

Using Fuzzy QCA Analysis in Testing the Institutional Conditions for the Emergence of Agency

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Introduction

There is a burgeoning literature on agency in economic geography that explores the role of actors in the transformation of economic landscapes of regions (Huggins and Thompson 2017; Sotarauta, Beer, and Gibney 2017). Agency manifests as purposeful action done in response to regional economic disturbances and can come in the form of policy intervention (Bristow and Healy 2014b). Agency has been shown to be integral to launching resilience strategies and engendering transformative change to regional economies (David 2018). As such, the lack of agency in a region may help explain why some are unable to recover from economic decline and why regional development is uneven across places. Despite the increased interest in agency, however, it is not very well understood why and how actors intervene and the conditions in which agency emerges in regions. These conditions are, in part, constituted by institutions, which refer to rules that govern the actions of actors (Lawrence, Suddaby, and Leca 2011). Actions of actors are inextricably underpinned by an institutional environment, that is to say, the rules, norms, laws, and social codes within the structures in which actors are embedded (Battilana 2006). And yet, few studies in economic geography empirically investigate these institutions in relation to agency and the specific ways in which they limit, constrain, enable, and embolden actors to intervene with policy action; beyond the typically general acknowledgement that institutions matter. Thus, a need to further investigate the link between actors, institutional conditions, and the emergence of agency is apparent.

This link however is fundamentally challenging to study and test. Because of its inherent complexity, it needs to be studied qualitatively through case studies because it requires richly detailed accounts of the processes in which actors behave and internalize institutions and how these manifest in actions.

Whilst case studies contribute and enrich the literature, results are niched and specialized to the case in question and few studies are able to generalize results towards this phenomenon. Quantitative methods can provide generalized statements but runs the risk of losing the level of nuanced understanding that qualitative data provides. This dilemma in the methodology in the literature has, in part, effectively stalled progress in understanding further the micro foundations of policy action for regional development. This, despite the fact, that there exists a mixed method that is able to overcome this dilemma. The fuzzy qualitative comparative analysis (fsQCA) method has been increasingly used in other social science fields and shown to be a robust mixed method that is a good fit for the research problem at hand (Schneider and Wagemann 2010). To date, there have been very few studies using this method in the study of agency and institutions in economic geography. This paper aims to fill this gap.

Using data from a comparative case study conducted on the parallel closures of a leading pharmaceutical firm in two regions and using configurational methods, this paper, then, interrogates the research question **“Can the fsQCA method be used test the relationship between agency and institutions?”** Exploring this question can help demonstrate that the fsQCA method can show the nuances between actors, how they respond to institutional conditions, and why some actors intervene and some do not, in times of regional economic crises. The aim of this paper is to demonstrate how this novel mixed method can improve the ways we test the relationship between actors and institutions.

[Review of how the method has been used](#)

The ambition of this review is not to provide an exhaustive list of papers that have used the QCA method but instead, to focus on papers with analytical frameworks that, when abstracted, demonstrates parallelisms to research queries involving the link between agency and institutions. The aim is to curate and discuss studies that can demonstrate the opportunities and limitations to using

this method for the study of the emergence of agency manifested through policy action and the institutional conditions that shape the causes of this emergence. For a more general and extensive review of the literature on the method, see (Rihoux et al. 2013).

The use of fsQCA is increasingly more common in the social sciences in such fields as political science, public policy, sociology, and applied in numerous ways (Rihoux et al. 2013; Kogut and Ragin 2006; Warren, Wistow, and Bambra 2013; Makszin and Schneider 2014; Bara 2014; Guzman-Concha 2015). One paper in public policy examines how path dependent policies enabled the labour market integration of asylum seekers in Switzerland despite the presence of anti-immigration sentiments in some cantons (Sager and Thomann 2017). It compared the performance of 24 cantons across the years 2000 to 2003. It examined constellations of actors and existing institutional settings and organizational structures within the cantons and its governing bodies in the analysis. Another explored the grounds by which the International Monetary fund (IMF) evaluated the success prospects of 20 austerity programs during the European debt crisis across 14 countries from 2009 to 2012. Its analyses hinged on showing the policy implementation abilities of countries by looking at the institutional conditions such as 'effective state administration', 'strong center right government', and 'strongly decentralized political system', that permit structural reform and reduction of expenditures (Hinterleitner, Sager, and Thomann 2016). These factors, in turn, were linked to policy actions and outcomes. Another paper investigated under which conditions governments undertake unpopular social policy reforms linked to how well these governments do in a next round of elections (Vis 2009). This paper examined whether conditions such as a decline in economies, the presence of a rightwing or leftwing government, and other features of the structural setting that make pursuing an unpopular policy initiative likely and unlikely. Data on 25 cabinets from four countries, namely, UK, Denmark, the Netherlands, and Germany, were used.

