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Multiplexity and strategic alliances: The relational embeddedness of coalitions in social movement organisational fields

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ABSTRACT

While scholars have embraced the notion of social movements as networks, there has been little empirical exploration of the emergence of coalitions within these multilayered systems. Here I explore the role of overlapping relations in alliance formation amongst a group of 55 health-related professional social movement organisations mobilised against austerity. Using cross-sectional bivariate exponential random graph models, I find dependencies between digital proxies for alliance, shared allies, information exchange, positive nomination and offline colobbying activity at the dyadic, degree and triadic levels. Cross-network associations indicate that multiplexity plays a non-trivial role in the formation of alliances and, more generally, social movement organisational fields, necessitating increased attention from scholars of social movements.

1. Introduction

Historically, movement scholarship and lay discourse around social change have suffered from a tendency to treat social movements as single, unified entities. While it is a matter of convenience to refer to whole movements as "the" movement, this obfuscates their internal processes (Meyer and Corrigall-Brown, 2005; see also Touraine, 1981; Melucci, 1996). In reality, movements are amalgamations, phenomena that are comprised of "internally differentiated actors operating within complex social settings. . ." (Rucht, 2004, p. 197). Of these actors, Social Movement Organisations (SMOs) are united by various relations, among which alliances — an ad-hoc and largely informal type of "means oriented" cooperation (Tarrow, 2005, p. 163) understood to exist anytime two or more SMOs work together around a common task (van Dyke and McCammon, 2010) — is only one.[1] Scholars taking a network perspective (c.f. Diani, 2015; Mische, 2008; Wang and Soule, 2012; see Diani and McAdam, 2003 for a review) have successfully argued against holist thinking and lobbied for the more appropriate conceptualisation of movements as a constellation of both SMOs[2] and individual activists. However, since Gould's (1991) classic exploration of overlapping ties among insurgents in the 1871 Paris Commune, there has been little further acknowledgement of co-occurring relations in social movements, particularly amongst SMOs.[3] Given the range of ways through which these organisations may be simultaneously directly and indirectly tied, my concern here is the scant systematic and empirical exploration of the role of concurrent relations in the establishment of alliances between these strategic actors.

Here I focus on the structure of alliance networks between SMOs and my principal empirical task is to uncover the degree to which co-occurring relations help explain their emergence. In the most basic sense, social systems may be conceived of as a number of heterogeneous actors tied together via a broad range of social and economic relations. The ties that bind any two actors are diverse, representing, for example, positive feelings/affirmation (friendship, love, affiliation), communication/information exchange, the exchange of goods and capital (trade) or behavioural interaction

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[1] Broadly, alliances between SMOs range from those that are informal and largely ad-hoc to fusion via mergers (c.f. Cornfield and McCammon, 2010). While this heuristic is problematised in light of new relations that are digital in nature (e.g. hyperlinks between SMO webpages), they provide a tractable framework for theorisation. Note that for the purposes of this work, "coalition relationships" refers to the entirety of this relational spectrum.

[2] I use Zald and Ash's (1966) classic definition of social movement organisations as organisations with goals aimed at changing society. These organisations ultimately wish to restructure society and/or the state of individuals or maintain the status quo as opposed to only existing to offer a regular service, such as in bureaucratic organisations.

[3] Diani (2003, p. 314), Baldassarri and Diani (2007), and McAdam and Paulsen (1993) are notable exceptions.

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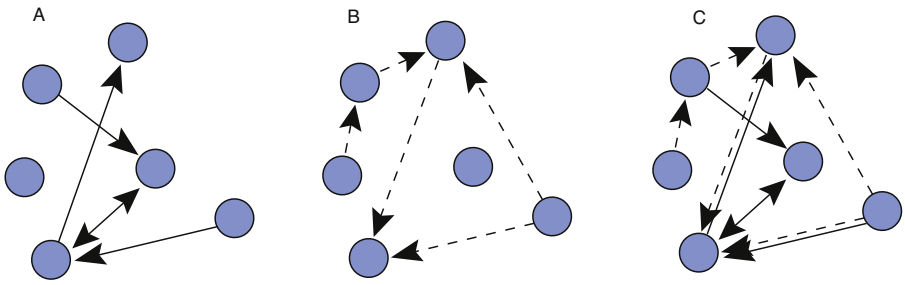


Fig. 1. Slices of a multilayered network. Simplex view of relationship one (A), simplex view of relationship two (B), and multiplex view of both relationships (C).

(cooperation or punishment). Each of these relational contexts may constitute individual networks, however, they all influence one another — each acting as a constraint or an enablement. Thus, society is characterised by "the superposition of its constitutive socio-economic networks" (Szell et al., 2010, p. 13636). This superposition is called multiplexity (Fig. 1).[4]

In light of this superposition, I ask in what ways and to what degree is alliance formation governed by multiplexity? To answer this question I draw from work in organisational studies to explore multiplex network configurations as key determinants of alliances in social movement organisational fields[5] — populations of interdependent SMOs oriented towards a similar set of issues who are tied together in a network structure chiefly dependent upon patterns of domination and cooperation, information exchange and mutual awareness (Minkoff and McCarthy, 2005). Maintaining that contemporary accounts of multiplexity within social movement scholarship must move beyond simple acknowledgement to forge an explanatory understanding of the role of co-occurring ties, I argue that: (a) alliances between SMOs and the other relational contexts within which these actors are embedded (e.g., information exchange, positive nomination, tactical advice giving, project collaboration) are characterised by manifold interdependencies; and thus (b) to avoid the biased understanding of social systems that comes with simplex (i.e., single relation) analyses, alliance formation must be investigated alongside concurrent ties. Here multiplexity is treated as given, using it as a tool for unravelling the puzzle of emergence. This positions the alliance network as the dependent variable to be explained.

