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Revaluating Theoretical Progress of Oversized Coalition Models: A Set-Theoretical Analysis of Government Formation in Parliamentary Democracies

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Abstract
This article provides a set theoretical assessment of oversized coalition models. Coalition theory was established in the 1960s based on a minimalist approach and expects government formation by the smallest possible majority, the so called 'minimum winning coalition'. However, this approach neglects the question of why political parties sometimes seek to form oversized coalitions. Numerous studies from the 1970s onward sought to give a systematic explanation of this puzzle, which can be described as oversized coalition models. Although these models are confirmed by various statistical tests, there is no systematic evaluation through set theoretical methods, which can be understood as an alternative to correlation-based research strategies. Therefore, this article revaluates the models from a set theoretical perspective through Qualitative Comparative Analysis (QCA). Using the recently published R package 'QCA', we finally capture both static (negated outcome) and dynamic characteristics (model development) of oversized coalition models.

Keywords
Coalition, Comparative Politics, Government, Qualitative Comparative Analysis

Contents

1. Introduction

This article seeks to provide a set theoretical assessment of oversized coalition models. These models are based on a theory developed in the 1960s, following a minimalist approach (see Von Neumann and Morgenstern 1944). Coalition theory in this tradition expects government formation by the smallest possible majority, the so called 'minimum winning coalition' (see Riker 1962). However, it also asks the empirical question of *why political parties sometimes seek to form oversized coalitions*. Numerous studies from the 1970s onward sought to give a systematic explanation, which can be described as oversized coalition models.

These models are confirmed empirically by various statistical tests, especially discrete choice models (for example, ordered or multinomial logit models). Although these methods are useful for evaluating individual effects of conditions within the models, there is no systematic evaluation of which interactions have an influence on oversized coalitions. If coalition formations in reality are characterized by complexity, models should be assessed by addressing (1) to what extend models give a consistent explanation, and (2) in what manner models provide an understanding of empirical diversity. Because linear additive models imply multi-collinearity when evaluating the various interactions, we apply a configurational model based on set theory and formal logic. Specifically, we use *Qualitative Comparative Analysis* (QCA), which can assess consistency and diversity of explanations through multiple conjunctive causal paths.

This article consists of three parts. First, we set theoretically reconstruct the conceptual structure of oversized coalitions. Second, three chronological models within the framework are reformulated from a perspective of formal logic. Finally, we carry out empirical analyses of each model. As a result, two aspects are identified: (1) The framework is dual in nature, because its models are empirically confirmed only from the negated outcome, i.e. the case of not-oversized coalitions; (2) By accounting for the chronological development of the models, the theoretical framework will more closely illustrate the complex empirical reality of coalition formation. Because our theoretical framework only constitutes a first step in enhancing the formalized analysis of coalition formation, there is still room for further improvement through the introduction of plural perspectives, for example inductive/deductive and correlational/set relational notions.

2. Concept formation

Before identifying the theory and models used in our analysis, the conceptual structure of oversized coalitions is taken into account first. In order to understand concepts from the perspective of set theory and logic, the underlying set relationships between the concepts must be clarified.

Oversized coalitions can abstractly be described as "to let all or most of the important

parties share executive power in a broad coalition" (Lijphart 2012: 33). This aspect of government formation is understood as a component of the consensus model of democracy (see Ganghof 2010). From this perspective, oversized coalitions can be understood as a consensual government type at the conceptual level, which consists of two sub-types. The first type is characterized by a government with formal cooperation, specifically a government that includes coalitions between parties AND a majority status. In contrast, the second type is described by informal cooperation, i.e. no coalitions OR a minority status (see Lijpahrt 2012: 92-97). In this context, oversized coalitions can be categorized as consensual governments with formal cooperation.

However, the notion of 'not-oversized coalitions' can still not be fully described at the conceptual level based on this information, at least when we take into account a democratic continuum from a consensus to a competitive model (i.e. the Westminster model; ibid: Ch. 2). Following this macro-level argument, we can assume a 'not-consensual government', namely a competitive government. Similar to consensual governments, competitive governments could be distinguished by whether a government engages mainly in formal or informal cooperation.

Based on these remarks, the set relationship between the underlying concepts can be described adequately. First, oversized coalitions can be understood as a subordinate concept of consensual government, called a consensual government with formal cooperation, because it constitutes a subordinate concept of consensus democracy. Second, 'not-oversized coalitions' are related to the following three government types: (1) consensual government with informal cooperation; (2) competitive government with formal cooperation; and (3) competitive government with informal cooperation. Based on this conceptual structure, next we clarify which theoretical framework and models exist that provide a systematic explanation of oversized coalitions.

3. A theoretical framework of oversized coalitions

The question of why political parties seek to form certain types of governments instead of others is central to coalition theory and traditionally follows a minimalist approach. According to this perspective, a party's goal is to get into office (*office seeking*; see Riker 1962), although without specific preferences for coalitions. Through a second assumption, namely that parties also seek to achieve majority of seats in parliament, the theory can account for majority coalitions between parties. In line with these assumptions, parties aim at minimizing cooperation with other parties because they want to maximize the benefits of being in power. When no single party is able to form government on its own, a minimum winning coalition should be expected (ibid: 32).

These arguments, however, cannot straightforwardly explain oversized coalitions, because

the latter contradict the disequilibrium principle of parties (i.e. maximizing one's own benefits of being in power). Based on the fundamental question of *why political parties seek to form oversized coalitions* (i.e. 'not-minimum winning coalitions'), various models have been suggested to explain this puzzle. The historical development of these models can be loosely divided into three phases, ranging from the 1970s to the 2000s. They will be sketched briefly in the next section (for a more general overview, see Laver and Schofield 1998; Müller 2004).

3.1 Three phases of oversized coalition models

In the 1970s and 1980s, the assumed motivation of politicians for government formation was revised, subsequently called the 1st-phase model. According to this perspective, political parties aim at realizing their policy preferences (policy seeking; see De Swann 1973). The underlying causal mechanism poses that the possibility of coalition formation depends on policy similarity within the party constellation (i.e. 'coalition possibility'). The oversized coalition model was introduced in this phase to provide a theoretically founded explanation of why political parties aim at forming a not minimum winning coalition, relying on a one-dimensional understanding of policy space.

In the 1980s and 1990s, coalition theory emphasized the role of the 'median party' in models of oversized coalitions, which we identify as the 2nd-phase model. The median position in parliament was considered based on the assumptions about political parties mentioned above, i.e. office and policy seeking (see, e.g., Schofield 1993). Competition in this phase can be assumed against the background of a multi-dimensional policy space, contrasting the simpler concept of the first phase. The explanation of oversized coalitions was advanced by claiming a causal mechanism where a coalition becomes necessary because the median party's influence in the legislative process is considered weak (i.e. 'coalition necessity').

In the 1990s and 2000s, the oversized coalition model was further refined, thereby constituting the 3rd-phase model. First, the monolithic assumption of political parties is modified with a focus on the characteristics of party organization. For example, maximizing electoral votes was established as an additional motivation (vote seeking; see Müller and Strøm 1999). Second, certain institutional settings that constrain the motivations of parties were analysed alongside their relative constellations in parliament (see Tsebelis 2002). This sophisticated model provides a more nuanced explanation on the basis of expected complex interactions between parties and it includes a causal mechanism that emphasizes the possibility and/or necessity of coalitions (see Junger 2002).

