The approach and method of QCA has undergone remarkable developments in terms of dissemination (Mello, 2021; Oana et al., 2021; Rihoux et al., 2013), methodological innovation, and diversification (Schneider, 2018; Thomann & Maggetti, 2020).

Methodological recommendations of good practice (GPs) for using QCA have been developed to guide applied QCA (Greckhamer et al., 2018; Schneider & Wagemann, 2010; Wagemann & Schneider, 2015). Nevertheless, recent reviews of the state of the art suggest that the use of QCA frequently lags behind GPs (Emmenegger et al., 2013; Møller & Skaaning, 2019; Verweij & Trelle, 2019; Wagemann et al., 2016). In our opinion, this is a serious problem. Poor practice applications not only bear a high risk of flawed inferences, but also nourish criticism of the QCA methodology as such. If QCA is to enrich the social science methodology toolkit in a sustainable manner, it can only do so through its rigorous, correct and stringent use by researchers. However, we lack a proper understanding of the reasons underlying low adherence to GPs in QCA.

The proper use of any research method is usually a question of stringent research design that coheres with the overarching analytical goal of the given methodology (King et al., 1994). This fundamental idea underlies the distinction between QCA as an analytic technique based on truth tables and logical minimization, on the one hand, and QCA as an encompassing research approach, on the other (Berg-Schlosser et al., 2009; Rihoux & Lobe, 2009). Unlike Creswell and Poth (2016), we define QCA as an approach as “the processes before and after the analysis of the data, such as the (re-)collection of data, (re-)definition of the case selection criteria, or (re-)specification of concepts” (Rihoux & Lobe, 2015; Schneider & Wagemann, 2012: 11).

Ragin (1987, 2000, 2008) has set out QCA as a case-oriented, exploratory, integrative approach built on a foundation of substantive and theoretical knowledge (Rihoux et al., 2021). However, challenging the notion of a single approach to QCA, recently Thomann and Maggetti (2020) have demonstrated a diversification of analytic approaches to QCA including large-N QCA with no qualitative elements (Greckhamer et al., 2013), theory-evaluating applications (Møller & Skaaning, 2019), and a focus mainly on minimization algorithms (Baumgartner, 2015). This diversification has partly contributed to confusion over QCA's proper use. Thomann and Maggetti (2020) argue that with each approach, some analytic choices are more appropriate than others. While one approach is not inherently superior to another, they argue that *coherence* in choosing tools in line with analytic goals of a given approach should improve QCA use. However, this assertion has so far gone untested. No systematic knowledge exists yet about

the empirical prevalence of different types of approaches to QCA and the specificity of their respective methodological practices.

This paper performs a systematic review of studies applying QCA in research on public administration to address three questions. First, which types of QCA approaches prevail in this interdisciplinary research field, and how prevalent are the “hybrids” that mix elements of different QCA approaches? Second, has the use of approaches and recommendations of good practice changed over time? Third, are different approaches linked to particular good or not-so-good practices? Given its focus on bureaucracies as political actors, its interdisciplinary nature (Rosenbloom, 1983) and epistemological “affinity” toward some core assumptions of the QCA methodology, the field of public administration is a typical case of contemporary QCA use and indicative of some broader developments in the social sciences.<sup>1</sup>

We now elaborate on Thomann and Maggetti’s typology of QCA approaches. We then briefly introduce the QCA method and corresponding GPs and formulate expectations as to the prevalence, development, and relationship of QCA approaches and GPs. We then motivate our selection of QCA studies and outline the method for systematically reviewing and coding them. By mapping the past and current use of QCA and linking it with different approaches to QCA, our goal is to illuminate how different types of QCA studies might get astray from good practices and how these pitfalls could be avoided. The results suggest that the coherence of a QCA approach is indeed associated with GP adherence. This information is insightful for users, reviewers, and teachers in order to move the use of QCA forward in all areas of social and political research.

## DOES THE QCA APPROACH AFFECT ADHERENCE TO GOOD PRACTICES?

What sets QCA apart from mainstream statistical techniques is its set-theoretic nature and focus on causal complexity. QCA conceives of cases as members or non-members of sets (Wagemann, 2017). A condition is necessary for an outcome if the members of the outcome set are a subset of the members of the condition set. Conversely, a condition is sufficient if its members are a subset of the members of the outcome set. Standard wisdom has it that QCA identifies so-called “INUS” causes; Insufficient but Necessary parts of configurations that are themselves Unnecessary, but Sufficient (Mahoney & Acosta, 2021).<sup>2</sup> These assumptions resonate with core analytic goals of public policy analysis, policy evaluation, democratization research, and public administration, amongst others (Møller & Skaaning, 2019; Pattyn et al., 2019; Rihoux, 2020; Rihoux et al., 2011; Thomann, 2020; Thomann & Ege, 2020; Verweij & Trell, 2019).

### Approaches to QCA

Figure 1 highlights the diversity of approaches currently being applied in QCA research: 1) the approach to cases, 2) the mode of reasoning, and 3) the approach to explanation (Thomann & Maggetti, 2020). Some studies do not apply these approaches coherently—the so-called “hybrids”.<sup>3</sup> Below we specify and illustrate how the hybrids are defined.

<sup>1</sup>The particular relevance of QCA within public administration research is discussed in Thomann and Ege (2020).

<sup>2</sup>Some QCA methodologists deem this to be the case only for some approaches to QCA (see Haesebrouck & Thomann, 2021).

<sup>3</sup>We use the term “hybrid” as a neutral description of “a thing made by combining two different elements” (Oxford Dictionary of English, 2015).



reveal multiple paths leading to regional poverty. Although many analytical decisions are guided by detailed knowledge of the country and its regions, they do not discuss the results using individual cases.<sup>4</sup>

## Mode of reasoning

The mode of reasoning captures how QCA studies draw inferences from QCA results toward more abstract conceptual or theoretical knowledge. Traditionally, QCA has been used to generate rather than test abstract knowledge as it emerges from the evidence in an *exploratory* fashion. The analytic goal of this approach is to “help the researcher generate some new insights, which may then be taken as a basis for a further theoretical development or for re-examination of existing theories” (Berg-Schlusser et al., 2009: 16). This exploratory approach reflects the iterative nature of case-oriented research. Thus, even an exploratory QCA usually uses theoretical or conceptual knowledge to inform calibration and truth table analysis. However, exploratory QCA studies formulate no prior expectations about specific results to be observed.<sup>5</sup>

However, QCA is also increasingly used for the analytic goal of evaluating expectations which were derived from theory or other abstract notions prior to the analysis. *Theory-evaluating* QCA differs from traditional notions of hypothesis testing and deductive research in various respects. However, theory-evaluating QCA studies formulate concrete set-theoretical expectations with which they then confront the results, for instance using formal set-analytic theory evaluation (Ragin, 1987; Schneider & Wagemann, 2012). The challenge for this approach is to formulate expectations in line with the QCA epistemology. Expectations can be about the necessity or sufficiency of (combinations of) conditions and expectations about causal complexity.