Nevertheless, multiplexity is not the sole determinant of alliance. In addition to social ties a number of other factors have been linked to coalition formation. Broadly, these include the (in)congruence of ideology/interest (Croteau and Hicks, 2003), contender perceptions (Kadivar, 2013) and socio-political threat (McCammon and Campbell, 2002).[6] Recast within classical movement theories, these factors address issues around political opportunity structure (Kriesi, 2004), resource mobilisation (Jenkins, 1983), and collective identity/frame alignment (Benford and Snow, 2000). Owing to classic treatment of movements as singular and/or homogenous entities, scholars focusing on coalition relations have traditionally analysed the importance of these factors at the level of the individual organisation, e.g., traits such as resources, age and ideology, as opposed to the interplay of these attributes and structure. While the acknowledgement of exogenous, non-network, properties helps relax quite strong assumptions about self-organisation in social systems, understanding of the formation of social relations is limited when dependencies at the structural level, orders increasingly higher than individual actors, are unaccounted for. Thus my goal is not to suggest that social ties alone are adequate for the complete exposition of the processes which govern the formation of alliances between SMOs. Instead, I simply seek to empirically demonstrate that there are complex, multiplex dependencies at the level of the network which movement scholars focused on alliance formation have yet to address.

The empirical context chosen for the exploration of these ideas is the forging of online alliances, in the form of hyperlinks (see Park et al., 2004; Pitt et al., 2006; Rogers and Marres, 2000), between the websites of professional SMOs. The world has seen the proliferation of collective actions with notable Internet dimensions in recent years. While the degree of political and democratic efficacy afforded through use of the Internet is still hotly debated, contemporary instances of collective action necessitate a focus on the role of the Internet in facilitating relations which bind political actors (c.f. González-Bailón et al., 2011) and thus comprise, in part, the structure of social movement organisational fields in an information society (Garrett, 2006). Lest I unduly suggest equivalence between traditional movement alliances, with their expectation of the investment of material and symbolic resources and their ability to facilitate long-term commitment, and online alliances, which are informal and asymmetric whilst intrinsically imposing no immediate obligations for those involved, the nature of hyperlinks relative to traditional social movement alliances must be addressed.

In crafting my understanding of online alliance I draw heavily from Rogers (2013), viewing the network constituted by hyperlinks as representative of an associational space.[7] Importantly, this space is constructed via organisations' purposive creation of hyperlinks to signify with whom or what they wish to be affiliated (see Lusher and Ackland, 2011; Pilny and Shumate, 2012; Shumate and Lipp, 2008; Weber, 2012). In these systems of representational communication (Shumate, 2012) the acts of making, not making, or removing hyperlinks are political in that they have implications for the construction of organisational reputation. Hyperlinks serve as doors from one website to another through which users traverse, and make sense of, the structure of the Web. The opening and closing of these digital pathways by SMOs may facilitate the construction

[4] Multiplex relations are also known as multirelational, multimodal, multivariate and multistranded in the social sciences.

[5] Note that in the most holistic sense, organisational fields include both the focal actors of interest, here SMOs, and those other organisations they routinely interact with, such as governmental agencies and opposing groups, in addition to grassroots organisations. Here I only explore relations between SMOs, using the phrase social movement organisational fields to distinguish populations of only SMOs from the larger set of actors work in this area typically addresses. Additionally, I do not give treatment to configurations of individuals and SMOs as populations of SMOs represent a unique aspect of movements which require inquiry into processes that are supra-individual (Zald and McCarthy, 1980). In this regard, social movement organisational fields may be viewed as equivalent to social movement industries (McCarthy and Zald, 1977). However, here the notion of field is favoured due to its more explicit connotation of relational processes (see DiMaggio and Powell, 1983).

[6] See van Dyke and McCammon (2010) for a review of these and other factors.

[7] The original notion of an associational space or "issue network" includes hyperlinks between social actors and inanimate objects (e.g., a hyperlink from an organisational website to a specific webpage such as the Wikipedia entry on flat organisational forms). Here, I only consider direct hyperlinks between organisational actors as they position themselves next to one another. Ackland (2013, p. 82) provides an overview of different disciplinary perspectives on hyperlinks.

of collective identity (Ackland and O'Neil, 2011) and contribute to the collective visibility of movement actors (Shumate and Dewitt, 2008). Ultimately, from this perspective hyperlinks represent a means of constructing categories and establishing boundaries. Thus to the extent that SMOs: (a) actively manage their personas and; (b) are cognisant of public understanding of organisational identity by means of comparison to others, the creation, maintenance and modification of hyperlinks are understood to reflect the strategic communicative choices and agendas of actors (on such strategy see Dysart, 2002; Garrido and Halavais, 2003; González-Bailón, 2007; Kleinberg and Lawrence, 2001; Park, 2002; Tremayne, 2004).[8]

Empirically, bivariate exponential random graph models (ERGMs) were used to explore the relationship between online alliance and digital proxies for shared allies (co-followers on Twitter), information exchange (Twitter Friend/Follower Graph), positive nomination (Likes between SMO Facebook pages), and offline co-lobbying activity (joint meetings with government ministers) at the dyadic, degree and triadic levels. Data come from the associational practices of 55 health-related, professional SMOs with charitable status who have come together in an issue campaign around public sector cuts in the UK.

To be sure, the relationships explored here are not redundant, which would indicate that movement scholars simply need to more accurately count the number of relations in dyads (Gould, 1991). Instead, results indicate that multiplexity, as exhibited by cross-network dependencies in various local-level configurations of ties, plays a non-trivial role in the formation of alliances and, more generally, social movement organisational fields. Large tendencies for alliance to co-occur with both expressive and instrumental ties suggest that embeddedness, and the trust it breeds, are key components of alliance formation at the dyadic level. Furthermore, this layering of alliance onto other relations may be thought of as a strategy to manage risk when information is imperfect and a SMO has already invested in another.