3.2 Integrated framework

The oversized coalition model can be described based on three distinct phases, which represent the change from a simple to a more sophisticated model within coalition theory. While it shows a certain dynamic, there was a common frame focused on a structural factor

that constrains parties' motivation to form a minimum winning coalition. More specifically, models often focus on a specific party constellation within multi-party systems that are expected to lead to oversized coalitions. The basic assumption of these models posits that such coalitions are not the preferred path under other party constellations within multi-party or two-party systems.

As a common framework at the conceptual level, we loosely identify (1) a multi-party system that facilitates a specific government form, namely a consensual government with formal cooperation, and (2) residual party systems i.e. two-party systems and other types of multi-party systems which promotes *not* consensual governments.

These party systems are empirically difficult to grasp by individual indicators, because various attributes exist at the conceptual level and these should be reflected in the measurement (see Mair 1997). Furthermore, different forms of such party systems, i.e. diverse combinations of the attributes, are also assumed at the empirical level (Kropp and Strum 1998: Ch. 2). Accordingly, various forms of these systems could have an influence on oversized coalitions or 'not-oversized coalitions' as a functional equivalent.[1]

This notion is also applied to the concept of specific institutional settings (see Lijphart 2012: 91-92). Specifically, various components of the concept are combined at the conceptual level, and various functional equivalences can be empirically expected when (1) institutions facilitate consensual governments with formal cooperation, and (2) institutions do not facilitate formal cooperation.

3.3 Reformulating the three models

For an empirical analysis, each model's expectations resulting from the above theoretical framework has to be formalized. At this point, we expect the formation of consensual governments with formal cooperation (Y) at the conceptual level under a specific party constellation within multi-party systems (A).

In the 1st-phase model, this structural factor was identified as 'policy closeness between political parties' (A_1). The 2nd-phase model focuses on 'the weakness of the core party' (A_2). Lastly, the 3rd-phase model is centred on the 'complexity of parties' interaction' (A_3). In addition to this structural factor in the most recent model, the formation of consensual government (Y) can be also expected as a consequence of a 'specific institutional setting' (B).

Using Boolean algebra (Schneider and Wagemann 2012: 42-54), each theoretical expectation can be formalized as follows.

Theoretical expectation (T_1): $A_1 \rightarrow Y$ (1)

[1] The concept structures at the conceptual and empirical level are methodologically described as 'radial categories' (see Collier and Levisky 2009), whose concept is fundamentally constructed by sufficient conditions (i.e. radial categories within two-level concept structures; see Goertz 2006: 51).

Formula (1) represents the first model. The structural factor policy closeness (A_1) can be understood as a sufficient condition for the formation of consensual governments (Y), marked by the arrow (→).[2] A similar formula is drawn from the next model:

Theoretical expectation (T_2): $A_2 \rightarrow Y$ (2)

Formula (2) shows that the second model exhibits the same causal relationship as the first model. Although it is focused on the weakness of the core party (A_2), both models are centred on the party constellation. In contrast with these phases, the third model adds another condition.

Theoretical expectation (T_3): $A_3+B \rightarrow Y$ (3)

As *explicans*, formula (3) takes into account not only a structural factor, namely the complexity of parties' interaction (A_3), but also an institutional factor (B). Each condition can be expected to function as a sufficient condition for the formation of consensual government (Y) respectively, marked by the (+) symbols.[3] From the set theoretical formulation of each model, negated theoretical expectations also can be derived through a set theoretical assumption, namely De Morgan's law (ibid: 49-51; for a practical application, see also ibid: 114).[4]

Negated theoretical expectation ($\sim T_1$): $\sim A_1 \rightarrow \sim Y$ (4)

Formula (4) clarifies that 'policy distance' (~A) can be seen as a sufficient condition for '*not*-consensual government formation' (~Y) in the first model. This negation rule is also applied to the second model, marked by (~).

Negated theoretical expectation ($\sim T_2$): $\sim A_2 \rightarrow \sim Y$ (5)

Formula (5) refers to the strength of the core party ($\sim A_2$), a structural factor of *not*-consensual government formation (~Y). In comparison with the similar formulas of the first two models, a different expectation can be identified in the third model via De Morgan's law.

Negated theoretical expectation ($\sim T_1$): $\sim A_3 * \sim B \rightarrow \sim Y$ (6)

Formula (6) illustrates what is negatively expected within the most recent model. Here, two conditions are combined through a logical conjunction (*). Simply put, the simplicity of parties' interactions (~A) and the institutional setting (~B) have an interactional effect on *not*-consensual government formation (~Y). This clarifies how different expectations between the positive and negative outcome can be set theoretically formalized in oversized coalition

[2] As a basic assumption, the structural factor is also understood as a necessary condition, because it can be seen as a paradigmatic explanation from within coalition theory, which is originally based on rational choice theory (for a development of rational choice theory, see Peters 1999).

[3] This institutional factor is also expected as a necessary condition, because the explanation is in line with a paradigmatic explanation of rational choice institutionalism as an expanded rational choice model (see also FN 1).

[4] In line with the underlying assumption, the negated theoretical expectation based on De Morgan's law does not affect the underlying sufficiency statement.

models based on the notion of causal asymmetry (see Schneider and Wagemann 2012).

After having reformulated the oversized coalition models within a formalized set theoretical framework, the next section seeks to evaluate the models and connected empirical hypotheses via QCA.

4. Set theoretical evaluation

Based on the theoretical expectation at the conceptual level, we now investigate the empirical hypotheses and the underlying data set.

4.1 Data set

We assess oversized coalition models by using cases of 19 countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, New Zealand, Sweden, Switzerland, and the United Kingdom.

This case selection is used because we intend to reconsider those models that are generally confirmed by statistical procedures. First, coalition theory empirically struggled with an explanation of European countries whose *non*-presidential systems can be distinguished from regimes such as the United States (see Laver and Schofield 1998). By using other regional data, for example on Canada, Japan, and Israel, the 'basic' cases were expanded afterwards (see Bergman *et al*. 2010: 89). In order to reassess the original data, cases are chosen from the above 19 countries, which were already democratized in the 1950s (Lijphart 2012: 49). From this case selection, we can control for the following three aspects: (1) traditional research subjects are focused upon, namely *not*-presidential systems; (2) a homogenous number of cases can be observed in each unit; (3) exogenous factors such as external threats can be ignored.

In the 19 countries, we count governments after each parliament election as individual cases, ranging from 1945 to 2012 (n = 369; see Seki and Williams 2014)[5]. The outcome, the formation of oversized coalitions, is captured by a cross-country comparison as previously applied within coalition theory (see Gallaher, Mair and Laver 2005). Cases where at least one unnecessary party is part of a majority government are assigned the value '1', otherwise '0'.

4.2 Hypotheses and Calibration

Based on the above mentioned data set, we now clarify working hypotheses for each model. At the same time, a set theoretical operationalization, the so called 'calibration procedure', is

[5] Even if large-N data weakens a characteristic of QCA, i.e. case orientation, it can be still useful for large-N analysis (see Emmenegger *et al*. 2014).

considered (see Thiem and Duşa 2013: 57). In this context, the following set relational thresholds are considered for each operationalized factor: (1) full inclusion threshold, where hypotheses are expected to be true (in the underlying set); (2) full exclusion threshold, where explanations are not true (out of the underlying set); (3) and, if needed, crossover thresholds or the point of maximum indifference as to whether hypotheses are true (neither in nor out of the set).

The first model relates to policy closeness within certain party constellations. Based on Axelrod (1970; minimum connected coalition), we formulate our working hypothesis as follows: (1) If a majority group in parliament that consists of more than two parties which adjoin each other in the left-right spectrum, (2) and if this group includes at least one party that is unnecessary for the majority needed to form government, then an oversized coalition government is expected. We assign a membership of '1' (full inclusion) to oversized coalitions, otherwise '0' (full exclusion).

