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Social and causal complexity in Qualitative Comparative Analysis (QCA): strategies to account for emergence

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ABSTRACT

Qualitative Comparative Analysis (QCA) is said to be a method that can be used to uncover social complexity. However, this complexity is often 'missing in action' in actual empirical applications of the method. We aim to rearticulate the properties of social and causal complexity in their relationship to QCA. We first discuss the reasons why this relationship is not fully articulated in the current research. Rooted in a realist understanding of social emergence, we identify four possible strategies to bring social complexity back on focus when performing QCA: the use of thick case descriptions; the opening of the black box of conditions, by stacking and/or by developing them in a grounded manner; the integration of time in the method itself; and the combination of QCA with other, more time-sensitive methods.

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Introduction

Social complexity concerns the processes of becoming, characterized by the heterogeneity of cases and the variation in time- and place-bounded 'causal recipes'. Hence, causal complexity is about the generation heterogeneity. Qualitative Comparative Analysis (hereafter: QCA) is said to be particularly suitable for revealing social complexity (Gerrits, 2012, Gerrits & Verweij, 2018; Befani, 2013; Blackman et al., 2013; Byrne & Ragin, 2009; Cairns et al., 2017; Kraus et al., 2018; Ragin, 1999; Ragin et al., 2003; Sager & Andereggen, 2012). QCA acknowledges that cases emerge under varying circumstances. As such, it provides an alternative approach to additive variable-oriented models (see, e.g. Ragin, 2000). It focuses on both the within-case variation of a set of dissimilar cases and on the identification of common patterns across them, i.e. cross-case variation. As limited cross-case generalisations, also called 'causal recipes', can be identified, the relationship between case heterogeneity or social complexity is captured in combinations of conditions, including the outcome condition (Ragin, 2000; Rihoux & Lobe, 2009). As such, QCA accounts for social complexity with a specific ontological understanding of causal complexity, epistemologically expressed both formally (in its comparative procedures) and analytically (the types of statements derived from the procedures). Core concepts in QCA include multiple and conjunctural causation, equifinality and multifinality (Ragin, 1987; Marx et al., 2014).

These features notwithstanding, we note that empirical applications of QCA often do little to address social and causal complexity explicitly. This unfortunate lack is at least partially due to researchers being unfamiliar with the assumptions and logic underlying QCA (see Thiem et al., 2015), and partially due to the difficulties of grasping social and causal complexity on conceptual

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and empirical levels. Although essential, the main methodological handbooks on QCA (Ragin, 1987; Schneider & Wagemann, 2012; Rihoux & Ragin, 2009) do not provide much guidance as to what this social complexity actually is and how the method can address it. There is a need to refocus QCA on social and causal complexity, and to demonstrate how its internal logic can be used to exploit the conceptual and formal attributes of QCA as an approach and method.

The goal of this paper is to rearticulate the properties of social and causal complexity in their relationship to QCA such that this complexity can be made more manifest in empirical research. In what follows, we will first discuss how social and causal complexity is conceived in QCA. Second, we will use a realist conceptualization of emergence to demonstrate how social and causal complexity are manifested empirically. Third, we will show the extent to which QCA could address these complexities, i.e. rearticulating the relationship between the method and social reality. Fourth, we will present and discuss four strategies to bring such complexity into focus when performing QCA: the use of thick case descriptions; the redefining of conditions; the integration of time in the method itself; and the combination of QCA with other, more time-sensitive methods.

QCA at the core: social and causal complexity in tandem

QCA was first introduced by Charles C. Ragin in 'The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies' (Ragin, 1987). In this book, he sought to solve the methodological problem that large-n studies lack in detail but can be used to detect patterns, while small-n studies show more empirical detail but fall short of generalization. Simultaneously, he wanted to reconcile qualitative (case-based) research with quantitative (variable-oriented) research. The new method, QCA, built on set theory, where conditions as sets replaced the more commonly used variables to express causal patterns. QCA aims to identify conditions that may be considered necessary and/or sufficient in producing the outcome (which replaced the more familiar dependent variable). Typically, single conditions are not found to be necessary or sufficient; rather, conjunctions of conditions can associate with the (presence or absence of the) outcome. QCA research specifically acknowledges and reveals that there may be multiple pathways or 'causal recipes' towards the (presence or absence of) the outcome, as it can arise from different and non-mutually exclusive combinations of conditions.[1]

The concepts of multifinality and equifinality indicate that QCA is grounded on a specific understanding of social reality, which is generally understood as being complex. QCA's concern with social complexity traces back to Ragin's 1987 book, also restated in Ragin (2000), and is frequently mentioned as a core property of QCA. This complexity appears in two related dimensions: as a property of cases (within-case variation; heterogeneity), and as a property of causality (across-case variation; multiple causal recipes). Although we discuss both aspects in more detail by keeping them separated, they are strongly intertwined, both conceptually and in empirical research.

Ragin, like others (e.g., Abbott, 1992b; Byrne, 2005; Harvey, 2009; Platt, 1992; Byrne, 2009; Byrne & Ragin, 2009), locates the complexity of cases in their heterogeneity and their embeddedness in time- and place-specific contexts. In terms of within-case variation, this means that cases in social reality may be similar but never the same. Exactly how and to what extent they differ is an empirical question that can be answered through structural comparison. While single cases will always appear unique, comparison will show that cases share similar case- and/or context-specific characteristics but also feature unique differences that can be causally relevant. Uniqueness (maximum heterogeneity) or homogeneity (absence of variation) is hence better conceptualized as a continuum and relates to both case-specific attributes, as well as context-specific features.

The distinction between cases, their constituent parts and the environment come from a rich tradition in sociology including Durkheim, Simmel, Elias, Boudon and Latour. Cases constitute dissipative social systems (Harvey, 2009), i.e. are objects composed by a variety of parts, that exchange information (of any kind) with their contexts. The case properties are established through the interaction with the context, which implies that cases emerge and solidify over time (Gerrits, &

Verweij, 2013). It renders cases, and their explanation, local in place and temporal in time. Ragin's contribution to this case-based approach offers a concrete methodology to articulate the intricate relationship between cases as 'objects', whose constituent parts can be identified, and their contextual characteristics.