Title	Year published	Authors	Journal	Data size	Unit of analysis	Level of analysis	Type of Findings
Mapping the institutional capital of high tech firms: a fuzzy set analysis of capitalist variety and export performance	2009	Schneider et al	Journal of International Business Studies	Small-n	Countries	Country level	Multiple causation
Governments and unpopular social policy reform: Biting the bullet or steering clear?	2009	Vis	European Journal of Political Research	Medium-n	Cabinets	Country level	Multiple causation
Applying Qualitative Comparative Analysis (QCA) to evaluate a public health policy initiative in the North East of England	2013	Warren et al	Policy and Society	Small-n	Individuals	Individual level	Multiple causation
Incentives and opportunities: A complexity oriented explanation of violent ethnic conflict	2014	Barra	Journal of Peace Research	Small-n	Groups	Country level	Multiple causation
Forms of welfare capitalism and education based participatory inequality	2014	Schneider and Makszin	Socio-economic Review	Medium-n	Countries		Multiple causation
Radical social movements in Western Europe: a configurational analysis	2015	Guzman	Social movements studies	Medium-n	Cities	Regional level	Multiple causation
The politics of external approval: explaining the IMF's evaluation of austerity programmes	2016	Hinterleitner et al	European Journal of Political Research	Small-n	Austerity programs	Country level	Multiple causation
Multiple streams in member states implementation: politics, problem construction and policy paths in Swiss asylum policy	2017	Sager and Thomann	Journal of Public Policy	Small-n	Cantons	Regional level	Multiple causation

But the method has also appeared in business studies and entrepreneurship literatures. The research questions that have been queried include testing whether the quality of institutions affect the veracity of export performance of high tech firms (Schneider, Schulze-Bentrop, and Paunescu 2010). It used data on high tech firms from 19 countries across four years and institutional quality was drawn from the conceptual framework of the varieties of capitalism literature (Hall and Thelen 2008), a conceptual framework for institutions that is also commonly referred to in economic geography. The method allowed findings that show combinations of institutional features in countries such as the presence of weak employment protection, low trade union bargaining, university level human capital, such of countries complimentary to explaining rates of exports which coheres with theories on the inherent complexities of institutional impact.

Abstractly, what these papers show is that QCA, as a research approach, and research method, can evaluate how policy outcome emerge and linked to institutional settings. Based on the empirical evidence from the extant literature, the QCA method allows findings that cohere to a theory that accounts for combinations of causation rather than attribution to one single factor. Fuzzy QCA, then, together with formal theory evaluation, is well suited to analyzing the combinations of effects of 'problem-related factors, politics (actor constellations), and policy paths' to understand policy contexts, perceptions of problems, and solutions and initiatives that are adopted (Sager and Thomann 2017; Thomann and Wittwer 2016). It allows for causal complexity to explain a phenomenon. This is precisely the kind of method that is well suited to studying the complex relationship between agency, institutions, and policy outcomes that has increasingly been on the research agenda in economic geography.