Focusing on the weakness of the core party from the second model, the following two hypotheses are deduced based on Crombez (1996). First, we assume a weak core party, if the strongest party only has a small number of seats. Strength of the core party is expected when 51% of parliamentary seats are occupied by this party (full exclusion), because the party can easily control the parliamentary majority in this situation. In contrast with the full exclusion threshold, setting the full inclusion threshold is more difficult, because a continuous factor is a characteristic of the seat share ratio. Thus, it is calibrated as a continuous fuzzy set membership score whose categories are assumed not only as a dichotomized classification between 0 and 1, but also account for a degree in membership between 0 and 1, for example 0.33, 0.66, and 0.99 (see Ragin 2009: 91). To realize a fuzzy set calibration, crossover and full inclusion thresholds must be set.[6] On the one hand, the crossover point is reached, if the strongest party has 30% of all parliamentary seats. This is because this value represents half the score of 60%, which is referred to as a percentage of seats where the main parties will play a key role in parliament due to their parliamentary strength (see Smith 1990). On the other hand, we set a 15% seat ratio as the full inclusion threshold, which is derived as a regular interval in relative distance to the crossover point. If the strongest party has only 15% of parliamentary seats, or if the other at least seven parties[7] share the remaining 85% of seats, 'atomized pluralism' can be expected, which is characterized by the absence of a parliamentary core (Sartori 1976: 325).

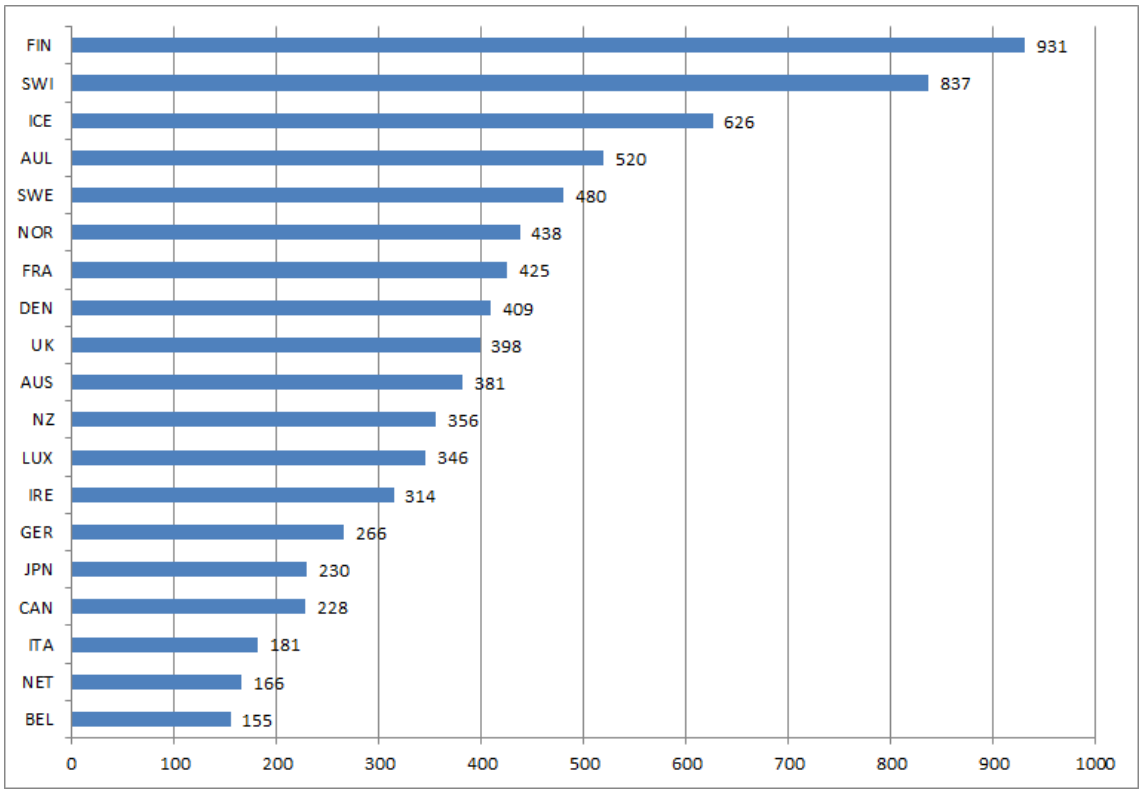
Second, we assume a weakness of the core party. If this party stands for peripheral policy positions, it will try to form an oversized coalition in advance to compensate for its vulnerability.

[6] A mathematic foundation of how fuzzy sets are calibrated is illustrated by Thiem and Duşa (2013: 55). With regard to fuzzy set score calculations, a value of 0.95 is used in this article for the inclusion degree of full membership (see ibid 2013: 60).

[7] If the strongest party has 15% of seats, at least seven additional parties with less than 15% must be present to account for the total share of parliamentary seats.

The centre or periphery of policy positions is measured by the extremeness of the strongest party's policy position. It is calculated by the Euclidian distance, based on a multiplier of the distance between the strongest party's policy position score and the average policy position score in parliament, which in turn is based on the left-right scale data of the Manifesto Research on Political Representation (see Volkens *et al.* 2015).[8] A score of 0 is then set as the value of full exclusion, because it represents the minimum distance between policy positions. However, the threshold defining a 'peripheral' policy position cannot be determined easily by theoretical means. As a result, we investigate the threshold from the tendencies that result from aggregated country-level data. Specifically, averaged scores are calculated within the dataset, resulting in an inductive threshold setting (see Yamasaki and Rihoux 2009: 130). This tendency of each country is shown in *Figure 1*.

Figure 1: Strongest party's policy position (extremeness)



Source: authors' illustration

The figure shows that the two countries with a score of more than 800 (Finland, Switzerland) have a clear tendency towards peripheral policy positions by the strongest party. This corresponds with a characteristic shared by both countries in that both their party systems are categorized as 'polarized pluralism', i.e. the centre position in parliament has vanished as a consequence of the centrifugal drive of the parties (Sartori 1976: 136). Therefore, a peripheral

[8] We identify the strongest parties in the cases. Subsequently, each policy position score ('rile', see Volkens *et al*. 2015) is subtracted by the averaged policy positions score for each parliament. Finally, the score is squared.

policy position is assumed in cases of scores higher than 800 (full inclusion).

Between the inclusion score (800) and exclusion score (0), continuous fuzzy set membership scores are calibrated to account for a degree between centrality and periphery, because an equal status among cases under a score of 800 cannot be expected. As a consequence, we focus on an empirical category that covers cases with a score of less than 400. In this category, we can identify five Western European countries (Austria, Belgium, Netherlands, Germany, and Luxembourg; see Lehmbruch 1996). Their party systems are characterized not only by centripetal party competition, but also by negotiation and cooperation (ibid). We thus expect that the core parties move towards the centre or the periphery based on a crossover score of 400.

Whereas the above classifications were simply done on the basis of qualitative information, the threshold settings can be inductively identified via formal methods, for example cluster analysis, median, and arithmetic mean (see Thiem and Duşa: 31). By conducting a cluster analysis to find the crossover and inclusion scores, we can calculate a score of 459 as the crossover point, and a score of 731.5 as the full inclusion score.[9] Although the method shows a different score, these calculations are not in conflict with the above qualitative categorizations. As a result, we were able to get robust results from the second model in the subsequent analysis (i.e. QCA), even if the different thresholds were used.