Moreover, results suggest alliance formation happens in the face of both competition and cooperation over scarce relational resources in social movement organisational fields. The simplex analysis here does indeed indicate that the alliance network is characterised by processes representative of macro-level cohesion (i.e., large propensities for reciprocity and transitivity) which are typical of the non-hierarchical organisational forms represented by offline (Baldassarri and Diani, 2007) and online (Ackland and O'Neil, 2011) social movement networks. However, cross-network associations between degree distributions indicate that some SMOs engage in opportunistic alliance formation whereby they pool relational resources without establishing alliances with others. This process is, arguably, magnified by strong tendencies for concurrent ties to be entrained with alliance. Substantively, such free-riding may adversely affect the wider integration of social movement organisational fields. With regard to theory, the coexistence of opportunistic and cooperative behaviour suggests that work exploring competing hypotheses about how these seemingly orthogonal processes impact alliance formation (c.f. Okamoto, 2010) must consider how both may operate jointly within and across network layers.[9]

Finally, tendencies for alliance to be embedded in triangles formed with co-occurring ties suggests that signalling, by means of structural position, helps to govern alliance formation in multilayered systems. Specifically, the tendency for a SMO to form an alliance with another SMO with whom it positively nominates the same third other and/or with whom it is positively nominated by the same third other compared to a tendency against the formation of an alliance with a SMO that is indirectly positively nominated, suggests a form of uncertainty reduction. Here, SMOs privilege direct confirmation of identity-based similarity vis-à-vis choice of expressive partners over the imperfect information of the latter scenario.

The outline of the remainder of this work is as follows: I first build a uniquely relational understanding of alliance formation that sits at the intersection of social movement and organisational studies (Sections 2 and 3). Given that social movement alliances have received little empirical attention (van Dyke and McCammon, 2010) in addition to the interdisciplinary nature of my argument, I give an extended treatment of past research on alliance, multiplexity and inter-organisational networks for contextualisation. This is then followed by hypotheses (Section 4), the presentation of the case study, data and methods (Section 5), and a substantive discussion (Section 7) following results in Section 6.

2. Social ties and movement alliances

Scholarship at the intersection of alliance formation and social ties has largely emphasised the importance of "coalition brokers" or bridge builders — individuals in the form of leadership or membership who span organisations — in building coalitions (Bystydzienski and Schacht, 2001; Ferree and Roth, 1998; Obach, 2004). These individuals have been found to play a critical role in bridging class (Rose, 2000) and racial (Grossman, 2001) divides. Yet, these metaphors are rooted in network theories of brokerage and closure (Burt, 1992; Granovetter, 1973), and use of these concepts in the absence of empirical studies of networks has led scholars in this area to fail to offer a systematic account of their foundations — network structuring processes driven by intricate dependencies in multilayered social systems. The appropriation of network metaphors without the network itself has serious implications given the complexity of social systems and the multiple processes leading to their formation (Monge and Contractor, 2003).[10]

Two issues, scale and context collapse, perpetuate the use of network metaphor in the absence of substance in previous work. The first relates to the level of analysis. Despite social relationships influencing perceptions of potential allies (Rose, 2000), scholarship on coalition relations has largely focused on how factors at the level of the actor (e.g., resources and ideology) and factors external to those under study (i.e., political opportunity structure/environment) affect coalition formation. This removal of actors from the relations which tie them precludes precise accounts of processes at the structural level as ties are written off. The second sees the implicit projection of multiple layers onto a single one. This may largely be attributed to a one dimensional view of boundary spanning actors as the only social tie of concern outside of the alliance itself (c.f. Osa, 2003; Arnold, 2011; and Park, 2008 provide alternatives). Such an approach effectively neglects the array

[8] See Appendix A for an additional discussion on hyperlinking as an associational practice.

[9] Here, "instrumental" and "expressive" are used to describe the nature of the relation that some actor may create whereas "cooperative" and "opportunistic" are used to describe the logic in which ties of both type may be established when considering their patterning within and across network layers. These two sets of categories are not orthogonal, such that network structure may suggest a cooperative logic in the establishment of instrumental ties and vice versa. To make the difference between cooperative and opportunistic logics more concrete, consider the cyclic triad and the reciprocated dyad, sub-graphs archetypal of exchange whereby all actors stand to benefit. These structures stand in stark contrast to those that allow some actor to exploit their structural position at a loss for other actors. For example, consider sub-graphs in the form of unclosed triangles and chains wherein structural position may afford an actor the ability to control resources flows (e.g., brokerage, in the case of the unclosed triangles, or penultimate actors on shortest paths, in the case of chains; see Brandes, 2008).

[10] See McAdam and Paulsen (1993) for an analogue discussion of the use of network metaphor over substance in work on the importance of social ties for activist recruitment.

of ways in which organisations may be directly and indirectly tied within and across multiple networks. Together, issues of scale and context collapse leave a number of unanswered questions: What structural positions are most conducive to the receipt of allies? How does the alignment and trade of ties across networks influence alliance formation? How do alliances form in the face of mutual selection of (agreement) and mutual selection by (co-citation) third others across different layers of a network? How might the receipt of various social relations influence a SMO's willingness to form alliances with others?

Diani (1992) has extensively outlined the importance of the relational aspect of social movements, ultimately positioning them as organisational fields (Diani, 2013; also see Minkoff and McCarthy, 2005). This positioning is crucial as it allows one to acknowledge and analytically account for the existence of heterogeneous actors who possess varying levels of resources, harbour different interests and identities, operate under various exogenous constraints, and are tied together via a number of relations in addition to overlapping membership. From this perspective, both a multilevel (i.e., multiple levels of nested structure) and multiplex understanding of social movement organisational fields is crucial for the most complete understanding of the dynamics of alliance formation. Unfortunately, the somewhat niche literature on social movement coalitions is, at best, vague as to what structural factors lead to the formation of simplex alliance networks, much less multiplex inter-organisational networks. Therefore, I now turn to scholarship in organisational studies, in addition to work on civic networks, where scholars have actively addressed these two issues.

3. Multiplexity and inter-organisational networks

Uniting insight from classic work in the social sciences on overlapping relations in dyads (Gluckman, 1962; Kapferer, 1969; Vebrugge, 1979; Wheeldon, 1969) and more recent work in mathematics and physics on the non-trivial coupling of multiple layers of distinct relations in systems (De Domenico et al., 2013; Gómez-Gardenes et al., 2012; Kivelä et al., 2013), I define multiplexity as overlapping relations between a set of actors whereby; (a) each relation forms a distinct layer of a larger system of interest; (b) layers are beholden to emergent processes which may differ from other layers; and (c) combinations of ties across layers may interact in non-random ways. As much of social network research makes clear, layers may be usefully analysed in the absence of others. However, layers are often interdependent and collectively shape network structure (Cardillo et al., 2013). Ignoring this limits understanding of the complexity of social life as it produces an incomplete picture of the embeddedness of actors and their relations (Ferriani et al., 2013; Zhao & Rank, 2013). This is because one tie, while forming a unique relational context, often entails another (Shipilov and Li, 2012; White, 2008).