The interaction between cases and context is fundamental to the ways in which causality is approached in QCA, culminating in cross-case variation. If (parts of) cases interact with time- and place-specific contextual attributes, causation becomes multiple and conjunctural (Berg-Schlosser & de Meur, 2009; Ragin, 1987; Schneider & Wagemann, 2012; Ragin, 2000; B. Rihoux & Ragin, 2009). That is: '[…] different causally relevant conditions can combine in a variety of ways to produce a given outcome' (Ragin, 1987, p. 26), which is very different from saying that several independent variables additively influence a dependent variable in terms of net effects, discounting for randomness and error. QCA sees causality as being complex; that is, conditions are rarely, if at all, either sufficient or necessary by themselves, but exert causal power when acting in combination (Schneider & Wagemann, 2012). Conceptualizing and working with social and causal complexity 'in tandem', as QCA aims to do, has considerable consequences for research at a variety of levels (Rihoux & Marx, 2013). This is because the uniqueness of the cases and their within-case diversity must be acknowledged (i.e. social complexity) *and* understood without homogenizing assumptions (i.e. causal complexity).

On a conceptual level, researchers must reconsider the way in which they define cases. Cases are often taken as a given but casing is much more than just identifying empirical units (Ragin & Becker, 1992; Byrne & Ragin, 2009). Researchers should articulate cases' boundaries (in time and space) and elaborate their membership to a larger population as well as the scope of their comparability. Case heterogeneity implies that they should be understood as composites, in contrast to research methods that rely on a form of decomposition that is anything but holistic. On a methodological level, researchers must examine the interaction between case- and context-specific characteristics of their data, by handling alternative causal combinations and logical contradictions. These issues challenge the interpretation of the results, in particular regarding the delicate line between case-specific statements and generalized statements (Ragin et al., 2003). Within-case heterogeneity and efforts towards generalization from the cross-case comparison are not just at odds with one another.

Considering social and causal complexity in tandem manifests that QCA does not just innovate social science research at the conceptual level, but also provides an ever-expanding, structured methodological toolkit to uncover social and causal complexity (e.g., Thomann & Maggetti, 2017).

The missing links in the tandem

Although QCA allows embracing social and causal complexity simultaneously, a significant gap between social reality and QCA's core operations still exists. This claim follows from the observation that social complexity is less about *being* complex as it is about *becoming* complex. If social systems were static, it would be difficult, but not impossible, to determine their inner workings unambiguously given sufficient resources. But social systems are anything but static. They are dynamic, transitioning between (undetermined) stages and transforming in composition, structure and agency (e.g., Abbott, 2001; Gerrits, 2008; Byrne & Callaghan, 2013; Castellani & Hafferty, 2009; Frantzeskaki & de Haan, 2009; Frantzeskaki, Thissen, & Grin, 2016; Haan, 2010; Kiel & Elliott, 2005; Merali & Allen, 2011; Prigogine & Stengers, 1985; Reed & Harvey, 1992; Sawyer, 2005). While as an approach QCA is geared towards uncovering processes of becoming, as a method it still falls short in this regard. Social and causal complexity is all about dynamics. Stated provocatively, if dynamics cannot be accounted for in QCA, then it should no longer be deemed an appropriate method for researching social and causal complexity. More positively stated, a dynamic perspective of social and causal complexity is actually in accordance with Ragin's work. In fact, there is much to Ragin's original argument that is not yet fully exploited in the method.

Emergence

Much of the groundwork in QCA comes from Ragin's reading of Mill's principles of inductive reasoning (1843). In Ragin's own words: 'The basic idea is that a phenomenon *or a change* emerges from the intersection of appropriate pre-conditions – the right ingredients for change. In the absence of any one of the essential ingredients, the phenomenon – or the change – *does not emerge*. This conjunctural or combinatorial nature is a key feature of causal complexity.' (Ragin, 1987, p. 25, emphasis added). The principle highlighted here has become more widely known as 'emergence'. The roots of the term itself can be found in Lewes (Lewes, 1875: Problems of Life and Mind, vol. II Prob. V. ch. iii. p. 412), who based it on the same difference between mechanical and chemical effects that Mill had identified (Sawyer, 2005), and was used extensively by Morgan (e.g., Morgan, 1927, 1932), upon which other thinkers later built their ideas (J. Goldstein, 1999; Hodgson, 2007). Emergence, in Morgan's work, concerns the appearance of something new, something truly novel, that could not be readily deduced from the constituent parts.

The concept gained traction (most notably with Whitehead) but then lost it again. The idea that a new phenomenon cannot be decomposed, and its roots cannot be traced in a linear fashion can be considered problematic from certain angles, in particular with those who hold a mechanistic and additive approach to causality. However, a more conventional approach does not always deliver the expected insights. Researchers may believe that those insights come with 'more data', but sometimes there is a need to reconsider one's assumptions of how social reality comes about before collecting more data.

No matter how elusive, emergence is considered pivotal to complexity in general (e.g., Mayr, 1985) and social complexity in particular (Cilliers, 1998, 2002; Gell-Mann, 1995; Holland, 1995; Holland, 2006; Kauffman, 1993; Waldrop, 1993), which is also why Ragin referred to it in his books. As a concept that describes how things come about, it also entails a specific approach to causality. If social and causal complexity must be considered more dynamically in QCA, then emergence must be considered when performing QCA. It provides a way of thinking about the causal relationships between micro-levels and macro-levels, parts and wholes, and self-organization (e.g. Juarrero & Rubino, 2010; Morçöl, 2012; Sawyer, 2005), a vocabulary to express those relationships (e.g., Jeffrey. Goldstein, 2000), and the logical underpinning for computational and heuristic tools to map those relationships (e.g., Axelrod, 1997; J. H. Holland, 1995). Emergence hinges on an anti-reductionist (Reed & Harvey, 1992) understanding of causality.

Types of emergence

Ubiquitous use of the term 'emergence' tends to hide that there are multiple possible interpretations of the term (Goldstein, 1999). For example, Morgan's 1923 work can now be seen as somewhat ambiguous as to whether emergence is something truly novel or something that is more than the sum of its parts – the latter implying that traces to the emergent whole were present but not yet activated in the constituent elements. Over time, the concept became more defined and situated within the social sciences.