The third model expects oversized coalitions based on the complexity of parties' interactions and a specific institutional setting. We build five working hypotheses in reference to the work of Volden and Carrubba (2004). First of all, complexity of party interaction is expected in the case of fragmented party systems, specifically an increase of parties in parliament. For the sake of simplicity, we can assume only one edge or interaction between two nodes or parties is assumed. Based on this assumption, three interactions for three parties, six interactions for four parties, ten interactions for five parties can be expected at the very least. At this point, the complexity of the interaction should be the lowest if only two legislative parties exist (full exclusion threshold). In contrast, it is difficult to set a full inclusion threshold dichotomously, because continuous factors are a characteristic of the absolute number of parties. Accordingly, we assume a higher complexity if there are more than five legislative parties, which can be understood as a threshold towards multi-party systems (theoretically, see Sartori 1976: 348). Twice the breaking point score, 10, is used as the full inclusion threshold, referring to party systems that tend towards atomization.[10]

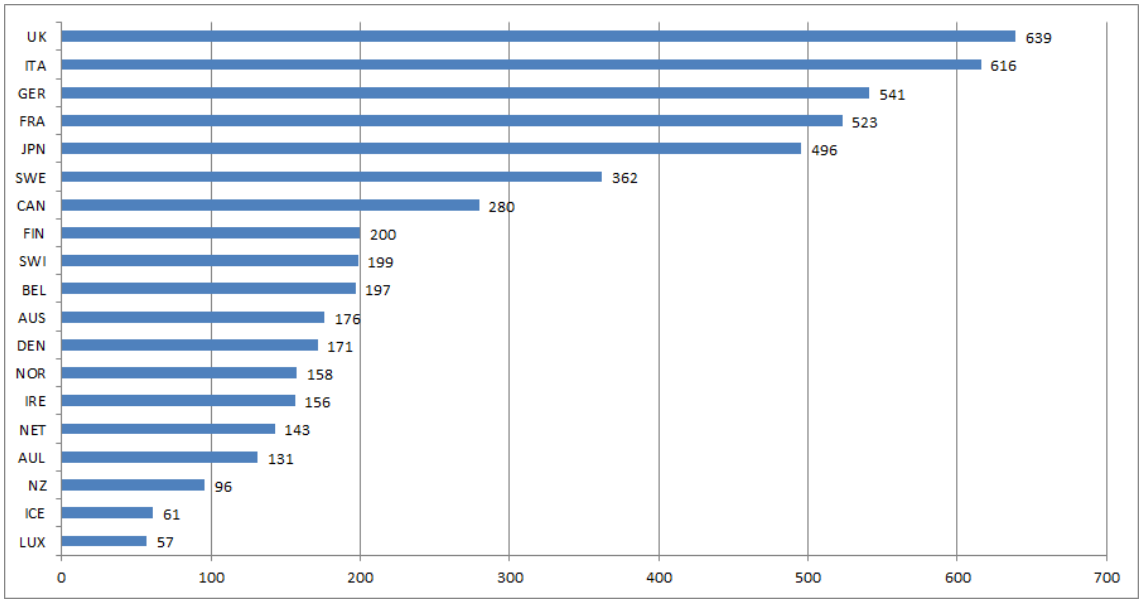
Secondly, we expect complexity if intra-party factions are institutionalized. However, systematic data for the 19 countries is difficult to collect. As a result, the parties' factions are

[9] In the cluster analysis, three groups are defined in order to identify the crossover and inclusion scores.

[10] It is assumed that party systems move toward atomization, if a number of parties relevant to the system is increasing to over eight (Sartori 1976: 126). Because this indicator is based on relevant parties, we expect that a score of 10 is enough to include non-relevant parliamentary parties when measuring the absolute number of parties. However, our result is robust even if we set 9 as the full inclusion threshold.

indirectly measured by total seats in parliament. This is because the total number of seats could have an influence on the formation and activation of intra-party factions. How many seats can be expected in institutionalized intra-party factions is empirically detected by calculating average values per country. The result is shown in *Figure 2*.

Figure 2: Total number of seats in parliament (intra party factions)



Source: authors' illustration

From this figure, we can identify five countries scoring over 400 whose parliamentary seats are obviously high (United Kingdom, Italy, Germany, France, and Japan). These five countries include Italy and Japan, where factional politics are traditionally considered to be highly institutionalized (see Pempel 1990). Therefore, we expect the existence of institutionalized party factions if the total seats score crosses 400 (full inclusion threshold). Second, we assume the absence of institutionalized factions if total seats are 57[11], which can be observed in case of Luxembourg (full exclusion threshold). In the legislative processes of Luxembourg, party member vote individually instead of gathering votes based on institutionalized party factions (Schoren 2008: 110).

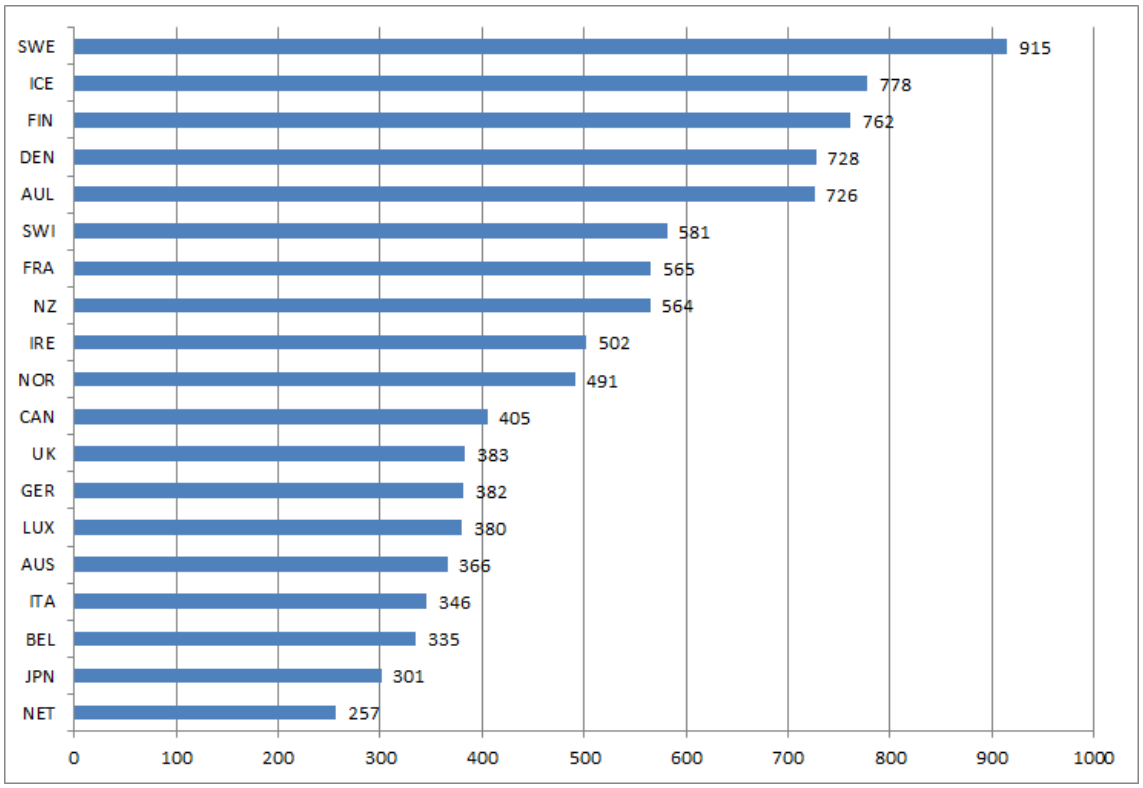
Between the exclusion threshold of 57 and the inclusion threshold of 400, we expect a varying degree of factions' institutionalization. As a consequence, the notion of continuous fuzzy set membership scores is again applied by setting a crossover threshold. Based on the clear cut-off line in *Figure 2*, a score of 200 is inductively identified as the breaking point. While the crossover point was considered based on the countries, a more formal method for calculating threshold settings can be applied, namely cluster analysis. Gaps in *Figure 2* are

[11] Although this score is not theoretically derived, the underlying hypothesis that 57 seats are enough for the absence of institutionalized intra party factions, is confirmed by Luxembourg. Even if the score 61 (Iceland) or 96 (New Zealand) is used instead of the inductive threshold (57), our result is not changed.

precisely identified by the analysis. As a result, we get a score of 240 as the breaking point, and a score of 429 can be seen as the full inclusion point.[12] However, we can draw robust results for the third model in the subsequent analysis (QCA), even if the other scores are used.