QCA studies with a *hybrid* mode of reasoning have no consistent analytic goal in contributing to theory; for example, they claim to be exploratory but then formulate hypotheses, or formulate hypotheses that are not in line with QCA logic or that are too general to be directly testable. For example, Shahidi (2015) explains the patterns of welfare state recommodification during the aftermath of the economic crisis by studying 18 labour market reforms in advanced welfare states. However, he very generally expects that “[l]abour market policy responses to the economic crisis will vary as a function of the scope and generosity of existing welfare state arrangements” (Shahidi, 2015: 662). Using QCA, it would not be possible to disconfirm this expectation. Another example is the study by Marr (2012), who investigates how the process of exiting homelessness is influenced by an interaction of social contexts operating at different levels. He formulates the following hypothesis: “individual vulnerabilities and acculturation to homelessness will be less important in pathways out of homelessness than access to economic and social resources” (Marr, 2012: 987). Such formulation is too vague to be evaluated using QCA.

## Approach to explanation

Finally, QCA approaches diverge on what constitutes a good explanation. The *realist* QCA emphasizes substantive interpretability<sup>6</sup>: rather than just drawing on methodological technique, inferences are drawn on the foundation of case, conceptual, and theoretical knowledge in order to derive meaningful set relations that do not entail empirically contradictory or

<sup>4</sup>Both case-oriented and condition-oriented QCA can be and often are implemented in mixed methods designs, while the hybrid studies in our sample are less often multi-method (see Table A6 in the Online Appendix).

<sup>5</sup>Apart from directional expectations about logical remainders, see below.

<sup>6</sup>The labels “idealistic” and “realist” were proposed by Schneider (2018) and neither refer to a realist epistemology (Olsen, 2014), nor to metaphysical or ethical meanings of the term.

logically untenable claims. This approach assesses not only empirical set relations, but also their substantive meaningfulness in light of existing knowledge (Oana et al., 2021). Asserting that there can be causes that are sufficient but not necessary, this approach therefore separates the necessity and sufficiency analyses. In the presence of limited empirical diversity (when logically possible configurations are not observed empirically), inferences about sufficient conditions are drawn using theoretically grounded counterfactual assumptions. This procedure results in so-called “intermediate solutions” (Ragin, 2008; Schneider & Wagemann, 2012). The “conservative solution” represents a condensed but complex description of the sufficient data patterns.

More recently, a divergent approach has been based on a regularity theory of causation (Mackie, 1965; Rohlfing & Zuber, 2019). It emphasizes that QCA models must be redundancy-free (Baumgartner, 2015). This *idealist* approach thus aims to identify complex causes that are simultaneously necessary and sufficient for a given outcome. In the presence of limited diversity, the only solution type that reliably eliminates all redundant conditions is the “parsimonious solution”. The sufficient parsimonious QCA solution must also achieve a high coverage, indicating that it is necessary for the outcome.

QCA studies adopt a *hybrid* approach to explanation if they neither consistently follow the protocol of the idealist approach (i.e. interpreting parsimonious solutions with high enough coverage to be necessary, and not analyzing necessity separately), nor that of the realist approach (interpreting intermediate or conservative solutions and analyzing necessity separately), even though its analytic goals are explanatory rather than descriptive. For instance, they might perform the analysis of necessity separately from sufficiency, but then resort to the parsimonious solution; or they might incorrectly infer necessary conditions from a sufficient solution.

Clearly, the hybrid category may cover a variety of different research design choices. For example, a hybrid approach to cases could be a small-N study that only discusses cases very superficially, or a large-N study that does not systematically assess robustness. However, all hybrids tend to combine research design features incoherently, which we expect to have a negative effect on performance against GPs.

## Recommendations of good practice (GPs)

In each of QCA's analytic phases, users can commit mistakes. Accordingly, Schneider and Wagemann (2010: 398) have recommended good practices. In 2015, responding to technological developments and research transparency initiatives, Wagemann and Schneider (2015) have complemented these GPs. The recommendations generally emphasize the need to make well-informed and explicitly reasoned analytic decisions, establish the highest possible levels of transparency about them, and connect theory and evidence in order to interpret QCA solutions. These recommendations strongly resonate with Ragin's “traditional” vision of a qualitative, case-oriented, and exploratory approach to QCA with a strong foundation in substantive and theoretical knowledge. As the QCA method has evolved, scholars continue to discuss the value of various different GPs (Braumoeller, 2015; Cooper & Glaesser, 2016; Schneider, 2018; Schneider & Wagemann, 2016; Thiem, 2016, 2019). Overall, more recent GP recommendations tend to refine the original recommendations, without differing substantively from them (Greckhamer et al., 2018; Oana et al., 2021; Rubinson et al., 2019). Focusing on the earlier published list of Schneider and Wagemann (2010, 2015), we analyze whether the studies in our sample consider their suggestions. Oana et al. (2021) suggest various updates for these GPs and explain in more detail how users can implement them.<sup>7</sup>

<sup>7</sup>Suggesting improvements of the GPs would go beyond the scope of this paper.

We now explain briefly the underlying rationale and main analytic steps of QCA and associated GPs (see e.g., Rihoux & Ragin, 2009; Schneider & Wagemann, 2012; recently, Kane & Kahwati, 2018; Mello, 2021; Oana et al., 2021). Table 1 lists the GPs and indicates which ones we focus on in the analysis.<sup>8</sup> The different analytic steps of QCA revolve around the truth table that lists all logically possible combinations of conditions. Accordingly, we distinguish the phases before, during, and after truth table analysis. The phases before and after truth table analysis are strongly related to the QCA approach adopted.

The phase before the truth table analysis (GPs 1–4) entails the selection and definition of cases, conditions, and the outcome. These decisions should minimize problems of limited diversity. Thus, we interpret GP3 as a suggestion to minimize the share of uncovered truth table rows.<sup>9</sup> During the analytic step of set calibration, sets are defined and empirical cases are attributed to sets. Based on calibrated sets, subset relations are analysed via truth table analysis and using parameters of fit to evaluate them (GPs 5–10). The consistency measure indicates whether a subset relation exists in the data. The coverage measure captures the empirical importance of set relations. GP6 foresees the analysis of necessity as being performed separately from, and often prior to, the analysis of sufficiency. The analysis of sufficiency begins by attributing the cases to the truth table rows and determining, for each row, whether it is sufficient for the outcome. This is indicated by the raw consistency score. Through systematically comparing the sufficient rows and detecting redundant conditions, the software-based process of *logical minimization* identifies the shortest possible logical expression of those combinations of conditions that imply the outcome—the solution formula. In this process, researchers need to decide what assumptions they wish to make about the empirically unobserved configurations (logical remainders). Accordingly, they can derive three different solution types: conservative, intermediate, or parsimonious solutions. GP6 and GP10 are however not applicable under an idealist approach to explanation, which analyzes sufficiency and necessity in one step and only deems the parsimonious solution to be causally interpretable.