Scholars from organisational studies have convincingly argued for the importance of multiplexity in light of the potential bias of simplex analyses (c.f. Lomi and Pattison, 2006). As Kenis and Knoke (2002) state, an organisational field cannot be reduced to a single network as a number of ties are relevant to an explanation of its structure. Thus groups of organisational actors are bound by manifold interdependencies within and across the layers of the network within which they are embedded (Lazega and Pattison, 1999; Rank et al., 2010). Laumann et al. (1978) identify two types of inter-organisational relations which may operate simultaneously: (a) those based on the transfer of resources; and (b) those which interpenetrate organisational boundaries. While both resource-based and interpenetrative relations are understood to be chiefly instrumental, "relations involving boundary interpenetration often have an additional component of solidarity maintenance" (Laumann et al., 1978, p. 463). As discussed in Section 2, scholarship on social movement coalition formation has focused most intensely on boundary spanning relations via brokers. Still, overlapping membership is only one of a number of types of ties between organisations, which may include transfer of a number of resources, project collaboration, joint participation in meetings and forums, and interlocking directorates, among others (c.f. Katz and Anheier, 2006).

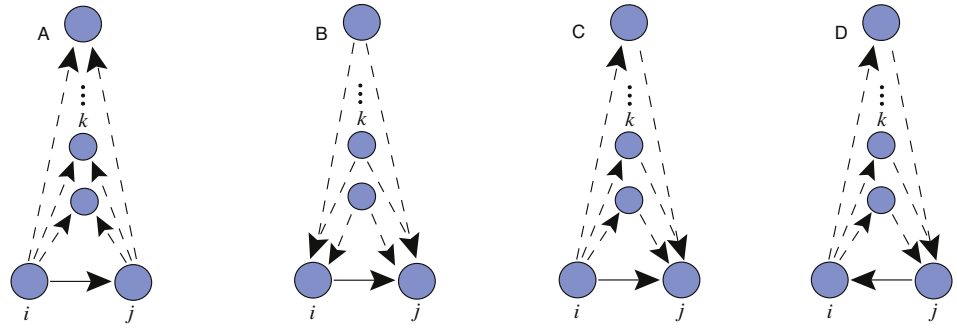
Each of these relations can be categorised based on the extent to which they are instrumental or expressive. In a study of civic organisations, Baldassarri and Diani (2007) note that these groups may limit their relations with others to the instrumental exchange (e.g., sharing material resources) necessary for action that, in the case of SMOs, is aimed at creating some normative condition or change. On the other hand, organisations may be tied via expressive connections that are affective and carry deeper obligation (e.g., overlapping membership). This is in contrast to instrumental exchange which is characterised by its ad-hoc and temporary nature. Despite expressive ties being more likely to lead to the formation of additional relational contexts between actors over and above instrumental relations (Ferriani et al., 2013), both must be accounted for to yield the most complete understanding of the dynamics of inter-organisational networks.

Baldassarri and Diani (2007) argue that multiplexity, as indicated by the simultaneous existence of various instrumental and expressive ties between civic organisations, perform a joint micro–macro integrative role. Following their logic, should a civic network be driven entirely by expressive exchange it would tend to fragment into non-overlapping clusters of ideologically similar organisations. However, should an instrumental logic dominate, these networks would take a disorganised form antithetical to the micro-level cohesion characteristic of solidarity whereby ties are created "according to 'quasi-random' criteria, with weak constraints on partner selectivity" (Baldassarri and Diani, 2007, p. 768). Comparing macro and micro-level features of observed networks (e.g., average path length and balanced interconnectedness in triads) to those of randomly generated networks, Baldassarri and Diani found that civic networks are comprised of organisations embedded in dense clusters of expressive ties which are united by global bridges in the form of instrumental exchange. This integrative logic was preluded by Wellman (1983) who maintains that the absence of ties across different sub-graphs in a network may lead to distinctive subcultures. Clustering, driven by transitive closure, leads to "bounded factions and coalitions" (Wellman, 1983; p. 178) and cross-linkages between clusters are understood to offer the structural foundation for macro-level integration. Wellman argues that the absence of these global bridges may have been the reason for the failed coalition by the Italian-American residents of Boston's West End in their efforts to put a halt to destructive slum clearance activities.

Key to this integrative process is the manner in which multiplexity functions in dyads and triads. While Baldassarri and Diani (2007) addressed two classes of relations (expressive exchange, which they call "social bonds", and instrumental exchange, which they label "transactions"), the authors effectively aggregate multiple types of ties into two categories. Though conceptually useful, this aggregation obfuscates the distinctiveness of each relation, each layer, and any unique understanding from their joint analysis is lost.

4. Hypotheses

Work on civic networks directs attention to multiplex dynamics located in dyads and triads. Of these two structures, dyads are the more obvious sub-graphs through which multiplexity may be expected to structure alliance. Specifically, I focus on



Shared out-ties (A2P-U; dashed) with activity closure via alliance (AT-U-BAB; solid).

Shared in-ties (A2P-D; dashed) with popularity closure via alliance (AT-D-BAB; solid).

Multiple two-paths (A2P-T ; dashed) with transitive closure via alliance (AT-T-BAB; solid).

Multiple two-paths (A2P-T ; dashed) with cyclicclosure via alliance (AT-T-BAB; solid).

Fig. 2. Forms of closure in multiplex networks. Dashed lines represent the tops of triads involving ties to/from/between candidate alliance partners (*i* and *j*) via multiple third others (*k*) in co-occurring networks (B). Solid lines represent hyperlinked alliance (A). The codes in parenthesis are the identifiers used to specify a multivariate ERGM in XPNet.