Third, we expect complexity of party interaction if policy positions of parliamentary parties are polarized. As a measurement, a variance score of policy positions in parliament is used, again based on the Manifesto Research on Political Representation data (see Volkens *et al.* 2015).[13] A minimum score of 0 is interpreted as no polarization (full exclusion). However, a threshold of polarization cannot easily be identified based on a continuous data set. Accordingly, the threshold is set based on empirical insights by aggregating average scores per country (see *Figure 3*).

Figure 3: Variance score of policy positions (polarization)



Source: authors' illustration

From the figure, we can detect three empirical categories: (1) within a variance score of 400; (2) scores between 400 and 600; (3) and scores over 700. In the first category where the variance score is lower than 400, five Western European countries are classified (Austria, Belgium, Netherlands, Germany, and Luxembourg). Their party systems are characterized not

[12] The results are drawn based on the three clusters resulting from the cluster analysis.

[13] Again, the averaged policy position score is first calculated for each case, before the score for each party in parliament is subtracted from the average score. This result is squared and divided by the number of parliament parties in each case.

only by centripetal party competition (Sartori 1976), but also by negotiations and cooperation (Lehmbruch 1996).

However, this classification might be criticized as follows: Northern European countries and especially Sweden can be characterized by centripetal party competition, and they show the highest polarization on average in *Figure 3*. This empirical result seems to be inconsistent with the above conceptual classification. Against this counter intuitive result, it should be taken into account that the number of parties is included to measure the polarization within the typology of party systems (see Dalton 2008). By extracting the essence of polarization, a higher polarization can be confirmed for Northern European countries, such as Sweden and Iceland (for polarization at the cognitive level, see ibid: 907).

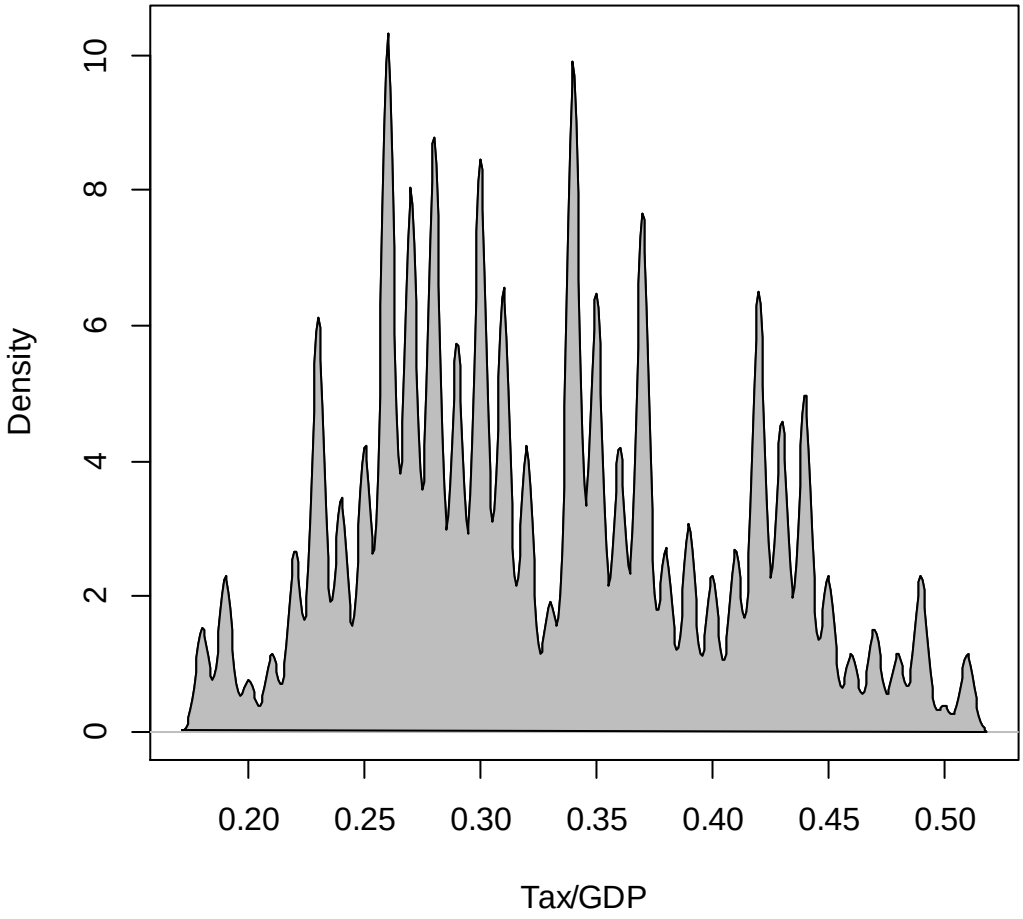
We therefore expect polarization if the score crosses over 400, which is true for all Northern European countries. However, it is difficult to assume equal degrees of polarization between the cases scoring over 400. In reference to *Figure 3*, this assumption ignores at least the case of Norway, whose party system can be understood by a lower polarization relative to other Northern countries (Gilljam and Oscarsson 1996: 37). Therefore, by setting the third category (over 700) as the full inclusion threshold, we consider the difference between scores 0 to 700 as a matter of degree through a continuous fuzzy set membership score.

Although the above thresholds were estimated on the basis of qualitative information within 19 countries, these scores can also be achieved through formal analysis. Based on a cluster analysis that shows three different groups, we can identify the following threshold scores: 446 as the crossover point, 624 as the full inclusion score. However, even if the different scores are considered in the subsequent analysis (QCA), results remain robust.

Fourth, we expect complexity of party interaction if parties can refuse to compromise on certain sensitive policy issues. Because sensitivity is characterized by logrolling due to policy intolerance and thus not easily to assess systematically, we measure this hypothesis indirectly. Specifically, it is identified by the capacity of parliaments to put public policies into practice, indicated through total tax revenue divided by GDP.[14] Relating the TAX/GDP ratio to sensitivity towards important policy issues is again done empirically (see *Figure 4*).

Figure 4: Ratio of tax and GDP (policy intolerance)

[14] The data is assembled from OECD reports (OECD 1970; 2014).