In broad terms, emergence concerns a relationship between parts and wholes in a social system. Exactly how this relationship is formed, and how it gives shape to social phenomena, and what parts and wholes are is subject to debate (e.g., Juarrero & Rubino, 2010). Types of emergence differ in three ways: between weak and strong emergence; between diachronic and synchronic emergence; and between levels and whole-parts.

Weak emergence concerns those instances where the emergent whole is unexpected but traceable to the parts from which it emerged. Strong emergence, in contrast, concerns those instances where the emergent whole is not conceivably traceable to the 'prior' constituent parts (Chalmers, 2008). Weak emergence has been at the heart of much research in social complexity (e.g., Holland, 1995; Holland, 1999), while strong emergence provides a somewhat thornier concept. If an

emergent whole is entirely novel and entirely detached from the properties of the elements from which it emerged, it is going to be very hard to say anything analytical about it.

Since the earliest thinkers, emergence and time have been intrinsically connected, usually structured as a process where the constituent elements come first and novel wholes come later. This is the diachronic form of emergence. Conversely, synchronic emergence considers the relation between parts and wholes to be instantaneous, i.e. there is no prior or after (Elder-Vass, 2005), although a certain persistence must be in place to differentiate between singular, inconsequential occurrence and an actual whole. Arguably, diachronic emergence is somewhat easier to research than synchronic emergence.

Emergence also concerns its occurrence to different levels, that is: where elements at the micro-level lead to emergent outcomes on the macro level. Alternatively, one could think of the same dynamics in terms of wholes and parts without the hierarchical structure that is necessary for the differentiation between various levels.

Attempts to incorporate various forms of emergence into empirical research can be found across the scientific landscape. Notably, researchers using cellular automata (CA) and agent-based modeling (ABM) focus on finding simple behavioral rules that (supposedly) create complex social systems as wholes (e.g., Holland, 2006, 1999). Here, the micro-level gains analytical priority over the macro-level (Hodgson, 2007). The advantages of this approach are that first, emergence becomes a property of self-organization (i.e. the general patterns resulting from localized, iterative interactions among individual elements), and second, that it can more easily be adapted to applied research, in contrast to, e.g. synchronic emergence. However, 'bottom-up' emergence rooted in self-organization is also reductionist, because it positions the explanandum squarely at the micro-level.

A critical realist approach to emergence

An avenue to move beyond these dichotomous approaches to emergence is offered by critical realism (Bhaskar, 2008), an ontology that ties in well with a case-based method such as QCA (Gerrits & Verweij, 2013; Easton, 2010; Losch, 2009). It holds that society features deep structural relationships that are active even if we do not have direct access to it. Bhaskar's stratified reality, which articulates the differences between the real, the actual and the empirical (Bhaskar, 2008), provides the keys to understanding emergence (Dave Elder-Vass, 2004). The real concerns all the mechanisms in society, the actual concerns those mechanisms that are actualized because of certain conditions, and the empirical concerns the personal experience of observing that actualized reality. In this light, emergence is the appearance of a novel quality (or 'whole') out of its constituent parts (not levels) that bear the traces of said novelty, but that could not be predicted on the basis of the observations of its constituent parts alone. This new quality will only emerge under certain conjunctions of conditions.

What exactly constitutes an emergent whole is lively debated among emergence scholars. In the realist view, reality can be differentiated in parts that have a relationship with the whole, even though that relationship could remain unobserved. This approach leaves room for the possibility that the researcher may simply fail to observe the causal powers at work, thus giving the impression that the novelty does not relate to the constituent elements in any kind of way. Indeed, the three layers or strata may be regularly out of phase (Gorski, 2013).

The important point here is that wholes are more than the collection of parts, and that not every set of parts can generate emergent wholes. Following Laszlo (1972) and Elder-Vass (2005), unstructured collections of parts with no emergent properties can be thought of as 'heaps'. Thus, the defining characteristic between a 'whole generative' and a 'whole non-generative' ensemble of parts is the structure that is formed across the parts. This means that the 'whole generative' parts can, following their interaction, form a structure that is qualitatively different from their constitutive characteristics, but still maintain a relationship with those characteristics. Importantly, the

relationship between the parts and whole is a matter of composition, not causation (D. Elder-Vass, 2005). This constitutes social emergence.

Emergence in QCA

Now that we defined social emergence in realist terms, we will discuss how it relates to QCA. Subsequently, we will identify the methodological gap between this connection and empirical research.

Emergence in QCA: the connections

Consider two points in time, t_0 and t_1. The range of system states that can emerge from t_0 and t_1 is limited, because it depends on the set of initial conditions that are defined at t_0. Therefore, multiple (plausible) system states may emerge from t_0 but only some of those will instantiate empirically given the set of initial conditions at t_1. Once a new system state has been achieved at t_1, a new but again limited space of adjacent possibilities becomes available at t_2 (Gerrits, & Marks, 2017; Kauffman, 1993; Kiblinger, 2007). Hence, while infinite possibilities exist in theory, the actualization of specific system states is more limited because specific combinations of conditions limit the space of possibilities. In QCA, this is indicated by what Ragin has called 'limited diversity' (Ragin, 1987; Ragin, 2000; Ragin, 2009).

However, the set of initial conditions is not a determinant and knowing the set does not render predictive power. The set of initial conditions defines a possible range of system changes and states in probabilistic terms. This implies that novel properties of wholes (i.e. system states) can emerge from similar combinations of conditions (multifinality), but not necessarily (equifinality). Here we swing between social and causal complexity: the heterogeneity one can trace in the social world, as represented in empirical data (i.e. social complexity), is the result of the discrepancy between all the systems states that are *theoretically* possible and the system states that are *actually* possible (i.e. limited diversity), given the combinations of a certain set of conditions at certain points in time (i.e. causal complexity). As such, social emergence and limited diversity refer to one another: what will emerge in social reality depends on the limited diversity, i.e. social and causal complexity acting in tandem.

Emergence in QCA: what is missed in research

Above, we have shown how social emergence, in the particular realist form as described above, is central to how Ragin envisaged QCA. However, researchers using QCA have struggled to account for emergence in empirical research. There are four main reasons why researchers miss the link between emergence and QCA in research.