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entrainment and exchange. Entrainment represents the degree to which directed ties co-occur within dyads. In the case of two actors, *i* and *j*, embedded in two layers, e.g., perception of reliability and money lending, entrainment occurs when actor *i* nominates actor *j* as reliable in addition to lending actor *j* some sum of money. Additionally, another degree of entrainment would be present if *i* and *j* were formal business partners. Exchange represents the trading of connections of different types across dyads. In an exchange scenario actor *j* would return her loan to *i* who would then nominate *j* as trustworthy. Explanations for these two associations are largely rooted in work on the embeddedness of economic action within social structure (Granovetter, 1985), relational embeddedness (Gulati and Gargiulo, 1999), exchange (Homans, 1950, 1974) and resource dependency (Blau, 1964). Given that dyads are the most elementaryof network forms, I expect that:

Hypothesis I. In dyads, instrumental and expressive ties will tend to be entrained and exchanged with alliance.

Beyond dyads a comprehensive body of research has addressed configurations of three actors in work on network closure. In the context of inter-organisational networks, closure has largely been interpreted as "a direct consequence of the costs and risks inherent in the formation and maintenance of network ties with partners whose quality, capability, and trustworthiness are only imperfectly observable" (Lomi and Pallotti, 2013, p. 202). From this perspective, shared partners are a source of trust, legitimacy and reliability (Granovetter, 1973, 1985; Gulati, 1995; Uzzi, 1996). The ties which directly link those connected via multiple third others are understood to be structurally embedded (Gulati and Gargiulo, 1999; Rivera et al., 2010).

For simplex digraphs, Robins et al. (2009) identify four possible types of closure based on the arrangement of ties in triangles, which consists of a top (2-path, in-2-star or out-2-star) and a base (the structurally embedded arc). Specifically, these four types of closure are: (a) activity closure, whereby a form of structural equivalence based on shared outgoing ties to the same third others induces the formation of the structurally embedded arc; (b) popularity closure, whereby a form of structural equivalence based on shared incoming ties from the same third others induces the formation of the base of the triangle; (c) transitive closure, whereby indirect connections from *i* to *j* induces the establishment of the embedded arc *ij*; and (d) cyclic closure, a form of generalised exchange whereby the indirect receipt of ties from *i* to *j* induces the embedded arc *ji*.

Given the role of closure in simplex scenarios it is not unreasonable to expect it to be a prominent feature of multilayered networks. Building on work demonstrating that embeddedness has implications for transitivity (Gulati, 1995; Gulati and Gargiulo, 1999), Lee and Monge (2011) advance the notion of"embedded transitivity" whereby multiple common third party ties between two organisations in one network lead to the formation of a tie in another. While these authors focused only on undirected relations, thereby reducing the four types of cross-network closure to one triangle with three symmetric ties, Huitsing et al. (2012) maintain the directed configurations of Robins et al. (2009) to generalise the four types of closure to a multiplex scenario (Fig. 2). I utilise each type of multiplex closure to model alliance, expecting that:

Hypothesis II. In triads, instrumental and expressive ties to and from candidate alliance partners by way of third-others in co-occurring networks will impact the likelihood of alliance formation.

To also gain a more holistic understanding of the association between alliance and the co-occurring relations under study, I explore associations at the degree level via multiplex mixed-2 -stars, in-2-stars (popularity) and out-2-stars (activity). Table 1 gives the network configuration and a short description for all simplex and multiplex configurations utilised in this work.

5. Data and methods

5.1. Health in austerity: the case of the UK anti-cuts movement of the disabled

Here I adopt the UK anti-cuts movement as a case study for exploring the role of multiplexity in the formation of online alliances. Broadly speaking, grievances expressed over public sector cuts in the UK are embedded in a much larger transnational wave of contention around anti-capitalism in the wake of the 2008 global financial crisis (Calhoun, 2013 provides a summary of events). As prominent drivers of the narrative around socio-economic inequality, aspects of the revolutions in the Middle East and North Africa, the Indignados in Spain, protests in Greece, and the Occupy Movement in the US can be found within the UK anti-cuts movement. Indeed, one may even trace the roots of the contemporary incarnation of the anti-capitalist imperative to the 1994 Zapatista rebellion in Chiapas, Mexico, or the "Battle of Seattle" anti-WTO demonstrations in 1999. Despite media and lay attention emphasising the role of the more visible Occupy, in the UK groups of varying degrees of institutionalisation, such as UK Uncut, the Trades Union Congress and Keep our NHS Public, gained more traction with activism around the perils of neoliberal austerity.

Table 1
Summary of parameters for univariate and bivariate ERGMS.

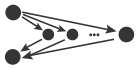
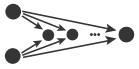
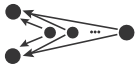
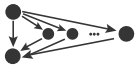
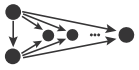
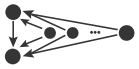
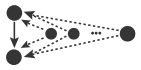
Network statistics	Description	Structural signature
Univariate parameters		
Dyadic parameters		
Reciprocity	Occurrence of mutual ties	
Degree parameters		
Mixed 2-star	Correlation of indegrees and outdegrees	
Alternating-in-star (A-in-S)	Network centralisaiton around indegree	
Isolate	Occurrence of actors with zero indegree and zero outdegree	
Sink	Occurrence of actors with an outdegree of zero and indegree of at least one	
Triangle parameters		
Multiple connectivity (A2P-T)	Multiple paths of indirect connectivity	
Shared out-ties (A2P-U)	Activity based structural equivalence: multiple sets of out-ties to the same third others	
Shared in-ties (A2P-D)	Popularity based structure equivalence: multiple sets of in-ties from the same third others	
Transitive closure (AT-T)	Transitive closure of multiple 2-paths	
Activity closure (AT-U)	Closure of multiple in-2-stars	
Popularity closure (AT-D)	Closure of multiple out-2-stars	
Multivariate parameters		
Dyadic parameters		
Entrainment	Tendency for links to co-occur in dyads	
Dyadic covariate	Used to test for the co-occurrence of alliance and some third relation not being explicitly modelled	
Exchange	Exchange of links between actors across networks	
Degree parameters		
Multiplex popularity (In-2-StarAB)	Correlation of the indegrees of networks A and B	
Multiplex activity (Out-2-StarAB)	Correlation of the outdegrees of networks A and B	
Multiplex mixed-two star (Mixed-2-Star-AB)	Correlation of the indegrees of network A (dashed) and outdegrees of network B (solid)	
Multiplex mixed-two star (Mixed-2-Star-BA)	Correlation of the indegrees of network B (dashed) and outdegrees of network A (solid)	