Source: authors' illustration

Figure 4 is based on the original 369 cases and illustrated via kernel density estimation, which clarifies how cases can be distributed (inductive threshold setting; see Thiem and Duşa 2013: 30-31). In the figure, we can loosely identify that the density score starts to shift over '4' and below '4' at tax/GDP scores of 0.20, 0.25, 0.33, 0.40, and 0.45. From the empirical findings and based on the assumption that a higher ratio can be expected to lead to higher issue sensitivity, we set 0.20 as the full inclusion threshold. Following the same reasons, the score of 0.45 is set as the full exclusion threshold. Based on the threshold settings, we identify the difference between the scores of 0.25, 0.33, and 0.40 as a varying degree and thus a fuzzy set membership. It is calibrated in a way that the median score of the aforementioned oscillation points (0.33) is assumed as the breaking point.

Finally, we assume that specific institutional settings exert influence on oversized coalitions, specifically if more than one political arena comes into play in the legislative procedure. It could be measured by a dichotomized score between bicameralism and unicameralism, because the existence of bicameralism has an influence on legislative processes (Tsebelis and Money 1997: 211). However, the question remains whether all bicameral systems empirically influence oversized coalitions (see Eppner and Ganghof 2015).

Based on these arguments, the index of symmetrical bicameralism by Lijphart (2012: 199-

200) is used as a measure, because the measurement considers the constitutional influence of the upper chamber on the legislative process. This situation is categorized as either symmetrical or asymmetrical bicameralism. We can expect that political arenas in strong symmetrical bicameral systems should be considered by political parties in the coalition formation processes to a higher extent than in the cases of weak bicameralism and unicameralism. We can deduct from this argument that if the second chamber possesses symmetrical powers in relation to the first chamber, they are calibrated with a membership of '1', otherwise '0'.[15]

4.3 Evaluation through QCA

We calibrated the working hypotheses based on the underlying oversized coalition models and the theoretical framework. *Table 1* summarizes the results of the calibration procedure.

Table 1: Calibration results

model		hypothesis		calibration		
				In.	Cr.	Ex.
1	Policy closeness	Policy-connected coalition (a1)	Structural (A)	1	-	0
2	Weakness of core party	Weak dominancy of seats (a2)	Structural (A)	0,15	0,3	0,51
		Extremeness of policy position (b2)	Structural (A)	800	400	0
3	Complexity of parties' interaction	Fragmentation (a3)	Structural (A)	10	5	2
		Institutionalized parties' factions (b3)	Structural (A)	400	200	57
		Policy polarization (c3)	Structural (A)	700	400	0
		Policy intolerance (d3)	Structural (A)	0,2	0,33	0,45
		Symmetrical bicameralism (e3)	Institutional (B)	1	-	0

Source: authors' illustration

The left side of the table shows the three chronologically developed models and their hypotheses. Structural and institutional attributes of the hypotheses are identified based on the theoretical expectation at the conceptual level. Finally, the right side of the table represents the set relational thresholds, i.e. full inclusion (In.), full exclusion (Ex.), and crossover threshold (Cr.).

In reference to the two theoretical expectations about consensual government formation and *not* consensual government formation, each model's hypotheses are now evaluated.[16]

Analysis of the positive outcome

Before we carry out the QCA to analyse oversized coalition formations (y), first necessary conditions within the hypotheses are investigated in accordance to established standard

[15] Specifically, cases in Australia, Belgium, Denmark (until 1950), Germany, Italy, Japan, Netherlands, Sweden (until 1970), and Switzerland are calibrated with the full inclusion membership score of '1'.

[16] If the results of each model are independently valid and if QCA aims for understanding diversity, the hypotheses of the models cannot be combined in the test (for the concept of models, see Clark, Golder and Golder 2013: Ch. 2).

practices, because QCA is an analytical tool focused on finding sufficient conditions for specific outcomes (Schneider and Wagemann 2012: 129). Necessity is identified through a so called consistency score, which roughly speaking calculates the contrariness of each condition as a necessary condition. Generally, conditions whose scores are above 0.90-0.95 can be interpreted as a necessary condition (ibid: 139-144). However, no necessary condition can be identified through the analysis (see *Appendix*).[17]

Based on this result, we construct so called truth tables. From all logical combinations of conditions (i.e. 2^h patterns), a truth table identifies combinations that are present when the expected result is also present. These combinations can be understood as sufficient explanations for the outcome. In order to evaluate the explanatory power of these logical combinations, the so called consistency score is useful as it illustrates contradictions with regard to the presence of both combinations of conditions and the expected outcomes. Specifically, combinations whose consistency score is over 0.75-0.80 can be understood as plausible explanations (ibid: 123-129). *Tables 2-4* show the resulting truth tables.

Table 2: Truth table for oversized coalitions (1st model)[18]

	condition	outcome	SYM consist.	case
row	a1	y		
1	1	0	0,41	56
2	0	0	0,16	313

Source: authors' illustration

Table 3: Truth table for oversized coalitions (2nd model)

	condition		outcome	SYM consist.	case
row	a2	b2	y		
1	1	1	0	0,34	28
2	1	0	0	0,31	48
3	0	1	0	0,15	88
4	0	0	0	0,14	197

Source: authors' illustration

Table 4 Truth table for oversized coalitions (3rd model)

[17] The *R* package *QCA* is able to identify not only single (i.e. unilateral), but also bilateral and multilateral necessary conditions (Theim and Duşa 2013: 34). However, because we focus on identifying unilateral necessary condition only, *fsQCA 2.5* (Ragin and Sean 2014) is used for assessing necessary conditions.

[18] The *R* package *QCA* is based on an enhanced Quine-McCluskey algorithm, which does not consider assessment of single conditions in QCA (see Duşa 2010), which is why this calculation is carried out with *fsQCA 2.5* (Ragin and Sean 2014).

	condition					outcome	SYM consist.	case
row	a3	b3	c3	d3	e3	y		
1	1	0	1	1	1	0	0,51	1
2	1	0	0	1	1	0	0,51	2
3	1	0	1	0	1	0	0,44	3
4	1	1	1	1	1	0	0,41	4
5	0	0	0	1	1	0	0,35	11
6	1	1	0	0	1	0	0,34	14
7	1	1	1	0	1	0	0,32	8
8	1	0	0	0	1	0	0,32	11
9	1	1	0	1	1	0	0,29	15
10	0	1	1	1	1	0	0,29	3
11	0	1	0	1	1	0	0,28	7
12	0	1	1	0	1	0	0,28	1
13	0	0	1	1	1	0	0,27	14
14	0	1	0	0	1	0	0,26	3
15	1	1	0	0	0	0	0,19	5
16	1	1	1	0	0	0	0,17	16
17	1	0	1	0	0	0	0,13	25
18	1	0	1	1	0	0	0,13	9
19	1	0	0	0	0	0	0,11	8
20	0	1	1	1	0	0	0,11	9
21	0	1	1	0	0	0	0,10	5
22	0	1	0	0	0	0	0,09	6
23	0	0	1	1	0	0	0,08	20
24	0	0	1	0	0	0	0,07	6
25	0	1	0	1	0	0	0,05	12
26	1	0	0	1	0	0	0,04	10
27	0	0	0	0	0	0	0,04	11
28	0	0	0	1	0	0	0,02	19
29	1	1	1	1	0	-	-	0
30	1	1	0	1	0	-	-	0
31	0	0	1	0	1	-	-	0
32	0	0	0	0	1	-	-	0

row 29-32: logical remainder

Source: authors' illustration

The highest consistency in the first model is 0.41. This score is higher than the highest consistency in the second model, which is 0.34. Therefore, the first model gives a more consistent explanation of oversized coalitions than the second. In comparison, the score of three rows within the truth table are higher in the third model, thus it provides a more consistent explanation of oversized coalitions with regard to empirical diversity. However, it should be noted that the logical combinations from this model consist of five conditions, constituting a more complex framework than the explanation from the first model, which is based on a single explanatory condition.