After the analysis (GPs 11–20), a variety of diagnostics tell us whether the results are robust (Oana et al., 2021). Since condition-oriented QCA is not analytically interested in individual cases, we cannot expect condition-oriented studies to relate QCA results back to cases (GP15 & GP16 are thus not applicable). Under a case-oriented approach, performing robustness tests may not always be desirable especially if the analytic choices are unambiguous and strongly supported by case knowledge (GP19 not applicable). The presentation of QCA results should relate the often complex results back to individual cases or broader conceptual and theoretical knowledge (Ragin, 1987/2014).

For our review, we only include standards that 1) can be operationalized in a comparative manner, 2) can be expected to vary across approaches, and 3) are not too closely associated with other standards. We justify the exclusion of certain GPs (not marked bold in Table 1) in box A1 of the Online Appendix. This leaves us with a total of 20 GPs. Each article's adherence to GPs is assessed by calculating the share of standards that are met in relation to all (applicable) standards. Yet, since methodological and software-related innovations over time have provided more opportunities to do robustness checks, use graphical tools, or calculate measures of fit, most GPs are subject to an applicability criterion (see Table A4). If an individual GP, for instance, was not applicable at the time of publication<sup>10</sup> or if it relates to the analysis of sufficiency but the article does not conduct a truth table minimization, the respective practice is not used to calculate the total number of (applicable) GPs. Moreover, as already discussed, some GPs cannot be meaningfully applied to some QCA approaches.

<sup>8</sup>The scholarly discussions on different GPs do not allow us to conclusively weight specific GPs in this analysis.

<sup>9</sup>We measure GP3 as the share of truth table rows that are covered empirically.

<sup>10</sup>This concerns GPs 5 and 20. We did not introduce a time lag from publication of a GP to the year of publication of studies it is applicable to, as draft papers and early online publications are usually circulated before inclusion in a journal issue.



TABLE 1 Analytic steps of QCA and good practices

Analytic step	Good practices recommended by Schneider and Wagemann (2010)	GP
<b>Before the truth table analysis</b>	h) The appropriate QCA terminology should be followed	
Theoretical embedding	a) QCA should be used for its original aims	
Research design	<b>b) QCA should be applied together with other data analysis techniques in a research project</b>	1
	c) familiarity with cases is a requirement before, during, and after the analytical moment of a QCA	2
	<b>d) There should always be an explicit and detailed justification for the (non-) selection of cases</b>	3
	e) <b>The number of conditions should be kept at a moderate level</b>	
	f) The conditions and outcome should be selected and conceptualized on the basis of adequate prior theoretical knowledge as well as empirical insights gained throughout the research process	
Measurement and calibration	<b>g) The calibration of set membership scores should be discussed in detail</b>	4
<b>During the analysis</b>	<b>l) The choice of appropriate levels of consistency and coverage are research-specific, and need to be supported with arguments</b>	5
	p) The outcome and the negation of the outcome should always be dealt with in two separate analyses	
Analysis of necessity	<b>i) Necessary and sufficient conditions should be analyzed in separate analytical steps, with the analysis of necessary conditions going first</b>	6
Analysis of sufficiency	j) Contradictory truth table rows should be resolved prior to minimizing the truth table algorithm	7
	<b>k) Truth tables should be minimized with the help of appropriate computer software</b>	8
	<b>m) The treatment of contradictory rows (in csQCA) and of inconsistent truth table rows (in fsQCA) in the logical minimization process should be transparent</b>	9
	<b>n) The treatment of logical remainders should be transparent</b>	10
	<b>o) Based on one truth table, several solution formulas of different complexity should be produced and presented</b>	
<b>After the truth table analysis</b>	w) The raw data matrix should be published	11
	x) The truth table should be reported	12
	y) Every QCA must contain the solution formula(s)	13
	z) The consistency and coverage measures should always be reported	14
Relating results to cases and theory	q) Different presentational forms of QCA results should be used in order to depict both the case- and variable-oriented aspects of QCA	15
	<b>r) QCA should always be related back to the cases rather than being applied in a mechanical way</b>	16
	s) <b>Solution formulas should be linked back to the cases, preferably through graphical representation tools</b>	
Interpretation	<b>t) Individual conditions of a conjunctural and equifinal solution term should not be (over)interpreted</b>	17
	u) The researcher should always provide explicit justifications when one (or more) of the paths towards an outcome is deemed more important than others	18
	<b>v) Solution formula alone should not be taken as demonstrating an underlying causal relationship between the conditions and an outcome</b>	
Diagnosics and robustness	<b>Study performs a robustness test (see Wagemann &amp; Schneider, 2015)</b>	19
	<b>Were all logical unions that passed the threshold for consistency and coverage reported? (see Wagemann &amp; Schneider, 2015)</b>	20

Note: Only standards in bold are included in review (see justification below). Table A3 in the Online Appendix also reports the internal numbering that we used for dataset and coding. Table A4 describes the coding in more detail.

## Hypotheses

We ask which types of QCA approaches prevail, how the use of approaches and performance against GPs has changed over time, and whether different approaches give rise to particular methodological shortcomings in terms of adherence to good practices. [Box 1](#) summarizes our six hypotheses.

### Prevalence and development over time

#### *Approaches to QCA*

We expect that the case-oriented, exploratory, and realist QCA is the most prevalent approach, as it is put forward in most prominent textbooks and is predominantly taught at method schools. Conversely, condition-oriented QCA has become particularly popular only in management and business studies since the early 2010's (Greckhamer et al., 2013; Rihoux et al., 2013; Wagemann et al., 2016). Similarly, the idealist approach has only recently been spotlighted (Baumgartner, 2015; Baumgartner & Thiem, 2020) and is not currently represented in major textbooks or at method schools.

#### *Recommendations of good practice*

Compliance with GPs should generally have improved over time. Since their formulation in 2010, GPs have been actively disseminated in teaching and peer review. In particular, the GPs referring to the analytic moment should have been complied with more fully in recent years, reflecting rapid technical software developments with improved ease of implementation and replicability (Dusa, 2019; Oana & Schneider, 2018).