The first reason concerns conventions in social research. The ways in which researchers have been trained also influence the way they will work with QCA. On the one hand, considerable training is necessary to fully appreciate the depth and singular operations of the method. On the other hand, conventions from other research methods may stand in the way of deploying QCA with more attention to emergence. Naturally, some researchers may not even be interested. That is fair – there are many types of research questions and directions of interests – but for those who would like to use QCA in its full potential, a rethinking of the ways in which one does research is needed. Possibly, qualitative, case-based researchers are more prepared to welcome the logic of QCA as compared to more quantitative-oriented researchers (see Ragin, 2000, ch 1).

The second reason concerns the ways in which conditions are understood. Defined as sets, conditions are not separated from the cases, but they are considered aspects of the cases; not only they carry explanatory value for the observed outcome, but the membership of cases to the conditions implies that the latter capture case characteristics, too (Schneider & Wagemann, 2012;

Thiem & Baumgartner, 2016). This aligns with the discussion above about the relationship between parts and wholes, about the whole generative characters of cases into system states, i.e. configurations. Organized in a truth table, the outcome – also understood as a set – is associated with the entire configuration (i.e. combination of conditions) that together form a specific system state. In QCA, the relationships between parts (cases) and wholes (configurations and outcomes) are expressed, and are to be understood, in terms of (partial) set membership (Thiem et al., 2015).

In practice, however, the relationships between cases and wholes are often understood and modelled in terms of correlation, i.e. as a dependent variable that varies with a variance of the conditions (ibid.). There is an important difference between conditions and variables. Variables are labels that represent attributes of a particular social system. A qualitative or quantitative change in the aspect of a process is mirrored by a quantitative change of the value of that particular variable. Variable-based research attempts to establish co-variance between independent and dependent variables to explain the outcome by isolating net effects. Correlation between variables is established if they agree on the variance, which is then used to generate probabilistic causal statements.

While variables may be mapped for their net impact on the dependent variable, conditions and outcome condition in QCA co-occur in various combinations. In social reality, few factors can be considered truly independent of one another (Harvey, 2009; Rescher, 1998). Although this is common knowledge in QCA literature, researchers still tend to phrase their results in co-variance terms (e.g., one or multiple conditions are said to have caused the outcome). Conceiving conditions as variables detaches researchers from thinking about social emergence, whereas conceiving conditions in terms of super- and subsets re-connects QCA with emergence. The outcome condition is hence understood as representing the qualitative difference from the constituent parts as a matter of composition or configuration of conditions.

The third reason concerns the difficulty of defining conditions properly. When understood as aspects of cases, they present an immediate problem of working with sets. That is: they need to be discrete (to avoid assessing the same aspect twice in two conditions), yet they are an integral part of an empirical phenomenon. As such, it is hard – but not impossible – to define them satisfactorily. QCA invites researchers to formulate conditions in a somewhat generic, almost crude way, because they have to account for the same (or similar) aspects in multiple cases, i.e. there is a trade-off between generality and specificity (e.g. Goertz, 2005; Toshkov, 2016). Here, again, we swing between social and causal complexity, as QCA urges researchers to consider them in tandem. However, and consequently, conditions in QCA become containers that as black box hides considerable complexity and social action, in particular processes of becoming.

The fourth reason is that emergence is inherently dynamic. As cases and conditions refer to one another without directional assumptions, diachronic emergence does not suit QCA because it assumes the macro emerging from the micro-level. Instead, synchronic emergence should be focused on. This is because no distinction between micro and macro can be made. While empirical reality defies the convenient start and end points that diachronic emergence relies on, the incessant unfolding over time of said reality is uncontested (Byrne & Callaghan, 2013). As a method, QCA can be understood as time-agnostic (De Meur et al., 2009) even though Ragin's point of departure did not rule out the possibility for time-sensitivity. Subsequently, some authors have proposed ways in which time can be accounted for, most notably temporal QCA (Caren & Panofsky, 2005) and time-series QCA (García-Castro & Ariño, 2013; Hino, 2009). They were not necessarily developed with the emergence in mind but they could provide the keys to a version that does.

Below, we propose four strategies to solve the missed links between emergence and QCA: the use of thick case description might solve the first missed issue; the opening of the black box of conditions can solve the second and third issues; and the integration of within-case time variation, as well as the combination of QCA with other, more time-sensitive methods, could serve as a guide for addressing the fourth missed link.

Emergence in QCA: four strategies in applied research

The discussion has taken us to the point where one can start thinking about solutions for the ways in which emergence can be addressed more fully in QCA. Possible solutions are found in a variety of places. These solutions are not mutually exclusive and can be combined in various ways. Table 1 summarizes the possibilities.

The first strategy deals with a more thorough exploitation of qualitative data. Despite including the term 'qualitative', much of actual QCA research runs on quantitative data. While understandable for practical reasons, as numerical data are more easily malleable for calibration (see De Block and Vis 2017), it leaves social complexity underexposed. Qualitative data can give in-depth explanations about the appearance (presence) and disappearance (absence) of conditions. When interpreting results, a pattern derived from the comparison of different paths in the solution formula can be a starting point for in-depth research. This is because, beyond being a collection of occurrences about 'what' has happened, a QCA dataset should ask 'why' something has happened. Rich, qualitative data are essential for understanding the conditions under which changes in system states (transitions or shifts) occur (Abbott, 1992b). Qualitative data achieve this not through reductionism, but through progressive contextualization (Abell, 1984, 2004; Vayda, 1983) because it is in past and present contexts that information about the conditions behind the emergent whole appears.

The researcher has to decide which events and actions, in a given order, have contributed to the emergence of an outcome (Gerrits & Marks, 2017). As cases and configurations of conditions refer to each other, the researcher will select the parts of social complexity (heterogeneity of cases and variation in time- and place-bounded conditions) that will make up the ingredients for making causal complexity emerge. The causal complexity observed in the empirical instances will have to be described through the causal 'recipes' in QCA. The dialogue between the selected data and the concepts to be explained cannot be outsourced to automated procedures; it is not only selection that is required from the part of the researcher but also her ability to understand and gradually discover what she is looking at. The main guiding principle is plausibility or 'followability' (Abbott, 2001, p. 290). This means that the research has to have a plausible narrative as to why certain system states are actualized from a given set of conditions, and argue why this can be plausibly considered an emergent whole rather than just a heap.