As a consequence of these results, theoretical expectations of the models at conceptual

level cannot be evaluated properly because of the low consistency at the empirical level (i.e. the QCA results). We cannot detect any consistent combinations of conditions that can be identified as explanations for oversized coalitions (y = 0), i.e. with consistency values above 0.75-0.80. In other words, consistency scores in all three models are very low and cannot be considered consistent explanations for the formation of oversized coalitions. As a consequence of these inconsistent results, judgments about minimized solutions in each model also cannot be made by further investigation intended to clarify substantial conditions for the models. This constitutes an important result for coalition theory, whose three most widely used analytic models we integrated into a set theoretical model and revaluated through QCA. That is to say, the three models taken from within coalition theory cannot consistently explain the occurrence of oversized coalitions at the empirical level.

Analysis of the negative outcome

In accordance to standard practices within QCA, we now investigate the negative outcome, i.e. *not* oversized coalitions. First, necessary conditions are analysed. Again, no necessary conditions are found (see *Appendix*).[19] Based on this analysis, we construct truth tables including all combinations (2^h) of each model (see *Tables 5*, 6*,* and *7*).

Table 5: Truth table for *not* oversized coalitions (1st model)[20]

	condition	outcome	SYM consist.	case
row	a1	~y		
1	0	1	0,84	313
2	1	0	0,59	56

Source: authors' illustration

Table 6: Truth table for *not* oversized coalitions (2nd model)

	condition		outcome	SYM consist.	case
row	a2	b2	~y		
1	0	0	1	0,86	197
2	0	1	1	0,85	88
3	1	0	0	0,69	48
4	1	1	0	0,66	28

Source: authors' illustration

Table 7: Truth table for *not* oversized coalitions (3rd model)

[19] See also FN 17.

[20] See also FN 18.

	condition					outcome	SYM consist.	case
row	a3	b3	c3	d3	e3	~y		
1	0	0	0	1	0	1	0,98	19
2	0	0	0	0	0	1	0,96	11
3	1	0	0	1	0	1	0,96	10
4	0	1	0	1	0	1	0,95	12
5	0	0	1	0	0	1	0,93	6
6	0	0	1	1	0	1	0,92	20
7	0	1	0	0	0	1	0,91	6
8	0	1	1	0	0	1	0,9	5
9	0	1	1	1	0	1	0,89	9
10	1	0	0	0	0	1	0,89	8
11	1	0	1	1	0	1	0,87	9
12	1	0	1	0	0	1	0,87	25
13	1	1	1	0	0	1	0,83	16
14	1	1	0	0	0	1	0,81	5
15	0	1	0	0	1	0	0,74	3
16	0	0	1	1	1	0	0,73	14
17	0	1	1	0	1	0	0,73	1
18	0	1	0	1	1	0	0,72	7
19	0	1	1	1	1	0	0,71	3
20	1	1	0	1	1	0	0,71	15
21	1	0	0	0	1	0	0,68	11
22	1	1	1	0	1	0	0,68	8
23	1	1	0	0	1	0	0,66	14
24	0	0	0	1	1	0	0,65	11
25	1	1	1	1	1	0	0,59	4
26	1	0	1	0	1	0	0,56	3
27	1	0	0	1	1	0	0,49	2
28	1	0	1	1	1	0	0,49	1
29	1	1	1	1	0	α	-	0
30	0	0	0	0	1	β	-	0
31	0	0	1	0	1	α, γ	-	0
32	1	1	0	1	0	α, δ	-	0

row 29-32: logical remainder
α: possible to abstract A*~B (~y = 0)
β: possible to abstract ~A*B (~y = 0)
γ: possible to abstract A*B (~ y = 0)
δ: possible to abstract ~A*~B (~ y = 1)

Source: authors' illustration

The tables show higher scores for consistency in relation to the positive outcome analysis. While we were not able to find any consistent combinations for the occurrence of oversized coalitions, combinations which score above 0.75-0.80 can be identified as plausible combinations of conditions for *not* oversized coalitions, i.e. for the negative outcome. Based on this result, we further investigate which combinations of conditions can be deemed substantial explanations within the three models. With regard to the first model, the row 1 indicates that *not* policy closeness ($\sim a_1$) influences the negative outcome (~y). It can be formalized to a sufficient condition without logical minimization as follows.

Table 8: Causal path for *not* oversized coalitions (1st model)

Causal path (~s_1)	**~a1** → **~y**
Raw consistency	0.89
Unique coverage	0.89
Consistency	0.84
Solution coverage	0.89
Solution consistency	0.84

Source: authors' illustration

In *Table 8*, a causal path for *not* oversized coalitions is formalized as the substantial condition of the first model. Specifically, a set of parties that share similar policies and that holds a simple majority (~a_1) is a sufficient condition for *not* oversized coalitions (~y).

In contrast to the single solution of this model, the second and third models show multiple conjunctive solutions for the negated outcome. Thus, we use logical minimization based on the Quine-McCluskey algorithm as implemented by several QCA programs, such as *fsQCA* or the *R* package *QCA* (for a systematic comparison between the programmes, see Thiem and Duşa 2013b). From the truth table of the second model, we extract two combinations with a consistency score of more than 0.75.

Table 9: Causal path for *not* oversized coalitions (2nd model)

Causal path (~s_2)	**~a2** → **~y**
Raw consistency	0.79
Unique coverage	0.79
Consistency	0.86
Solution coverage	0.79
Solution consistency	0.86

Source: authors' illustration

In the above table, seat share by the strongest party (~a_2) is formalized as a sufficient and substantial condition for *not* oversized coalitions in the second model. The hypothesis about policy position centrality of the strongest party (~b_2) cannot be seen as a substantial condition, although it was included in the truth table. Thus, this model provides a single explanation of *not* oversized coalitions that is similarly consistent as the first model.

With regard to the third model, 14 solution terms with a consistency above 0.75 exist for logical minimization. However, a difficulty within the truth table can be identified, namely the rows 29 to 32 whose combinations were not observed empirically. Such combinations are called logical remainders. Because of the underlying algorithm, the QCA result could be

drastically changed depending on whether logical minimization is used or not. In order to account for this problem, we apply the so called *Theory-Guided Enhanced Standard Analysis* (TESA; Schneider and Wagemann 2012: 211-216).

First, each logical remainder is abstracted towards a conceptual attribute, i.e. either structural (A) or institutional (B). As a result, row 29 can be reduced to the conceptual combination A*~B. In the same manner, row 30 can be abstracted to ~A*B. At the conceptual level, we suggested that the theoretical expectation ($\sim T_3$), *not* consensual government, is formed under the condition ~A*~B. Therefore, rows 29 and 30 are not plausible combinations for *not* oversized coalitions. Third, whereas an institutional condition of row 31 can be straightforwardly abstracted, both structural attributes A and ~A can be expected in the respective logical combinations. However, we can decide that the row is not a plausible combination for the negated outcome, because possible conceptual combinations are not ~A*~B. Finally, for row 32, both structural attributes A and ~A are also expected. In contrast with row 31, the institutional factor is abstracted to ~B. At this point, we can expect two conceptual combinations, namely A*~B and ~A*~B. The former does not imply the negated outcome, whereas the latter does. Because of the lack of additional empirical and theoretical knowledge, we decide to exclude this indeterminate combination.

The result of the TESA procedure, which was used with regard to the four logical remainders from the truth table, is shown in *Table 10*.