One limitation of the method is that its core interest is identifying sufficient and necessary conditions for a certain outcome. This method is clearly not suitable for research agendas uninterested in these

answers. As with most research projects, the strength of the method lies in how it can help answer the research question. Another limitation of the method is that it relies on the researcher to calibrate the value of the membership scores of variables when translating variables into sets; i.e. 'is this municipality rightwing? And if so, to what extent, between the values of 1 and 0'. But this reliance is based on both theoretical and empirical knowledge of the researcher. Existing qualitative research methods already rely on the researcher to give an assessment of the qualitative data indicators based on readings of the theoretical and empirical data, such as when findings are interpreted from case studies, for example. This is to say that this limitation exists in qualitative methods, in general and to varying extents, and not mutually exclusive to the QCA method. The approach of QCA aims to formalize the logic underpinning comparative case studies (Kogut and Ragin 2006). Moreover, calibrating the values of qualitative indicators and performing a QCA analysis allows easier replication of results relative to other qualitative research methods. This is an advantage of this method because it contributes replicability of qualitative research which is important to the academic process.

Another limitation is that the findings of the method attributes causality which in quantitative methods, are very difficult to establish given the difficulties in achieving true randomness in data and because it allows for findings that involve single causation. In QCA, the definition of causality is based on the logic of Boolean algebra (Baumgartner 2009). An independent variable can be a necessary or sufficient condition for an outcome, or not at all. The method does not permit findings of single causation and only multiple causation, and, in this way, lowers the requirement for randomness (Schneider and Wagemann 2010; Rihoux and Ragin 2009; Baumgartner 2015).

Reformulating Questions on Agency and Institutions

The study of agency and institutions in economic geography has been mostly empirically tested using qualitative data and for good reason, since cases often feature complex processes that do not lend itself, easily to quantitative data (Bristow and Healy 2014a; Holmen and Fosse 2017; Huggins and

Thompson 2017). Some exceptions have been attempted to make general statements about findings by using more quantitatively oriented methods (Sotarauta, Beer, and Gibney 2017). However, there are limitations on the robustness of the kind of data it offers for the quantitative methods it uses such as homogeneity and selection bias, problems that can confound results.

Moreover, the research questions in the literature span inquiries regarding how agency emerges during times of crises and whether agency has been instrumental in enacting policy that formulate adaptive strategies for resilience (David 2018). But some of these research questions and concepts can be meaningfully reformulated in terms of set relations (Schneider and Wagemann 2010; Mahoney, Kimball, and Koivu 2009). How big is the set of actors enacting policy vs actors not enacting policy? Which set of conditions and combination that condition the emergence of agency? Answers to the reformulated questions permit answers the original questions because it can show how agency emerges with interactions with institutional conditions. Thus, if research questions regarding agency can be meaningfully reformulated to set-theoretic relations, then set-theoretic methods can meaningfully test these relations. This is why this paper aims to demonstrate that fsQCA methods improves the way the relationship between agency and institutions are tested.

Methodological Framework

FsQCA is an example of what is referred to as set-theoretic methods, methods that investigate social phenomenon using sets and set relations. A set is a collection of members and set relations refer to the union, the complement, and the intersection of these sets. Set-theoretic methods have three main features. They work with what is referred to as 'membership scores' in sets, relations between social phenomena are perceived as set relations, and the results indicate sufficient and necessary conditions and emphasize causal complexity (Thomann and Wittwer 2016). One type of set theoretic methods is qualitative comparative analysis (QCA) which can be either crisp or fuzzy (fsQCA). FsQCA is both a research approach and a data analysis technique. As a research approach, it entails the process of data

collection, calibrating the sets from the data which means assigning values to qualitative indicators, and constructing truth tables (Greckhamer, Misangyi, and Fiss 2013). Truth tables use Boolean algebra to determine whether a variable is in a set or not. FsQCA as a data analysis technique uses logical minimization and aims at causal interpretation. It relies on finding consistent enough combinations of conditions as supersets and subsets of an outcome. Data analysis is based on standardized algorithms available in statistical software like R. fsQCA was specifically developed to deal with small-N data settings (Greckhamer, Misangyi, and Fiss 2013).

Data and Methods

Data is based on processed information from a comparative case study done on the closure of AstraZeneca in two regions, Lund and Södertälje, respectively. Data was gathered from desk research which included annual reports, news articles, and strategic reports. Semi-structured interviews were also conducted. Eighteen interviews were conducted and were selected based on mentions of their names in newspaper articles, blog interviews, and interviews regarding the closures of AstraZeneca R&D facility in both Lund and Södertälje. The unit of analysis in this paper are the actors that were involved in the closure and had the opportunity to be involved in the subsequent policy action. Information on which actors are relevant to this analysis are gleaned from the interviews and the desk research. Selection of institutional conditions were informed by theory and data whilst information regarding to what extent they adhere to the institutional conditions are informed by data.