### Linking approaches with good practices

Our core question is whether these approaches to QCA help explain good practices in applied QCA. Thomann and Maggetti (2020) argue that “any given QCA study should select and justify one approach to cases, one approach to explanation, and one mode of reasoning and remain faithful to them” (Thomann & Maggetti, 2020: 21). This idea reflects King et al.'s (1994: 7, 12) call for “disciplined thought”: explicit procedures and methods of inquiry that are consistent with inferential goals and rules. In this line of reasoning, *coherence* in matching QCA practice with analytic goals is decisive. This makes us expect that hybrid QCA approaches, by running the risk of making inconsistent analytic choices, should be more prone to low adherence to GPs than “pure” types of QCA approaches. Conversely, by having explicit inferential goals and associated procedures and tools, pure types of QCA approaches should be more aligned with GPs.<sup>11</sup>

The GPs themselves were developed based on the case-oriented, exploratory, realist QCA. Studies following this approach should hence perform better against GPs, while studies adopting other approaches might more frequently violate them. For instance, condition-oriented QCA might be embedded in a more statistically-oriented tradition of research design and interpretation of results (Wagemann et al., 2016), while the analytic moment essentially remains the same. Moreover, idealist QCA will put less emphasis on the use of external and case knowledge and adopts a divergent protocol during truth table analysis.

<sup>11</sup>If the hybrids needed to comply with more GPs than the pure types, where non-applicable GPs were excluded; this would make it harder for hybrids to comply with a high share of GPs. However, the type of approach is just one of three reasons why a GP might be non-applicable, and we do not find significantly less applicable GPs for hybrids than for pure types. Only for the approach to explanation, the sum of all possibly applicable GPs for each QCA is actually higher for pure types than for hybrids ( $p = 0.0001$ ).

**BOX 1** Summary of hypotheses and findings

**Empirical prevalence of approaches and changes over time**

H1: The case-oriented, exploratory, and realist QCA is the most frequently observed type.

*Results: No, three combinations containing one or two hybrids each are more frequent. Both regarding the approach to cases and the approach to explanation, hybrids are more frequent than pure approaches. A realist, case-oriented, theory-evaluating approach is at least as common as the exploratory approach.*

H2: The idealist approach to explanation is relatively rare.

*Results: Yes, only about 3.5 percent show this approach.*

H3: Condition-oriented QCA has only recently become more frequent.

*Results: Yes, condition-oriented studies are indeed a recent phenomenon that have become more frequent after 2013.*

H4: Compliance with GPs has improved over time, particularly GPs regarding the analytic moment.

*Results: Yes, adherence to good practices in QCAs has improved substantially over time and improvements are strongest and most significant for GPs that apply during the analysis.*

**Relationship between approaches and GP**

H5: Hybrid QCA studies are more prone to failing GPs than pure types of QCA approaches.

*Results: Looking at individual approaches, we find mixed evidence. The hybrid approach to cases and to explanation are more prone to failing GPs than certain pure types, but not the hybrid mode of reasoning.*

***There is also clear evidence that, as the hybridity of a study increases, its adherence to good practices decreases.***

*Looking at configurations of approaches, however, even configurations of only pure types quite often fail to meet a high share of the GPs.*

H6: The case-oriented, exploratory, and realist QCA studies follow GPs best.

*Results: No, case-oriented, exploratory, and realist QCA studies do not consistently comply with GPs. Instead, a theory-evaluating mode of reasoning with a case-oriented realist approach is the only consistently high-performing type of QCA.*

*Note:* bold text: hypothesis supported.

## METHODOLOGY: A SYSTEMATIC REVIEW TO ASSESS THE APPROACH-GP NEXUS

We test these hypotheses by systematically sampling all applied QCA studies that are published in the most important public administration journals. Public administration research is a typical case of contemporary QCA use. Owing to its interdisciplinarity, it reflects the various fields in which QCA is most often used including political science, law, economics, and sociology (Rosenbloom, 1983). Public administration scholars study public administrations as political organizations as well as their relationships to political, economic, and societal systems and individual actors (Bauer et al., 2019). Moreover, the field has an epistemological “affinity” toward some core assumptions of the QCA methodology (Thomann & Ege, 2020). The method of systematic review effectively avoids selection bias and an underestimation of previous research efforts. The systematic, keyword-based selection of articles within a clearly defined field of research allows us to draw generalizations from our findings to the broader field of social sciences.

### Case selection

In order to select relevant research output, we used Thomson Reuters's Web of Science™ (WoS) to screen articles published in all 47 listed, peer-reviewed journals in the field of public administration. The search covers all research published until 1 January 2019. We limited the search to articles written in English that are listed in the “Social Sciences Citation Index” since 1956 using the search term “Qualitative Comparative Analysis” OR “Boolean” OR “QCA” in the title, abstract or WoS keywords Plus® AND the category “Public Administration”, excluding literature reviews, research programmatic publications, articles that do not actually apply a

QCA, monographs, edited volumes and commissioned policy evaluations (see Table A1 in the Online Appendix). Focusing on articles only helps us reduce research output to a manageable amount.<sup>12</sup> International, peer-reviewed journals are the most important and prestigious outlets for scholars of public administration and thus accurately represent QCA applications in the field for a given year.

## Coding

The coding of articles is based on a comprehensive codebook with explicit and transparent instructions that document the coding process, including a short description of each variable, its categories and coding examples if necessary (see Table A2). As Tables A2 and A4 show, QCA approaches and GPs are not only conceptually distinct, but were also coded in an empirically non-overlapping manner. Two coders with strong training and practical experience in QCA executed the coding. After induction to the purpose, content and requirements of the coding, the coders coded about half of the articles each. In case of ambiguity or questions, the coders referred the problem back to the first and second author with strong expertise in QCA and systematic review, respectively for discussion (coded DC, see Table A2), who would take a final decision on the coding and possible implications for the codebook. In order to assess intercoder reliability (ICR), we defined a random sample of 15 articles to be re-coded by the other coder. Even though intercoder agreement for the approach to theory (100%) and the approach to explanation (86%) was satisfactory, the approach to cases turned out to be quite difficult to code (50% intercoder agreement). In response, the coding guidelines were clarified and coder B double-checked and recoded all codes of coder A. This procedure leaves us confident that the final coding is not subject to systematic bias. The following analyses were conducted with Stata 13.1 and R.

## RESULTS: INCOHERENT DESIGN CHOICES ARE ASSOCIATED WITH LOWER GP COMPLIANCE

We start with a descriptive overview of QCA approaches and GPs and then link the two. [Box 1](#) summarizes how the results relate to our hypotheses.