Qualitative data, or thick case descriptions, are key in allowing the researcher to gain the in-depth knowledge necessary to understand, along a non-linear research process and iteratively, the social and causal complexity of the data at hand (Abbott, 1997; Riain, 2009). Thick case descriptions

Table 1. Four strategies for tracing emergence in QCA research

	Emergence and QCA		Complexity and QCA	
	Missed link between social emergence and QCA	Strategy to reconnect social emergence with QCA	Social complexity	Causal complexity
1	Not working according to the logic of QCA	Use of in-depth qualitative data; thick case descriptions	Heterogeneity of cases, that is however limited (limited diversity)	Equifinality and multifinality (combinations of sets of conditions)
2	Conceiving conditions as variables	Relationships between conditions and outcome are conceived in terms of super/subsets; two-step QCA, Grounded Theory	Cases, as parts, and their characteristics, generate wholes as types of system states (configurations)	Conditions capture aspects of cases as their parts
3	Conditions as black boxes	as above.	as above.	as above.
4	Time insensitivity of QCA as compared to social reality unfolding over time	Integration of time and mixed-method approaches	Social reality unfolds over time (social emergence)	Conditions as sequences (T/QCA), time and group effects (TS/QCA panel data QCA)

are at the heart of QCA, where synthetic case descriptions (SCD) can aid the systematization of qualitative data per case, across cases for subsequent comparison (Rihoux & Lobe, 2009). The main rationale of using qualitative data is to specifically describe and represent changes in the cases that can form combinations of conditions indicating a shift from one particular state to another, or to the next.

The second strategy, which addresses the second and third missed link, deals with maintaining a clear conceptual distinction between conditions and variables. As mentioned above, considering conditions as aspects of cases instead of as variables requires a thorough rethinking of social and causal complexity that the researcher addresses. More specifically, conditions should be defined so that they get closer to representing emergent processes instead of representing abstract aspects of cases. Indeed, much of QCA research features conditions on a fairly abstract level, which gives the impression that considerable social actions are addressed even though it is actually hidden in an abstract 'black box'. Conditions could be conceived not as case-specific, but as representing a family or typology of concepts and their attributes that can actualize differently in the other considered cases. Such grouping accommodates causal complexity (Fiss, 2011) while keeping the number of conditions manageable for comparison (Berg-Schlosser & de Meur, 2009). Naturally, such a step opens to another set of methodological issues, e.g., regarding the relative weight of each concept within a set, or whether there is a (conditional) hierarchy among the concepts in that set. Schneider and Wagemann's procedure for analyzing subsets of conditions in separate steps (Schneider & Wagemann, 2006) could be of help.

A Grounded Theory (GT; Strauss & Corbin) approach could be used to open the black boxes of conditions. GT offers a set of robust procedures that helps researchers in their efforts to move from raw data to conceptualizing conditions as sets, to be used for performing QCA (a step-wise guide can be found in Jopke, & Gerrits, 2019). The advantage of following this route is that the definition of conditions is rooted in social complexity, as it emerges from the raw, case-based data, instead of forcing the researcher to match the data to pre-defined definitions conditions. As data-driven and inductive, this approach also fits well with the realist perspective advocated here (see, e.g. Hoddy, 2018; Kempster & Parry, 2011; Oliver, 2012).

The third strategy is to render the method less time-agnostic. For example, different comparisons can be carried for the same set of cases over different time stamps (Fischer & Maggetti, 2017), time itself can be taken as one of the conditions (ibid.), and time can be used to delineate cases (De Meur et al., 2009). On a more technical level, the order or sequence of conditions (e.g., 'A before B') can be integrated into the minimization process (Caren & Panofsky, 2005), and a time-series cross-sectional approach can be applied to QCA data, such as in time-series QCA (Hino, 2009) or panel-data QCA (García-Castro & Ariño, 2013). However, some shortcomings of these approaches are that the number of possible configurations increases if their sequences have to be taken into account; calibration with time-series might require a large number of cases, which touches upon the loss of in-depth case knowledge when QCA is applied to large-n. More importantly, these approaches do not reflect its emergent character fully: a time-series cross-sectional logic and the conceptualization of time as discrete time stamps still imbue the current strategies to make QCA more time-sensitive.

Finally, while the underlying logic and workings of QCA will remain unchanged, their combination with other methods that are more sensitive to time is promising (i.e. multi- or mixed-method approach). Process tracing (PT) has shown to be a particularly well-suited approach to be exploited in combination with QCA, especially when 'typical' or 'deviant' cases have been identified through QCA (Beach & Rohlfing, 2018; Lambach, 2016; Mahoney & Vanderpoel, 2015; Schneider & Rohlfing, 2013; Schneider & Rohlfing, 2013). However, although appealing, the combination of methods is notably laborious and data hungry. Moreover, while it helps researchers homing in on emergence, combining methods does not make the core comparative procedures from QCA more sensitive to emergence. As such, it should be seen as an addition to the method.

As a final comment to the third strategy, when dealing with time there is a genuine risk to incur in 'backwards reconstruction', i.e. an explanation of an outcome by selecting only the factors that appear directly connected to it, brushing against tautologies. Backwards reconstruction may suggest a straightforward, even necessary, unfolding of reality. To prevent this, researchers have to acknowledge in their analysis and interpretation that the arrow of time points towards the future (Prigogine, 1997), and that what appears a linear path retrospectively is in reality only one path out of the multiple system states plausible at the previous time point. This suggests that the past must have been as uncertain as the future appears at the present. In a realist perspective, the social complexity that becomes actualized is not only an outcome of purposeful social action, but said action combined with both chance and the disappearance of certain actions (Authors, 2012) at the level of local conditions. Absence of factors should have the same causal power as factors enabling and outcome.

Conclusions

This paper started with the statement that QCA promises to be a method that does justice to social complexity but that this promise is only partially fulfilled. Complexity is found as a property of cases (within-case variation), and as a property of causality (cross-case variation). Rooted in a critical realist conceptualization of emergence that is more about 'becoming' than it is about 'being', we proposed four strategies to reestablish QCA's concern with complexity (see Table 1), which are (1) the more thorough use of case-based qualitative data (thick descriptions), (2) the emergent conceptualization of conditions beyond a variable-oriented approach (for instance, through Grounded Theory) and (3) the integration of time variation into QCA.