Table 10: Causal path for *not* oversized coalitions (3rd model)

Causal path ($\sim s_3$)	**~a3*~e3**	**~b3*~e3**	**~d3*~e3**	**~y**
	+	**+**	**→**	
Raw consistency	0.38	0.38	0.35	
Unique coverage	0.06	0.06	0.07	
Consistency	0.94	0.91	0.87	
Solution coverage	0.57			
Solution consistency	0.90			

Source: authors' illustration

The table shows that the following three conditions under weak bicameralism or unicameralism ($\sim e_3$) can be seen as sufficient conditions for *not* oversized coalition: a small number of political parties, $\sim a_3$; united political parties, $\sim b_3$; and policy tolerance, $\sim c_3$.

Polarization does not constitute a substantial condition of model 3 in our estimation. Another solution path, namely $\sim c_3 * \sim e_3$ in the above table, would be added if the row number 32 in the logical was included in the minimization process. However, it is difficult to find plausible empirical and theoretical reasons for including this logical remainder. As a result, even the negation of polarization ($\sim c_3$) cannot be understood as a substantial condition. Second and in contrast with the other models' causal paths, whose explanation of negated

outcomes consists of a single monistic condition, the causal paths of the third model represent multiple explanations based on conjunctive conditions. Therefore, this model takes into account the diversity of *not* oversized coalitions with a similar consistency as the other models.

4.4 Assessment of the theoretical framework

Based on the empirical results, we now assess the models and theoretical framework at the conceptual level. First, we focus on the models that expect consensual governments with formal cooperation. Each model has the following theoretical expectation: (1) $A_1 \rightarrow Y$, (2) $A_2 \rightarrow Y$, (3) $A_3+B \rightarrow Y$. However, our analysis did not reveal any evidence or counter-evidence at the empirical level. This is because plausible combinations for oversized coalition formations cannot be observed in each truth table. With regard to the explanation power of oversized coalition models, the three models do not allow judgment about whether they are plausible or not due to their inconsistent solutions.

Second, we consider the models that expect a *not* consensual government. The first model expects ~A1→~Y. At the empirical level, we can identify the causal path $\sim a_1 \rightarrow \sim y$. The conceptual and empirical paths are difficult to compare because of differences between the conceptual and empirical frameworks. Therefore, we assess the theoretical expectation from an abstracted form of the empirical causal path, i.e. ~A1→~Y. By combining the theoretical expectation and empirical solution, we can draw a set theoretical formula for the model evaluation (see Schneider and Wagemann 2012: 297-300).

Interaction ($\sim T_1 * \sim S_1$): $\sim A_1 \rightarrow \sim Y$ (7)

Formula (7) claims that the theoretical expectation corresponds to the empirical solution. Accordingly, we can suggest the expectation at the conceptual level is confirmed by the empirical analysis. In the same manner, we assess the second model's expectation, $\sim A_2 \rightarrow \sim Y$. For the evaluation, the empirical causal path $\sim a_2 \rightarrow \sim y$ is reduced to an abstracted form, $\sim A_2 \rightarrow \sim Y$.

Interaction ($\sim T_2 * \sim S_2$): $\sim A_2 \rightarrow \sim Y$ (8)

From formula (8), we can again suggest that the plausibility of the second model is updated by empirical evidence. Finally, the third model is assessed by investigating the theoretical expectation $\sim A_3 * \sim B \rightarrow \sim Y$. At the empirical level, we confirmed three causal paths, ~a3*~e3+~b3*~e3+~d3*~e3→~y. Based on the rules of associativity and distributivity in set theory (see ibid: 48), the paths can be reformulated to ~e3*(~a3*+~b3+~d3)→~y. This can be abstracted to $\sim A_3 * B \rightarrow \sim Y$ at the conceptual level. By combining the empirical solution and the theoretical expectation, the following formula can be identified.

Interaction ($\sim T_3 * \sim S_3$): $\sim A_3 * \sim B \rightarrow \sim Y$ (9)

Similar to before, the above formula demonstrates a correspondence between empirical solution and theoretical expectation, i.e. the third model is confirmed by empirical evidence.

While this framework cannot account for consensual government formation, it constitutes a plausible approach to explain the formation of *not* consensual governments. Based on the chronological development of the three models, the improvement of the theoretical framework can be assessed. The theoretical expectation of consensual governments at the conceptual level is still not sufficient to explain oversized governments at the empirical level, even under the third model, which can be understood as the most sophisticated model in this article. However, we find that the framework based on the third model takes take into account the empirical diversity for explaining *not* oversized coalitions. From this point, we conclude that the advanced theoretical framework illustrates potential to correspond with the complex empirical reality of oversized coalition formation, more so compared to the theoretical frameworks of the first and second models.

5. Conclusion

This article provided a set theoretical assessment of existing and established oversized coalition models. These models have been already confirmed by various statistical tests in the past. Although such methods are beneficial for evaluating individual effects of conditions, there is no systematic evaluation that accounts for interactions and specifically multiple conjunctive explanations for the formation of oversized coalitions.

Based on these considerations, we conducted a set theoretical analysis via QCA, which can consider various interaction forms. For the evaluation, we first reconstructed a conceptual structure of oversized coalitions set theoretically. Second, three chronological models within a framework were reformulated based on formal logic. Third, we carried out an empirical analysis of hypotheses for each model. Finally, the theoretical framework was assessed according to two criteria: (1) to what extend the models provide a consistent explanation; (2) in what way the models provide an understanding of empirical diversity. As a result, two aspects of the theoretical framework could be clarified. First, the framework is plausible as a framework for explaining *not* oversized coalitions, whereas it does not provide consistent explanations for the positive outcome. Second and based on the chronological development of the models, the advanced theoretical framework illustrates potential to correspond with the complex empirical reality, more so compared the other models.

This article reconsidered oversized coalition models from a set theoretical perspective. In sum, we believe that there is still room for further improvement by applying a plurality of perspectives, for example inductive/deductive, correlational/set relational notions, and others. Although the models are constructed based on deductive methods, inductive methods could play a critical role to investigate accurate causations and to identify causal mechanisms. Furthermore, based on the set theoretical notion of causal asymmetry, we can concentrate on oversized coalitions for the consideration of multiple conjunctive causal paths.

Appendix

Table 11: Analysis of necessary conditions (1st model)

	condition	consistency	coverage
oversized coalition (y)	a1	0,32	0,41
	~a1	0,68	0,16
not oversized coalition (~y)	a1	0,11	0,59
	~a1	0,89	0,84

Source: authors' illustration

Table 12: Analysis of necessary conditions (2nd model)

	condition	consistency	coverage
oversized coalition (y)	a2	0,48	0,36
	~a2	0,52	0,14
	b2	0,41	0,21
	~b2	0,59	0,18
not oversized coalition (~y)	a2	0,21	0,64
	~a2	0,79	0,86
	b2	0,36	0,79
	~b2	0,64	0,82

Source: authors' illustration

Table 13: Analysis of necessary conditions (3rd model)

	condition	consistency	coverage
oversized coalition (y)	a3	0,71	0,27
	~a3	0,29	0,12
	b3	0,57	0,22
	~b3	0,43	0,17
	c3	0,58	0,20
	~c3	0,42	0,18
	d3	0,52	0,20
	~d3	0,48	0,19
	e3	0,64	0,32
	~e3	0,36	0,12
not oversized coalition (~y)	a3	0,46	0,73
	~a3	0,54	0,88
	b3	0,49	0,78
	~b3	0,51	0,83
	c3	0,54	0,80
	~c3	0,46	0,82
	d3	0,51	0,80
	~d3	0,49	0,81
	e3	0,33	0,68
	~e3	0,67	0,88

Source: authors' illustration

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