The unit of observation in our dataset is an individual analysis. As one article may contain several analyses, the number of articles ( $N = 86$ ) is smaller than the number of analyses ( $N = 123$ ). An article conducts more than one truth table analysis if, for instance, it accounts for different conditions or conceptualizes several different outcomes. Analyses of both the occurrence of the outcome and its negation are not counted separately. We use the number of articles for studying the prevalence of the different approaches to QCA. When analyzing the relationship between approaches and GPs, we use individual analyses since GPs vary between analyses.

### Empirical prevalence and evolution of approaches and good practices

We first map the frequency of approaches and then map their development over time. Figure A1 in the Online Appendix gives an overview of the share of the different approaches at the level of individual studies ( $N = 86$ ).

<sup>12</sup>The exclusion of books is a common feature of systematic literature reviews. By providing more space to the writer, books using QCA are likely to display higher levels of GP compliance.

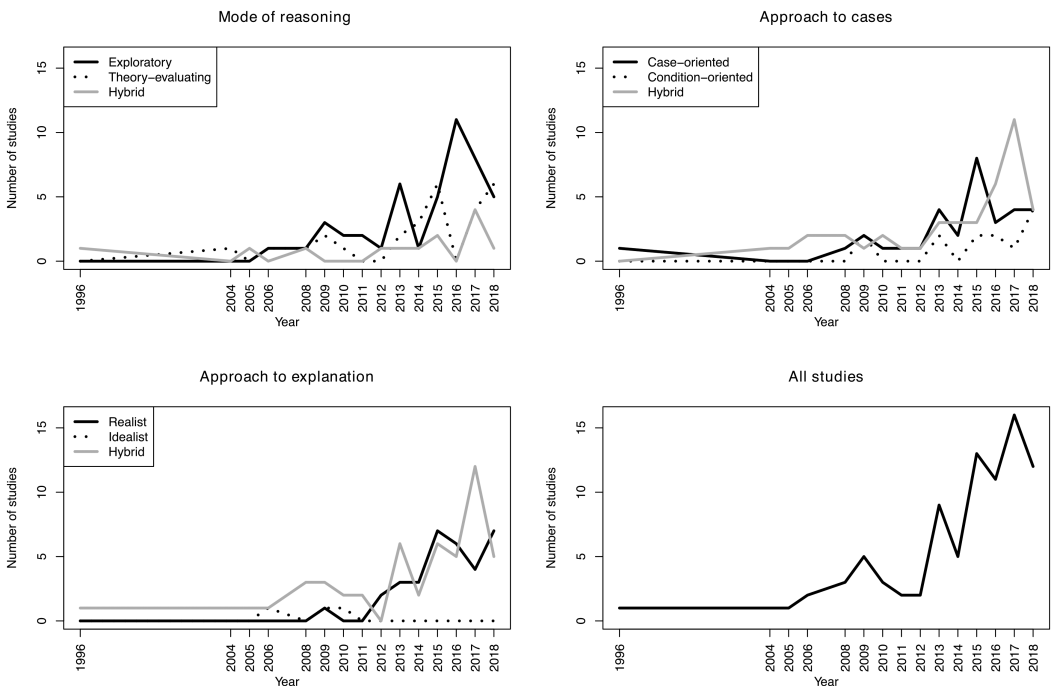


## Evolution over time

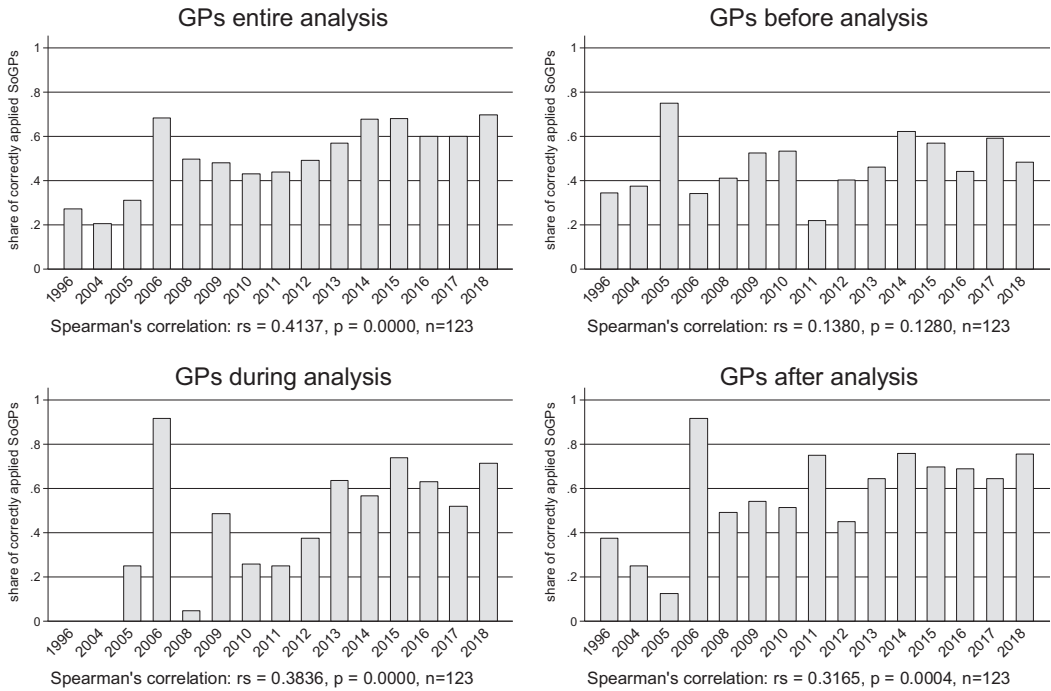
Figure 3 illustrates developments over time in the last 15 years. As expected, the upper right corner of Figure 3 shows that condition-oriented studies have indeed become more frequent after 2013 (Wagemann et al., 2016). While there is no clear trend over time regarding the mode of reasoning (upper left corner), the realist approach to explanation emphasizing substantive interpretation has become more prevalent (lower left corner). These results probably reflect the currently predominant practice of teaching QCA. The share of hybrids has indeed increased since 2010 for the approach to explanation and the approach to cases. Finally, the lower right corner of Figure 3 displays the number of all studies published each year – highlighting the continuous spread of QCA.

## Compliance with GPs over time

Figure 4 plots the shares of correctly applied GPs over time during the different phases of the analysis. In line with our fourth hypothesis, the first graph shows a moderate and significant increase of compliance with the GPs over time. We correct for whether a given GP was applicable at a given point in time. Improvements are strongest and most significant for GPs that apply during and to some extent after the analysis, whereas time does not seem to matter before the analysis. This supports hypothesis 4: efforts to disseminate and teach technical GPs have borne fruits in recent years.



**FIGURE 3** The evolution of the three approaches over time  
 Note: N = 86 studies. Years without publications are not displayed.