Each possible strategy also has drawbacks – but there is very likely is no shortcut when researching social complexity. However, that should not stop researchers from trying, if only because understanding social complexity (as a matter of becoming) is what QCA is all about. The entire set of proposals hinges on the specific choices of researching emergent outcomes and (subsequently) of working with qualitative data. All things considered, it would be unfortunate if QCA researchers ignore the possibilities that this avenue offers. After all, there is nothing in Ragin's work that would stop us from going there.

Note

1. This is a succinct description of the method. Readers can find more details in Ragin's books, as well as refer to C.Q. Schneider and Wagemann (2012) for a thorough overview and discussion.

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Disclosure statement

There is no potential conflict of interest.

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References

Abbott, A. (1992a). What do cases do? Some notes on activity in sociological analysis. In C. C. Ragin & H. S. Becker (Eds.), *What is a case? Exploring the foundations of social inquiry* (pp. 53–82). Cambridge University Press.
Abbott, A. (1992b). From causes to events: Notes on narrative positivism. *Sociological Methods & Research*, *20*(4), 428–455. https://doi.org/10.1177/0049124192020004002
Abbott, A. (1997). Of time and space: The contemporary relevance of the Chicago school. *Social Forces*, *75*(4), 1149–1182. https://doi.org/10.2307/2580667
Abbott, A. (2001). *Time matters. On theory and method*. University of Chicago Press.
Abell, P. (1984). Comparative narratives: Some rules for the study of action. *Journal for the Theory of Social Behaviour*, *14*(3), 309–331. https://doi.org/10.1111/j.1468-5914.1984.tb00500.x
Abell, P. (2004). Narrative explanation: An alternative to variable-centered explanation? *Annual Review of Sociology*, *30*(1), 287–310. https://doi.org/10.1146/annurev.soc.29.010202.100113
Adam, B. (1990). *Time and social theory*. Polity Press.
Adam, B. (1992). Modern times: The technology connection and its implications for social theory. *Time & Society*, *1*(2), 175–191. https://doi.org/10.1177/0961463X92001002003
Axelrod, R. M. (1997). *The complexity of cooperation: Agent-based models of competition and collaboration*. New Jersey: Princeton University Press.
Beach, D., & Rohlfing, I. (2018). Integrating cross-case analyses and process tracing in set-theoretic research: Strategies and parameters of debate. *Sociological Methods & Research*, *47*(1), 3–36. https://doi.org/10.1177/0049124115613780
Befani, B. (2013). Between complexity and generalization: Addressing evaluation challenges with QCA. *Evaluation*, *19*(3), 269–283. https://doi.org/10.1177/1474022213493839
Berg-Schlosser, D., & de Meur, G. (2009). Comparative research design: Case and variable selection. In Rihoux, B. & Ragin, C. C. (eds.), *Configurational comparative methods. Qualitative comparative analysis (QCA) and related techniques* (pp. 19–32). Configurational comparative methods. Qualitative comparative analysis (QCA) and related techniques. London: Sage.
Bhaskar, R. (2008). *A realist theory of science*. Routledge.
Blackman, T., Wistow, J., & Byrne, D. (2013). Using qualitative comparative analysis to understand complex policy problems. *Evaluation*, *19*(2), 126–140. https://doi.org/10.1177/1356389013484203
Byrne, D. (2005). Complexity, configurations and cases. *Theory, Culture & Society*, *22*(5), 95–111. https://doi.org/10.1177/0263276405057194
Byrne, D., & Callaghan, G. (2013). *Complexity theory and the social sciences: The state of the art* (1 ed.). Routledge.
Byrne, D. S. (2009). Complex realist and configurational approaches to cases: A radical synthesis. In D. S. Byrne & C. C. Ragin (Eds.), *The Sage handbook of case-based methods* (pp. 101–112). SAGE Publications.
Byrne, D. S., & Ragin, C. C. (2009). *The Sage handbook of case-based methods*. Sage Publications Ltd.
Cairns, J. M., Wistow, J., & Bambra, C. (2017). Making the case for qualitative comparative analysis in geographical research: A case study of health resilience. *Area*, *49*(3), 369–376. https://doi.org/10.1111/area.12327
Caren, N., & Panofsky, A. (2005). TQCA: A technique for adding temporality to qualitative comparative analysis. *Sociological Methods & Research*, *34*(2), 147–172. https://doi.org/10.1177/0049124105277197
Castellani, B., & Hafferty, F. W. (2009). *Sociology and complexity science*. Springer Berlin Heidelberg. http://link.springer.com/10.1007/978–3–540–88462–0
Chalmers, D. (2008). Strong and weak emergence. In P. Clayton & P. Davies (Eds.), *The re-emergence of emergence*. (pp. 244–256) Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199544318.001.0001
Cilliers, P. (1998). *Complexity and postmodernism. Understanding complex systems*. Routledge.