Table 1 (*Continued*)

Network statistics	Description	Structural signature
Triangle parameters		
Multiplex Transitive closure (AT-T-BAB)	Transitive closure of multiple 2-paths in B (dashed) by relation in A (solid)	
Multiplex cyclic closure (AT-C-BAB)	Cyclic closure of multiple 2-paths in B (dashed) by relation in A (solid)	
Multiplex popularity closure (AT-D-BAB)	Closure of shared in-ties (B; dashed) by a relation in A (solid)	
Multiplex activity closure (AT-U-BAB)	Closure of shared out-ties (B; dashed) by a relation in A (solid)	

The heterogeneous nature of the UK anti-cuts movement makes it a very fruitful case for inquiry; however, analytically, that same diversity raises important issues around boundary specification. The valid identification of boundaries is crucial for defensible network analysis. This is particularly true for ERGMs where the projection of estimates obtained from models of sampled networks to some global network of interest has been shown to be erroneous (Shalizi and Rinaldo, 2013).[11] To mitigate this issue, I focus on a sub-division of the broader UK anti-cuts movement that sits at the intersection of public sector cuts, access to health resources and the rights of the disabled. Specifically, I use the 55 largely health-related SMOs of the Hardest Hit Campaign (HHC).[12] Begun in 2011, the HHC was launched to raise awareness of the needs of the disabled and bring about change in the form of a fair UK benefits system. Organisers of the HHC consists of the Disability Benefits Consortium (DBC),[13] an association of 54 charities and advocacy organisations and the UK Disabled People's Council.

There are a number of benefits and caveats associated with use of the HHC. With regard to boundary definition, the HHC is a set SMOs that is clearly identifiable in membership and focus. As it would be unreasonable to expect to comprehensively account for all SMOs active in the UK anti-cuts movement, a clearly demarcated set of actors is very advantageous. However, it is important to note that focusing on this sub-section of the anti-cuts movement requires characterisation of the present analysis as one of alliance formation amongst members of specific issue campaign, as opposed to alliance formation in the throes of mobilisation at the level of a movement. This shift in focus means that analyses of networks comprised of a more expansive cross-section of the anti-cuts movement's organisational actors could see additional patterns in alliance formation emerge or different dynamics all together.

A related issue lies with the potential predisposition of the organisations under study to cooperate given that 54 out of the 55 SMOs are members of the DBC, a large-scale coalition itself. However, even within coalitions, relations amongst members are diverse (Arnold, 2011). Further still, the organisational maintenance required for long-term political survival leads coalition members to compete with one another for resources and differentiate (Hathaway and Meyer, 1993). Thus there is no a priori reason to assume collaboration precludes competition. To be sure, results (Section VI) do indicate that there are competitive processes at play in the organisational field constituted by the 55 SMOs of the HHC.

Furthermore, it must be said that the benefits around analysing this clearly identifiable group are weighed against the utility of having a more diverse study population with regard to degrees of radicalism, i.e., left-wing anarchist/right-wing conservative groups versus bureaucratic organisations. Given their charitable status, the HHC SMOs are most appropriately categorised as professional SMOs — staff driven entities devoted to political or legal advocacy, or technical support that derive their resources from institutions and isolated constituencies, and represent, rather than directly mobilise, their beneficiaries (Jenkins, 1998). This is in contrast to indigenous SMOs which are heavily involved in face-to-face organising and derive the bulk of their support from their movement's beneficiaries. This latter group best characterises the most visible activist organisations of the UK anti-cuts movement (e.g. Occupy, UK Uncut).

A similar concern lies with the ability to classify the 55 organisations as SMOs, nonprofits or interest groups. Scholars such as Císař (2013) have argued that there are notable differences between SMOs and interest groups, particularly for those SMOs that are radical and/or countercultural in nature and those interest groups that exclusively serve commercial interests. Notwithstanding, here I subscribe to the view of Andrews and Edwards (2004) who maintain that divisions between these three classes of organisations are porous. While the present analysis emphasises the social movement dimension of the HHC's members, it is important to note their difference from those organisational actors typically studied in the sociological literature on social movements (e.g. the grassroots SMOs of the civil rights or environmental movements).

Ultimately the benefits gained from a clearly bounded group of actors alongside the fact that health-related social movements are relatively understudied (Brown and Zavestoski, 2004), make the HHC a useful case study despite these caveats. Hereafter, "SMO(s)" is understood to refer to professional SMOs.[14]

5.2. Co-occurring networks of interest

Positive nomination: Affective ties between organisations provide social support, establish a sense of identity and belonging and

[11] Advances around estimation using snowball sampled networks and networks with substantial portions of missing data (see Koskinen et al., 2013) are not currently available for bivariate ERGMS.

[12] http://thehardesthit.wordpress.com/about/.

[13] The earliest report made available online by the DBC (http://disabilitybenefitsconsortium.wordpress.com/2011/03/) lists 41 organisational members as of March 2011. Coincidently, this is also the first post by the DBC on its website. Of the 41 SMOs, 40 were still members of the DBC (http://disabilitybenefitsconsortium.wordpress.com/dbc-members/) and the HHC at the time of data collection. While this is not definitive evidence for the age of the DBC, it seems fair to say that both the HHC and the DBC at the time of data collection are well established entities that have seen little fluctuation in membership from 2011.