**FIGURE 4** Evolution of GPs over time

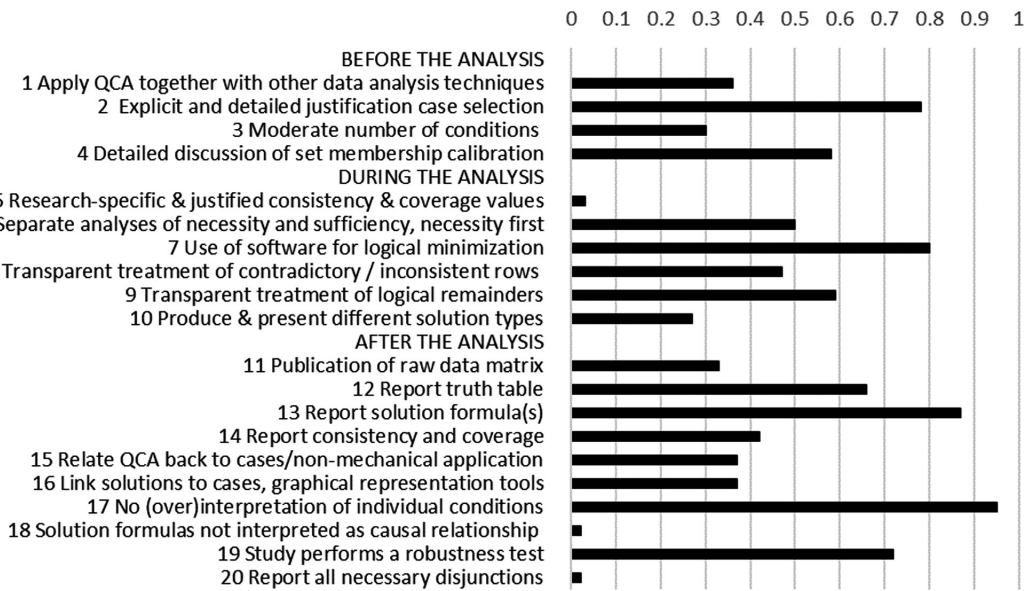
*Note:* Spearman correlations between the year of publication and adherence to GP.  $|rs| = 0.1$ : weak relationship,  $|rs| = 0.30$ : moderate relationship,  $|rs| = 0.5$ : strong relationship (Cohen, 1988).

## Compliance with individual GPs

Table A6 in the Online Appendix reports the mean compliance with each individual GP across all studies and QCA approaches. Figure 5 shows that some GPs are generally well complied with: the studies typically justify their case selection (GP2; especially the more case-oriented QCAs); use appropriate computer software for logical minimization (GP7); and report solution formulas (GP13). We also do not find that these studies tend to unduly interpret individual conditions in QCA solutions (GP17). A decent number of studies also discuss set calibration in detail (GP4) and perform robustness tests (GP19). The mean overall compliance rate of the studies is about 57 percent.

Conversely, some GPs are generally problematic. For instance, there tend to be high levels of limited diversity (GP3)—on average, only thirty per cent of the truth table rows are populated with empirical cases. Remarkably, limited diversity is least pronounced with case-oriented QCAs despite their tendency to work with smaller samples. This might indicate more thorough efforts to carefully select relevant conditions and reduce their number as much as possible. At the same time, rarely all three solution types are calculated and presented, which impedes readers to identify the impact of limited diversity on the results (GP10). Moreover, almost all the studies in our sample present solution formulas as causal relationships (GP18). These findings highlight the importance of a stringent approach to explanation that appropriately deals with the uncertainty arising from limited diversity.

Another frequent issue is that authors do not justify acceptable consistency and coverage levels (GP5); instead, most QCA studies refer to standard thresholds without providing research-specific arguments. Yet, the mechanical application of thresholds can be problematic since datasets might display different levels of set skewness, calibration techniques and



**FIGURE 5** Mean compliance with individual GPs

*Note:* Mean overall compliance with GPs = 0.5665 (N = 123). For descriptive purposes, mean compliance includes studies with non-applicability of GP.

frequencies that affect parameters of fit (Oana et al., 2021). Similarly, few studies report all necessary unions of conditions (GP20). This finding might reflect the fact that the related methodological discussions and corresponding user-friendly software tools have only emerged relatively recently.

Overall, these findings indicate that applied QCA often lags behind state-of-the-art recommendations of methodological good practices. Moreover, some scholars might choose not to apply a GP because they disagree with it, or because they do not find it useful against the analytic goals of their study. For example, scholars might not see any added value in combining QCA with other techniques (GP1), or prefer standardized thresholds for parameters of fit (GP5); they may have a general preference for one solution type (GP10), or be too confident in their analytic decisions to perform a robustness check (GP19). We now examine more systematically how the analytic QCA approach plays a role in the compliance with GPs.

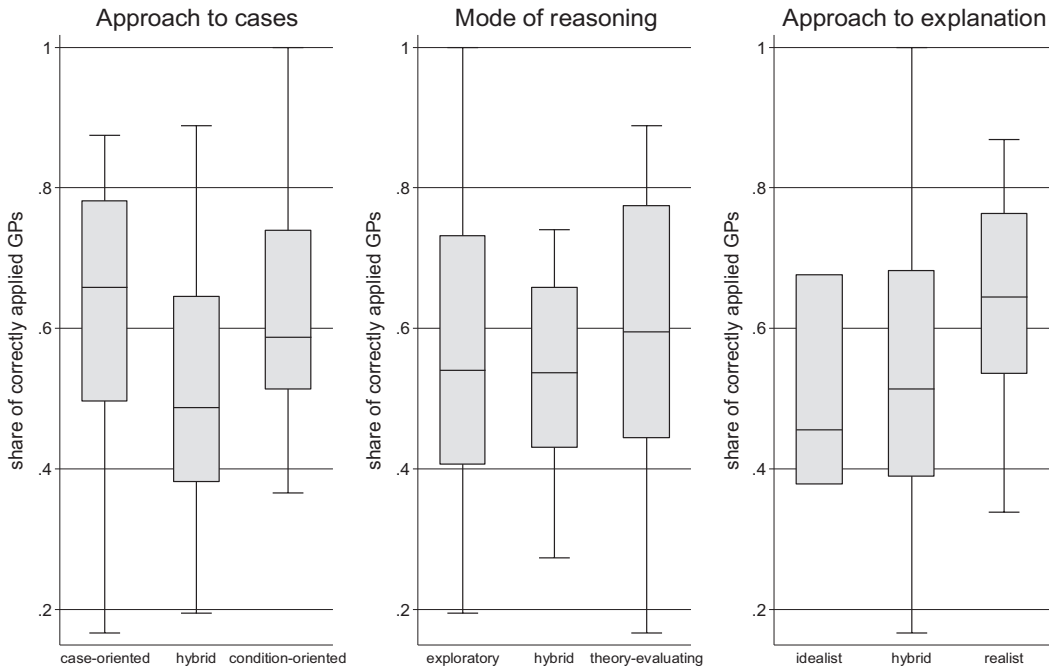
## Linking approaches with good practices

### Compliance of approaches with GPs

Our main expectation is that some QCA approaches are more prone to failing GPs than others. [Figure 6](#) visualizes the relationship between approaches and GPs in our sample.