Cilliers, P. (2002). Why we cannot know complex things completely. *Emergence*, *4*(1/2), 77–84. https://doi-org.eur.idm.oclc.org/10.1080/15213250.2002.9687736
De Block, D. & Vis, B. (2017). Addressing the Challenges in Using Qualitative Data in Qualitative Comparative Analysis. COMPASS working paper 2017-88, http://www.compasss.org/wpseries/deBlockVis2017.pdf
De Meur, G., Rihoux, B., & Yamasaki, S. (2009). Addressing the critiques of QCA. In Rihoux, B. & Ragin, C.C. (eds.), *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques* (pp. 147–166). Sage.
Easton, G. (2010). Critical realism in case study research. *Industrial Marketing Management*, *39*(1), 118–128. https://doi.org/10.1016/j.indmarman.2008.06.004
Elder-Vass, D. (2004). *Re-examining Bhaskar's three ontological domains: The lessons from emergence* In: Lawson, C., Latsis, J.S., Martins, N. Contributions to Social Ontology. New York: Routledge.
Elder-Vass, D. (2005). Emergence and the realist account of cause. *Journal of Critical Realism*, *4*(2), 315–338. https://doi.org/10.1558/jocr.v4i2.315
Fischer, M., & Maggetti, M. (2017). Qualitative comparative analysis and the study of policy processes. *Journal of Comparative Policy Analysis: Research and Practice*, *19*(4), 345–361. https://doi.org/10.1080/13876988.2016.1149281
Fiss, P. C. (2011). Building better causal theories: A Fuzzy set approach to typologies in organization research. *Academy of Management Journal*, *54*(2), 393–420. https://doi.org/10.5465/amj.2011.60263120
Frantzeskaki, N., & de Haan, H. (2009). Transitions: Two steps from theory to policy. *Futures*, *41*(9), 593–606. https://doi.org/10.1016/j.futures.2009.04.009
Frantzeskaki, N., Thissen, W., & Grin, J. (2016). Drifting between transitions. *Technological Forecasting and Social Change*, *102*, 275–286. https://doi.org/10.1016/j.techfore.2015.09.007
García-Castro, R., & Ariño, M. A. (2013). A general approach to panel data set-theoretic research. *COMPASSS Working Paper 2013-76*, 27.
Gell-Mann, M. (1995). What is complexity? *Complexity*, *1*(1), 16–19. https://doi.org/10.1002/cplx.6130010105
Gerrits, L. (2008). The Gentle Art of Coevolution: a complexity theory perspective on decision making over estuaries in Germany, Belgium and the Netherlands. Rotterdam, Optima Press.
Gerrits, L. (2012). *Punching clouds: An introduction to the complexity of public decision-making.* Litchfield Park, AZ: Emergent Publications
Gerrits, L. & Marks, P. K. (2017). Understanding Collective Decision Making. Cheltenham, UK: Edward Elgar Publishing.
Gerrits, L. & Verweij, S. (2013). Critical realism as a metaframework for understanding the relationships between complexity and qualitative comparative analysis. Journal of Critical Realism, *12*(2), 166–182.
Gerrits, L. & Verweij, S. (2018). The Evaluation of Complex Infrastructure Projects. A Guide to Qualitative Comparative Analysis. Cheltenham, UK: Edward Elgar Publishing.
Gerrits, L. M. (2008). *The gentle art of coevolution: A complexity theory perspective on decision making over estuaries in Germany, Belgium and the Netherlands*. Erasmus University Rotterdam.
Goertz, G. (2005). *Social science concepts*. Princeton University Press. https://press.princeton.edu/titles/8089.html
Goldstein, J. (1999). Emergence as a construct: History and issues. *Emergence*, *1*(1), 49–72. https://doi.org/10.1207/s15327000em0101_4
Goldstein, J. (2000). Causality and emergence in chaos *and complexity* theories. In W. Sulis & A. Combs (Eds.), *Nonlinear dynamics in human behavior (Studies of nonlinear phenomena in life sciences Volume 5)* (pp. 161190). World Scientific Publishing, 1996. (Republished as NATO Science Series, Volume 320, 2000).
Gorski, P. S. (2013). What is critical realism? And why should you care? *Contemporary Sociology: A Journal of Reviews*, *42*(5), 658–670. https://doi.org/10.1177/0094306113499533
Haan, F. J. D. (2010). *Towards transition theory*. Erasmus University Rotterdam.
Harvey, D. L. (2009). Complexity and Case. In D. Byrne & C. Ragin (Eds.), *The SAGE handbook of case-based methods* (pp. 15–38). SAGE Publications Ltd. http://methods.sagepub.com/book/the-sage-handbook-of-case-based-methods/n2.xml
Hino, A. (2009). Time-series QCA. *Sociological Theory and Methods*, *24*(2), 247–265. https://doi.org/10.11218/ojjams.24.247
Hoddy, E. T. (2018). Critical realism in empirical research: Employing techniques from grounded theory methodology. *International Journal of Social Research Methodology*, *22*(1), 111–124. https://doi.org/10.1080/13645579.2018.1503400
Hodgson, G. M. (2007). The concept of emergence in the social science: Its history and importance. In P. Cilliers (Ed.), *Thinking complexity. Complexity and philosophy Volume 1* (pp. 37–48). ISCE Publishing.
Holland, J. H. (1995). *Hidden order: How adaptation builds complexity*. Perseus Books.
Holland, J. H. (1999). *Emergence: From chaos to order*. Basic Books.
Holland, J. H. (2006). Studying complex adaptive systems. *Journal of Systems Science and Complexity*, *19*(1), 1–8. https://doi.org/10.1007/s11424-006-0001-z