[14] See Appendix D for a list of the 55 SMOs.

transmit normative expectations (Umphress et al., 2003). As a tool for social movement actors, Facebook has traditionally received scholarly attention around the degree to which the "Pages" and "Groups" features are effective information hubs for the purposes of mobilisation (e.g., knowledge exchange amongst movement adherents about protests or discussion of movement grievances; c.f. Harlow, 2012; Gaby and Caren, 2012) and the distribution of counter-narratives (Cammaerts, 2012). Here I take a different approach and employ the web of affective nominations between organisations' Facebook Pages when one organisation uses a social button to "Like" another. Facebook introduced the ability to "Like" content in 2009 as an activity geared to replace short affective proclamations such as "Awesome" (Pearlman, 2009). As Gerlitz and Helmond (2013) argue, "the [Like] button provides a one-click shortcut to express a variety of affective responses such as excitement, agreement, compassion, understanding, but also ironic and parodist liking" (p. 1358).

Given their affective nature, Liking amongst SMOs may influence perceptions of closeness, making them apt for establishing (sub)movement boundaries around collective identity (see Arnold, 2011). A need then arises to qualitatively distinguish Facebook Likes from hyperlinks, which also enable the maintenance of identity and boundaries amongst SMOs. Relative to the argument I advance here, the key difference between Facebook Likes and hyperlinks is the latter's primary existence as functional. Hyperlinks principally serve to move an Internet user from website A to website B, structuring the content of the Web (see Broder et al., 2000). While Likes do establish doors between organisations' Facebook Pages, the formation of pathways is the central purpose of hyperlinks.[15] This enables a conceptualisation of hyperlinks as a form of alliance as organisations are understood to actively use these digital ties to position themselves next to one another online.

Further still, amassing a large number of inbound hyperlinks may result in an organisation's increased online visibility by indicating the importance of its website to search engine algorithms (Ackland and O'Neil, 2011). Such a practical element is wholly absent from Likes between organisations' Facebook pages which I view as purely expressive given the affordances of Facebook as a platform and the original intent behind the introduction of "Likes". Importantly, the functional and practical aspects of hyperlinks are likely to contribute to the formation of a structure that is distinct from that which is built from Likes, despite the duality of both types of ties. This justifies treatment of both networks as unique.

Finally, there is one important caveat to my use of Likes in this work. The conceptualisation of Liking as an affective action has been exclusively advanced relative to individuals' interaction with content on Facebook and there is no a priori definitive way to know that a Like is positive in nature. With that said, the rhetoric of sociality and engagement that is characteristic of Facebook as a platform (Gerlitz and Helmond, 2013) alongside the collaborative logic uniting the organisations under study here allows Liking to be positioned as an affective action representative of positive nomination.

Information exchange: While information exchange is a social tie in the strictest sense, I use public-facing information exchange to relax expressive assumptions that might come with other exchanges of this kind such as gossip. Given its status as a cornerstone of activists' digital communication strategies (see Theocharis, 2013; Tremayne, 2014) and the absence of a technical requirement for, or expectation of, reciprocity (Marwick and Boyd, 2010), I use relationships on Twitter as proxies for instrumental information exchange (also see Bennett et al., 2014 on Twitter as an integrative link that ties together the macro-level structure of multiplex protest networks).

Ultimately, I take what is itself an instrumental perspective on these relations and see them as primarily constituted by what flows through them — news largely propagated by broadcasters (Kwak et al., 2010). This understanding is in line with scholarship approaching Twitter as a tool for direct communication and it is largely coloured by arguments against utopianism around and centrism of online communication platforms relative to social movements and social change (see Diani, 2000) and society more generally (see Mansell, 2012; Morozov, 2011). Essentially, the view of Twitter subscribed to here focusses on the platform's facilitation of weak ties and emphasises its most basic and uncontested dimension — the ability to move information from some content producer to consumer. Note that Twitter's architecture enables actor *i* to follow actor *j*, leading to a situation where actor *i* is automatically presented with all public content produced by actor *j* via her news feeds. While, technically, information flows from *j* to *i*, I retain the direction of these relations as dictated by the platform, i.e., from *i* to *j*, in order to have the network reflect the agency of SMOs in their choice of information sources as opposed to the flow of information.

Activist dependence: As past scholarship on social movement coalitions makes clear, the duality of persons and groups (Breiger, 1974) created by shared allies amongst SMOs is a key component of alliance formation. For organisations dependent upon voluntary work, and thus the commitment of (in)formal membership, the ties created by activists' support of multiple organisations suggest connections stronger than purely instrumental exchange (Baldassarri and Diani, 2007). Following the same rationale for the use of Twitter as a proxy for information exchange, I use co-followers on Twitter as a proxy for individuals' support of multiple organisations. While shared supporters between two SMOs constitutes a bipartite structure, I project these two-mode configurations as valued symmetric relations between two SMOs representative of the number of supporters they have in common. However, assuming that the importance of the raw number of shared supporters between any two SMOs is the same for both parties is unreasonable. I account for this by drawing connections between any two SMOs based on the ratio of their shared supporters to each SMO's total supporters. Specifically, for every dyad, a directed connection X_{ij} is established from *i* to *j* if φ_i — the ratio of *i* and *j*'s shared supporters to *i*'s total supporters — is greater than φ_j (Eq. (1)).

$$X_{ij} = \begin{cases} 1 & \text{if } \varphi_i > \varphi_j; \\ 0 & \text{otherwise.} \end{cases} \quad (1)$$

The assumption here is that when shared supporters represent a sizeable proportion of an SMO's individual supporters this SMO effectively supports those organisations with whom it shares a substantial number of activists.

Co-lobbying activity: Attempts by movement actors to raise awareness and collect allies amongst the political elite as they pursue new policies and legislation are fundamental aspects of movement success (Tattersall, 2010). Joint-meetings with politicians may be viewed as instrumental collaborative ties between SMOs as they jockey for legitimacy and social change. Here I construct a continuous co-lobbying matrix where the scalar at the intersection of the *i*th row and *j*th column is a count of the number of times *i* and *j* have been co-present at ministerial meetings.

[15] A Like between Facebook Pages serves as a type of platform-internal hyperlink. At this time, the list depicting the set of organisations that a focal organisation Likes allows an Internet user to move from the Page of the focal organisation to the Page of some organisation that has been Liked. However, this method of traversing Facebook has not historically been central to user engagement. This is in contrast to the foundational role hyperlinks play in structuring the Web with regard to user experience and the organisation of content.