To calculate the share of compliance with GPs, we only considered those recommendations that were actually applicable to a given study (see Table A4). For instance, indicating parameters of fit was not required for studies published prior to 2006, when Ragin introduced the consistency and coverage measures. The compliance rate (best displayed by the median line of the box plot) does indeed vary between approaches. However, while the hybrid approaches to





**FIGURE 6** Share of correctly applied GP across approaches

cases seem to be characterized by a particularly low score of GPs, this relationship is less clear-cut for the hybrid mode of reasoning and the hybrid approach to explanation.

## GP compliance at different stages of analysis

In order to move beyond a simple cross-tabulation of QCA approaches and GPs (see Table A5) and properly test this relationship, Table A8 shows the statistical relationship of the different approaches with the overall share of GPs as well as the sub-sets of GPs before, during and after the analysis that a given analysis meets. We performed an analysis of variance (ANOVA) and, where the former yielded significant differences, Tukey's Honestly Significant Difference test. Our fifth hypothesis states that hybrid QCA approaches are more prone to failing GPs than pure types of QCA approaches. The coefficients in Table A8 provide mixed evidence for the hypothesized relationship. On the one hand, the results support H5 with regard to the approach to cases and to explanation: the mean score in meeting GPs for hybrid approaches to cases is 9 percentage points lower than for the case-oriented approach to cases ( $p = 0.03$ ). Moreover, the realist approach to explanation performs significantly better than the hybrid approach to explanation. On the other hand, the condition-oriented approach to cases and the idealist approach to explanation do not show significantly higher GP adherence and, most importantly, the mode of reasoning does also not make a significant difference for whether recommendations of GP are met. When further differentiating GPs according to the phase (before, during or after the analysis), the more unsatisfactory performance of the hybrid approaches to cases is particularly visible before the analysis (where the hybrids meet GPs about 18.7 percentage points less than the case-oriented approach) and after the analysis (about 15 percentage point difference to both pure types). Finally, contrary to our expectations neither the condition-oriented approach nor the idealist approach violate GPs significantly more than the respective

alternative pure type. Given the very low number of idealist analyses ( $n = 3$ ), however, this latter result is preliminary.

## Degree of hybridity

Providing further support for our fifth hypothesis, Table A9 (Online Appendix) compares the means of GPs across the number of hybrid approaches per study; ranging from no hybrids (0) to the configuration hybrid-hybrid-hybrid (3). This analysis reveals a clear, statistically significant trend: the more hybrids a study features, the lower the share of GPs met. In other words, as the hybridity of a study increases, its adherence to good practices decreases. We find the same relationship when splitting GPs according to the analytical phase. The data shows that hybrids matter: as they cumulate – and pure types become less frequent – the compliance of a study with GPs decreases.

## Types of QCA approaches and GPs

Are there specific combinations (*types*) of approaches to QCA that meet, or fail to meet, GPs more often than others? We expect that the case-oriented, exploratory, and realist QCA studies particularly often meet GPs (H6). Conversely, types that have an unclear hybrid approach on more than one dimension should meet GPs less often. We consider an analysis to often meet the GPs if it complies with at least two thirds of the standards applicable at the time. Only 37.2 per cent of the analyses in our sample are members of this set ( $N = 42$ ). Figure A2 (Online Appendix) visualizes sufficiency of the types of QCA approaches for meeting GPs (entire analysis), applying a raw consistency threshold of 0.75. This means that 75 per cent or more of the analyses adopting the respective type of QCA approach must often meet the GPs. We find mainly one type of QCA approach that consistently complies with GPs. However, contrary to our expectations (H6), it is not “type one” QCA; instead it is “type two”, i.e., the configuration of a theory-evaluating mode of reasoning with a case-oriented realist approach.

With about 87 percent of applicable GPs met, the example of the highest GPs score for this configuration is Fischer's (2015) article that studies the institutional conditions under which coalition structures emerge in different policy processes. Employing fuzzy-set QCA and drawing on extensive case knowledge, Fischer performs a comparison of eleven decision-making processes in Switzerland between 2001 and 2006 (case-oriented). He formulates and evaluates three hypotheses about the presence of federalism, Europeanisation, and open venues (theory-evaluating). He conducts separate analyses of necessity and sufficiency and interprets the conservative solution (realist). The analysis reveals two alternative paths to the formation of dominant coalitions, namely, “domestic processes with open venues” OR “Europeanised, non-federalist processes with closed venues” (Fischer, 2015: 256). After that, he goes back to the cases and discusses them in light of these findings. The only applicable GPs that are not fully met in the article are GP20 (the author performed the analysis of necessity only for single conditions and not for unions of conditions), GP3 (50% limited diversity), GP5 (.25: only mechanical justification of both coverage and consistency thresholds) and GP14 (missing the reporting of some consistency and coverage measures).

Conversely, more than 90 per cent of the analyses that fail to comply with GPs were either not case-oriented or did not adopt a realist approach to explanation (Figure A2). A lot of approaches typically fail to meet the applicable GPs. Among them are three pure types of QCA, covering a minority of five analyses. This finding highlights that many of the types that consistently score low on GP adherence—and those covering the vast majority of analyses—are

hybrids in at least one or several of the approaches. It strongly supports the assertion that a lack of coherence between research design and analytic goals is associated with less adherence to good practices in empirical QCA applications.

## DISCUSSION

As a relatively new addition to the social science toolkit which combines elements of cross-case and within-case analysis, QCA is a particularly interesting case for studying the emergence and consolidation of good practices. We have mapped the development of its use based on a systematic review of QCA studies that represent the disciplinary diversity and typical research interests underlying applied QCA. We agree that “if the researcher's findings are to be valid (...), [the research] must take place according to explicit procedures consistent with rules of inference” (King et al., 1994: 12). Yet, we also acknowledge that there is a diversity of goals of inference with corresponding rules and tools (Brady & Collier, 2010; Mahoney, 2010). Therefore, we have provided the first empirical test of whether the coherence of QCA approaches can help understand adherence to GPs in applied QCA studies. Our study offers four key findings with corresponding implications.