Jopke, N. & Gerrits, L. (2019). Constructing cases and conditions in QCA – lessons from grounded theory. *International Journal of Social Research Methodology*, *22*(6): 599–610.
Juarrero, A., & Rubino, C. (Eds.). (2010). *Emergence, complexity, and self-organization. Precursors and prototypes*. Emergent Publications.
Kauffman, S. A. (1993). *The origins of order*. Oxford University Press.
Kempster, S., & Parry, K. W. (2011). Grounded theory and leadership research: A critical realist perspective. *The Leadership Quarterly*, *22*(1), 106–120. https://doi.org/10.1016/j.leaqua.2010.12.010
Kiblinger, W. P. (2007). Evolution and subjectivity. *Zygon®*, *42*(1), 193–202. https://doi.org/10.1111/j.1467-9744.2006.00815.x
Kiel, L. D., & Elliott, E. (2005). *Chaos theory in the social sciences*. University of Michigan Press.
Kraus, S., Ribeiro-Soriano, D., & Schüssler, M. (2018). Fuzzy-set qualitative comparative analysis (fsQCA) in entrepreneurship and innovation research – The rise of a method. *International Entrepreneurship and Management Journal*, *14*(1), 15–33. https://doi.org/10.1007/s11365-017-0461-8
Lambach, D. (2016). *Warum Staaten zusammenbrechen: Eine vergleichende Untersuchung der Ursachen von Staatskollaps*. Springer VS.
Laszlo, E. (1972). *The systems view of the World*. Blackwell Publishers Ltd.
Lewes, G. H. (1875). *Problems of life and mind. Volume 2*. Trubner.
Losch, A. (2009). On the origins of critical realism. *Theology and Science*, *7*(1), 85–106. https://doi.org/10.1080/14746700802617105
Mahoney, J., & Vanderpoel, R. S. (2015). Set diagrams and qualitative research. *Comparative Political Studies*, *48*(1), 65–100. https://doi.org/10.1177/0010414013519410
Marx, A., Rihoux, B., & Ragin, C. (2014). The origins, development, and application of qualitative comparative analysis: The first 25 years. *European Political Science Review*, *6*(1), 115–142. https://doi.org/10.1017/S1755773912000318
Mayr, E. (1985). The growth of biological thought. Harvard University Press. http://www.hup.harvard.edu/catalog.php?isbn=9780674364462&content=toc
Merali, Y., & Allen, P. (2011). Complexity and systems thinking. In Allen, P. Maguire, S. & McKelvey, B. (eds.), *The Sage handbook of complexity and management* (pp. 31–52). Sage.
Morçöl, G. (2012). *A complexity theory for public policy*. Routledge.
Morgan, C. L. (1927). *Emergent evolution*. Edward Arnold.
Morgan, C. L. (1932). *The emergence of novelty*. Williams & Norgate.
Oliver, C. (2012). Critical realist grounded theory: A new approach for social work research. *British Journal of Social Work*, *42*(2), 371–387. https://doi.org/10.1093/bjsw/bcr064
Platt, J. (1992). Cases of cases … Of cases. In C. C. Ragin & H. S. Becker (Eds.), *What is a case? Exploring the foundations of social inquiry* (pp. 21–52). Cambridge University Press.
Prigogine, I. (1997). *The end of certainty* (1 ed.). Free Press.
Prigogine, I., & Stengers, I. (1985). *Order out of chaos. Man's new dialogue with nature*. Harper-Collins.
Ragin, C. C. (1987). *The comparative method: Moving beyond qualitative and quantitative strategies*. University of California Press. https://books.google.de/books?id=mZi17vherScC
Ragin, C. C. (1999). Using qualitative comparative analysis to study causal complexity. *Health Services Research*, *15*. 34(*5 Pt 2*): 1137–1151. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1089057/
Ragin, C. C. (2000). *Fuzzy-set social science* (1 ed.). University Of Chicago Press.
Ragin, C. C., & Becker, H. S. (Eds.). (1992). *What is a case? Exploring the foundations of social inquiry*. Cambridge University Press.
Ragin, C. C., Shulman, D., Weinberg, A., & Gran, B. (2003). Complexity, generality, and qualitative comparative analysis. *Field Methods*, *15*(4), 323–340. https://doi.org/10.1177/1525822X03257689
Reed, M., & Harvey, D. L. (1992). The new science and the old: complexity and realism in the social sciences. *Journal for the Theory of Social Behaviour*, *22*(4), 353–380. https://doi.org/10.1111/j.1468-5914.1992.tb00224.x
Rescher, N. (1998). *Complexity. A philosophical overview*. Transaction Publishers.
Riain, S. (2009). Extending the ethnographic case study. In D. S. Byrne & C. C. Ragin (Eds.), *The SAGE handbook of case-based methods* (pp. 290–306). SAGE.
Rihoux, B., & Lobe, B. (2009). The case for Qualitative Comparative Analysis (QCA): Adding leverage for thick cross-case comparison. In D. S. Byrne & C. C. Ragin (Eds.), *The SAGE handbook of case-based methods* (pp. 222–242). SAGE.
Rihoux, B., & Marx, A. (2013). QCA, 25 Years after "The comparative method". *Political Research Quarterly*, *66*(1), 167–235. https://doi.org/10.1177/1065912912468269
Rihoux, B., & Ragin, C. (2009). *Configurational comparative methods: Qualitative Comparative Analysis (QCA) and related techniques*. SAGE Publications, Inc. https://doi.org/10.4135/9781452226569
Sager, F., & Andereggen, C. (2012). Dealing with complex causality in realist synthesis: The promise of qualitative comparative analysis. *American Journal of Evaluation*, *33*(1), 60–78. https://doi.org/10.1177/1098214011411574
Sawyer, R. K. (2005). *Social emergence: Societies as complex systems*. Cambridge University Press.

Schneider, C. Q., Rohlfing (2013). Combining QCA and Process Tracing in Set-Theoretic Multi-Method Research. Sociological Methods & Research *42*(2): 559–597, https://doi.org/10.1177/0049124113481341

Schneider, C. Q., & Rohlfing, I. (2013). Combining QCA and process tracing in set-theoretic multi-method research. *Sociological Methods & Research*, *42*(4), 559–597. https://doi.org/10.1177/0049124113481341

Schneider, C. Q., & Wagemann, C. (2006). Reducing complexity in Qualitative Comparative Analysis (QCA): Remote and proximate factors and the consolidation of democracy. *European Journal of Political Research*, *45*(5), 751–786. https://doi.org/10.1111/j.1475-6765.2006.00635.x

Schneider, C. Q., & Wagemann, C. (2012). *Set-theoretic methods for the social sciences. A guide to qualitative comparative analysis*. Cambridge University Press.

Thiem, A., & Baumgartner, M. (2016). Glossary for configurational comparative methods. In *QCApro: Professional functionality for performing and evaluating qualitative comparative analysis, R Package Version 1.1-1*. (pp. 28). http://alrik-thiem.net/data/documents/glossary.pdf

Thiem, A., Baumgartner, M., & Bol, D. (2015). Still lost in translation! A correction of three misunderstandings between configurational comparativists and regressional analysts. *Comparative Political Studies*, *49*(6), 742–774. https://doi.org/10.1177/0010414014565892

Thomann, E., & Maggetti, M. (2017). Designing research with Qualitative Comparative Analysis (QCA): Approaches, challenges, and tools. *Sociological Methods & Research*, *29*(2), 356–386. 0049124117729700. https://doi.org/10.1177/0049124117729700

Toshkov, D. (2016). *Research design in political science*. Macmillan International Higher Education.

Vayda, A. P. (1983). Progressive contextualization: Methods for research in human ecology. *Human Ecology*, *11*(3), 265–281. https://doi.org/10.1007/BF00891376

Waldrop, M. M. (1993). *Complexity: The emerging science at the edge of order and chaos (First printing)*. Simon & Schuster.