In order to test which conditions are causal to the emergence of agency during times of economic crises, the mixed-method of a fuzzy Qualitative Comparative Analysis (fsQCA) method will be employed in this paper. The fsQCA is suited to comparing qualitative data interested in institutional characteristics and evaluating conditions (Rihoux and Ragin 2009; Vis 2009). Truth tables are created in order to see and show the extent to which institutional conditions appear in the outcome for 'agency emergence', which, in this paper, is the dependent variable. QCA uses causal logic and identifies

sufficient and necessary conditions given an outcome of agency being studied. The truth table shows all the logically possible combinations of conditions, and to what extent cases represent them. In fsQCA, independent variables have to be transformed by assigning scores that represent the membership of cases in sets. These scores are from 0 to 1 and are allowed to be continuous. This is what earns this method its fuzzy name as opposed to just a crisp QCA wherein membership scores would be discrete, either 0 or 1.

Table 1. Raw Data Matrix

Cases	Conditions			Outcome	
	Term limit	Renew term limits	Resources	Network	Agency emergence
Lund University	1	0	.8	.8	1
Region Skåne	1	1	.8	.7	1
Lund Municipality	1	1	.3	.7	0
Södertälje Municipality	1	1	.7	.3	1
Mats Paulsson Foundation	0	0	.9	.7	1
PEAB	0	0	.7	.6	1
Scania	0	0	.6	.7	1
AstraZeneca Södertälje	0	0	.6	.6	0
AstraZeneca Lund	0	0	.6	.8	0
National Government Södertälje	1	1	.9	.9	1
National Government Lund	1	1	.3	.9	0
Ministry of Education Lund	1	1	.7	.7	0
Ministry of Education Södertälje	1	1	.7	.9	1
Karolinska Institute	1	0	.7	.6	1

Dependent Variable

A mixed, qualitative and quantitative approach is adopted in this paper due to the nature of the research question at hand, which is investigating the use of fsQCA methods in testing the institutional

conditions causing the emergence of agency during times of economic crises. Agency emergence is the dependent variable which is defined as the manifestation of purposeful action engaged in by an actor as a response to a local economic crises. The action is counted as agency even when it is engaged in, in the context of a coalition. Agency is in the form of allocating and mobilizing resources towards responding to the economic crises.

Independent Variables

The conditions to be tested here are theoretically and empirically informed and will be discussed and justified in the pending conceptual framework. They will be incorporated as conditions of the model:

1. Positions with term limit;
2. Positions with renewable term limits
3. Availability of resources and
4. Access to a coalition/network of other actors.

Expected Results and Discussion

Expected results will be a demonstration on how to operationalize the QCA method in studying the institutional conditions for the emergence of agency. It will show that multiple combinations of conditions can be generated in the findings which will show both necessary and sufficient conditions. A counterfactual will be produced as well, that shows the combinations of sufficient and necessary conditions in which agency does not emerge. The paper aims to show that fsQCA as a robust method can be used for testing the relationship between agency and institutions.

Conclusion

This paper intends to contribute a demonstration of a methodology scarcely used in resilience studies in economic geography. The fsQCA method has methodological currency in testing and explaining the relationship between agency and institutions whilst cohering with the theoretical requirement of multiple causation. This method permits testing which causal conditions are necessary and sufficient for the emergence of agency and allows results to be generalized.