First, *QCA use tends to lag behind methodological developments*. We find that relatively few QCA studies in research on public administration follow a high share of recommended good practices, particularly in the phases before and after the technical analysis, relating to conceptualizing and designing the research and presenting and interpreting the results. For example, we find that applied QCA studies can still deal more coherently with and be more transparent about the uncertainty that comes with high levels of limited diversity. This finding suggests that QCA researchers should put more effort into producing trustworthy causal inferences. Nowadays, the technical tools for state-of-the-art QCA are readily available (Oana et al., 2021). However, state-of-the-art QCA use is not just a matter of technique. Our findings imply that there is a marked scope to improve the implementation of QCA as an approach. However, the relatively low levels of adherence to (some) GPs might also reflect an apparent lack of clarity of these recommendations particularly for QCA “newcomers”, or even disagreement of QCA users with some of the more disputed GPs (Braumoeller, 2015; Cooper & Glaeser, 2016; Schneider, 2018; Schneider & Wagemann, 2016; Thiem, 2016, 2019). QCA methodologists should explore whether some GPs that are almost never complied with require reconsideration. Working toward improvements of the GPs and their implementation in practice requires concerted efforts and a heightened awareness by QCA methodologists, teachers, users, journal editors and reviewers. In this vein, Oana et al. (2021, chapter 7) suggest improved and updated GPs and explain their practical implementation, depending on the QCA approach, in more detail.

Conversely, *the use of QCA has improved regarding technical aspects*. Not only have condition-oriented QCAs and QCAs emphasizing substantive interpretability increased over time, but so has the compliance with GPs particularly regarding QCA as a technique. These developments appear to mirror the way in which QCA is disseminated and taught in textbooks and major method schools (Oana et al., 2021; Rihoux & Ragin, 2009; Schneider & Wagemann, 2012), as well as the technical advances for QCA and its implementation in software (Dusa, 2019; Oana & Schneider, 2018; Ragin & Davey, 2016). Efforts of improving, disseminating and teaching the state-of-the-art use of QCA are partly successful. While this is good news to some, our analysis underlines that technical improvements are not enough; QCA “needs also to be understood—and applied—as a research approach” (Schneider & Wagemann, 2010: 398).

Indeed, our third core finding is that beyond technique, *the hybridity of the QCA approach matters*. Our review suggests that the inconsistent hybrids, which do not coherently adopt a QCA approach in line with its analytic goals, are surprisingly, and increasingly, prevalent. It is

possible that the relative increase of hybrid QCA approaches is linked with the increased use of QCA and associated social dynamics of scholarly production (Sun et al., 2013)—for instance, inclusion of non-specialized experts in peer review processes, but also more diverse understandings of how QCA can and should be applied. With better software tools having become widely available, QCA is also being used by potentially less well-trained scholars who might be less aware of the deeper implications of QCA as an approach.

Moreover, we find that studies adopting one or several hybrid approaches to QCA tend to be characterized by lower adherence to GPs. This link is particularly clear-cut for the approach to cases and when comparing realist studies to those adopting a hybrid approach to explanation, but less so for the mode of reasoning adopted. While there is more than one way to perform a “good” QCA—something which we accounted for by only expecting studies to comply with GPs that apply to a given QCA approach—this finding indicates confusion in practice around which GPs should be adopted and how to implement QCA. This finding underscores Thomann and Maggetti's (2020) point that consistency in aligning methodological choice with the underlying analytic approach, specifically regarding case-orientation and explanation, is clearly key to a good practice empirical QCA application. Increasing knowledge and understanding of analytic goals of QCA approaches and establishing such coherence should thus be the heightened focus of teaching and peer review.

Finally, *theory helps*. The traditional exploratory QCA appears to be neither as prevalent nor as consistently linked with GPs as the literature would suggest. Instead, in our sample of studies, the more theory-evaluating approach to QCA which is also case-oriented and realist is just as prevalent and more consistently linked with GPs. Another review has also argued that more systematically theory-guided QCA studies tend to be of a higher quality (Møller & Skaaning, 2019). Theory (or an equivalent form of abstraction) is a key source of external knowledge that can serve as a “compass” and guide a researcher in making meaningful and successful analytic choices during a QCA analysis (Ragin, 1987/2014). We conclude that QCA needs not necessarily be presented as an inherently inductive or exploratory approach. Instead, more emphasis should be placed on the contribution that a focus on causal complexity and set relations can make to social science theory more broadly (Ragin, 1987/2014).

Like all studies, ours has limitations. We have focused on public administration as a subset of social science research, assuming, however, that it reflects the interdisciplinarity and diversity of QCA uses in the social sciences more generally. Future research should look into the most important GPs elsewhere and assess how QCA scholars comply with them, looking for systematic differences between disciplines in the use of QCA and GP compliance. Moreover, our data neither features enough cases of idealist studies to draw conclusive inferences about them, nor do they allow us to empirically infer the causal factors for the observed GP adherence levels. Finally, a closer analysis of different types of hybrid QCA studies and variation in their compliance could help refine the findings and implications of our study, which has not been possible here.

## CONCLUSIONS

As is the case with social science methods generally, the spread of QCA goes along with social dynamics leading to diverse and new research communities and associated uses of these methods (Sun et al., 2013). The coherence of the QCA approach is a significant factor that coincides with the implementation of good practices in QCA studies. Thus, linking the choice of approaches to GPs helps us to better understand the reasons underlying the use of QCA. A key conclusion is that for aligning QCA practices with recommendations of good practice, the dissemination and teaching of QCA as well as review practices should go beyond targeting

the QCA technique to focus more explicitly on QCA as an approach, integrating questions of research design and aligning methodological choices with analytic goals (Mello, 2021; Oana et al., 2021). Compliance with the GPs before and after the analytic moment requires training in topics that go beyond QCA as a technique. Moreover, our findings suggest that some GPs might not be generally accepted, pointing to a potential to critically interrogate, update, and improve the GPs themselves. For users, this implies that a state-of-the-art use of QCA requires more than mastering the technical aspects. While this has long been emphasized by QCA methodologists (Ragin, 1987, 2008; Rihoux & Ragin, 2009; Rohlfing & Schneider, 2017; Schneider & Wagemann, 2010, 2012), there is a need to put this insight into practice—in the teaching, use, and review processes of applied QCA.

The typology of QCA approaches (Thomann & Maggetti, 2020), while certainly open to further refinement, provides a useful point for orientation for assessing the coherence of the QCA approach and identifying suitable methodological choices. Oana et al. (2021) further specify which tools are suitable for which approach, as well as incompatibilities between them. These insights are important for users, reviewers, and teachers to move the use of QCA forward. As ours and similar reviews show (Emmenegger et al., 2013; Møller & Skaaning, 2019; Verweij & Trell, 2019; Wagemann et al., 2016), improving the use of QCA is still necessary to exploit the full potential of QCA to contribute to all areas of social research.

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## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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