References

- Bara, Corinne. 2014. 'Incentives and opportunities: A complexity-oriented explanation of violent ethnic conflict', *Journal of Peace Research*, 51: 696-710.
- Battilana, Julie. 2006. 'Agency and Institutions: The Enabling Role of Individuals' Social Position', 13: 653-76.
- Baumgartner, Michael. 2009. 'Inferring Causal Complexity', 38: 71-101.
- . 2015. 'Parsimony and Causality', *Quality and Quantity*, 49: 839-56.
- Bristow, Gillian, and Adrian Healy. 2014a. 'Regional Resilience: An Agency Perspective', *Regional Studies*, 48: 923-35.
- Bristow, Gillian, and Adrian Healy. 2014b. 'Building Resilient Regions: Complex Adaptive Systems and the Role of Policy Intervention', *Raumforschung und Raumordnung*, 72: 93-102.
- David, Lucinda. 2018. 'Agency and resilience in the time of regional economic crisis', *European Planning Studies*, 26: 1041-59.
- Greckhamer, Thomas, Vilmos F Misangyi, and Peer C Fiss. 2013. 'Chapter 3 The two QCAs: From a small-N to a large-N set theoretic approach.' in, *Configurational theory and methods in organizational research* (Emerald Group Publishing Limited).
- Guzman-Concha, Cesar. 2015. 'Radical Social Movements in Western Europe: A Configurational Analysis', *Social Movement Studies*, 14: 668-91.
- Hall, Peter A., and Kathleen Thelen. 2008. 'Institutional change in varieties of capitalism', *Socio-Economic Review*, 7: 7-34.
- Hinterleitner, Markus, Fritz Sager, and Eva Thomann. 2016. 'The politics of external approval: Explaining the IMF's evaluation of austerity programmes', 55: 549-67.
- Holmen, Ann Karin T., and Jens Kristian Fosse. 2017. 'Regional agency and constitution of new paths: a study of agency in early formation of new paths on the west coast of Norway', *European Planning Studies*, 25: 498-515.
- Huggins, Robert, and Piers Thompson. 2017. 'The behavioural foundations of urban and regional development: culture, psychology and agency', *Journal of Economic Geography*: lbx040-lbx40.
- Kogut, Bruce, and Charles Ragin. 2006. 'Exploring complexity when diversity is limited: institutional complementarity in theories of rule of law and national systems revisited', *European Management Review*, 3: 44-59.
- Lawrence, Thomas, Roy Suddaby, and Bernard Leca. 2011. 'Institutional Work: Refocusing Institutional Studies of Organization', 20: 52-58.
- Mahoney, James, Erin Kimball, and Kendra L. Koivu. 2009. 'The Logic of Historical Explanation in the Social Sciences', 42: 114-46.
- Makszin, Kristin, and Carsten Q. Schneider. 2014. 'Forms of welfare capitalism and education-based participatory inequality', *Socio-Economic Review*, 12: 437-62.
- Rihoux, Benoît, and Charles Ragin. 2009. "Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques." In. Thousand Oaks, California.

- Rihoux, Benoît, Priscilla Álamos-Concha, Damien Bol, Axel Marx, and Ilona Rezsöhazy. 2013. 'From niche to mainstream method? A comprehensive mapping of QCA applications in journal articles from 1984 to 2011', *Political Research Quarterly*: 175-84.
- Sager, Fritz, and Eva Thomann. 2017. 'Multiple streams in member state implementation: politics, problem construction and policy paths in Swiss asylum policy', *Journal of Public Policy*, 37: 287-314.
- Schneider, Carsten Q., and Claudius Wagemann. 2010. 'Qualitative Comparative Analysis (QCA) and Fuzzy-Sets: Agenda for a Research Approach and a Data Analysis Technique', 9: 376.
- Schneider, Martin R, Conrad Schulze-Bentrop, and Mihai Paunescu. 2010. 'Mapping the institutional capital of high-tech firms: A fuzzy-set analysis of capitalist variety and export performance', *Journal of International Business Studies*, 41: 246-66.
- Sotarauta, Markku, Andrew Beer, and John Gibney. 2017. 'Making sense of leadership in urban and regional development', *Regional Studies*, 51: 187-93.
- Thomann, E, and S Wittwer. 2016. 'Performing fuzzy-and crisp set QCA with R: A user-oriented beginner's guide', *Version*, 16: 2016.
- Warren, Jon, Jonathan Wistow, and Clare Bamba. 2013. 'Applying Qualitative Comparative Analysis (QCA) to evaluate a public health policy initiative in the North East of England', *Policy and Society*, 32: 289-301.
- Vis, Barbara. 2009. 'Governments and unpopular social policy reform: Biting the bullet or steering clear?', 48: 31-57.