5.3. Data collection

I use both data mining and the digital archive http://data.gov.uk/ to gather data about the various relationships between SMOs. The hyperlink network was collected in October 2013 by crawling[16] the websites of all 55 SMOs in the HHC and retrieving the direct connections between each of their websites. For the information exchange network and data on the number of co-followers between SMOs, a script was written in Python to interface with the Twitter Application Programming Interface (API) in January 2014. As the Facebook API does not make certain data available, "Likes" on each SMOs Facebook page were manually copied to individual text files and a Python script was used to construct the complete positive nomination network in November 2013. Finally, data on co-lobbying activity comes from publicly available quarterly transparency reports on UK ministerial meetings. Reports for the UK Department of Work and Pensions, the Department of Health, the Attorney General's Office and the Cabinet Office were collected for the year of 2013. These four departments were chosen due to their substantive relevance to the UK anti-health cuts activists, thus allowing data on co-lobbying activity to reflect SMOs' involvement in debates about issues germane to the HHC.

A brief comment is warranted on the differences in time covered by the source data for the five relations. While the information exchange, activist dependence, positive nomination and hyperlink networks are collected very near to one another around the last quarter of 2013, the co-lobbying network is comprised from source material spanning the length of the year. Despite this, co-lobbying is rare and when SMOs do co-lobby, it tends to happen once. Density for the binary co-lobbying network is 0.023. Of the 3025 dyads in the 55×55 weighted co-lobbying adjacency matrix, 42 see one joint-lobbying session, 22 see two joint-lobbying sessions, two dyads see three sessions, and two dyads see five sessions. Given that the majority of non-null dyads saw just one joint-lobbying session across the year it is reasonable to treat co-lobbying dyads as stationary for use as a dyadic covariate in the cross-sectional ERGMs.

Regarding missing data, one SMO did not have a profile on Twitter and two did not have profiles on Facebook, representing missing data at the level of the actor. Given the inability of actors to establish connections with those who do not have profiles on these websites, reconstruction and hot deck imputation, as described by Huisman (2009), are not possible. Favouring a more simple procedure due to the percentage of missingness being quite small (1.8% in the information exchange network and 3.6% in the positive nomination), I employed Huisman's method of imputation using the unconditional total mean of the network (i.e., average tie value over all observed ties). In binary networks this is equal to the density. Using this method, the rounded value of a network's density (0 if density is <0.5) is imputed. Effectively, this treats missing ties as absent in sparse networks and present in dense networks. Collectively, data collection yielded four binary asymmetric 55×55 matrices for alliance, information exchange, positive nomination and activist dependence, and one continuous symmetric 55×55 matrix for co-lobbying. Descriptive statistics for these five networks are given in Table 2.

[16] One may analyse the structure of the web using a program referred to as a crawler. Here, hyperlink networks were extracted from the Web using Issuecrawler (http://www.govcom.org/Issuecrawler_instructions.htm), a server-side, parallel web crawling platform for the social scientific analysis of networks of actors around specific themes and topics. Direct hyperlinks between domains (e.g. http://www.macmillan.org.uk/) were extracted by crawling each domain to a depth of three (i.e. from homepage to all sub-pages (1), to all sub-pages found on level one (2), to all sub-pages found on level 2 (3). A maximum crawl of 1000 urls was set for each domain.

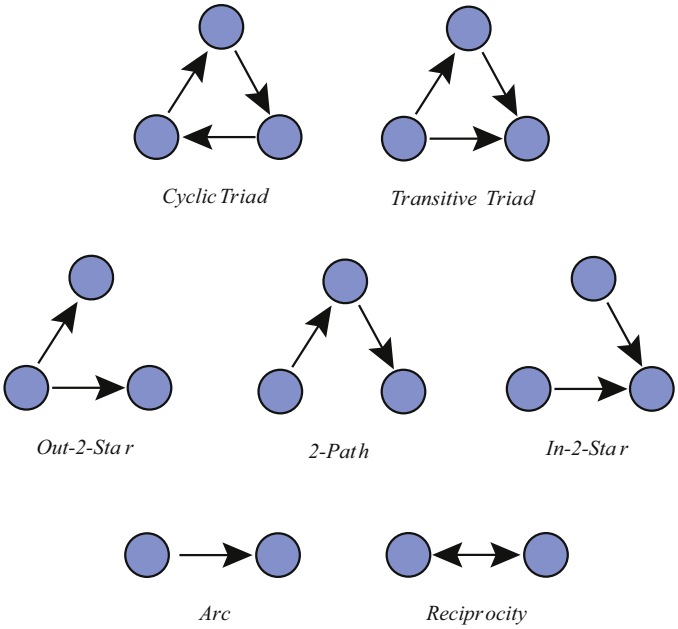


Fig. 3. Hierarchy of lower-order network configurations. From bottom to top, with arcs being the simplest, configurations increase in complexity.

5.3.1. Method: bivariate exponential random graph models

Exponential random graph models are statistical models of network structure which permit inference about how and why ties arise using a number of structural configurations. These configurations are understood to reflect the underlying social processes which create and sustain a social system of interest. I employ bivariate ERGMs to capture processes which span multiple network layers. The importance of a univariate model relative to a multivariate model in this framework deserves further clarification. Recall that ties constitute networks of their own which are superimposed upon one another to create a multiplex system. This requires the joint modelling of each network layer alongside multivariate configurations in order to assess, or rather isolate, the role of multiplexity. Practically, this requires quite complex models. However, a key strength of ERGMs as tools for pattern identification is their ability to allow the researcher to test multiple, sometimes competing, theories of network formation (Monge and Contractor, 2003).

Network configurations are nested, wherein one entails another (e.g., arcs individually compose 2-paths, which both compose a transitive triad; Fig. 3). Substantively, this requires the interpretation of configurations as ensembles which collectively drive the formation of a given network. Functionally, this requires the use of higher-order and lower-order configurations in ERGMs in order to have the most holistic understanding of tie formation.

To this end, ERGMs are used to simultaneous model the alliance network and one of the co-occurring networks where multiplex triadic dependencies are hypothesised to impact alliance formation (positive nomination, instrumental information exchange) in a pairwise fashion. This results in a total of five different ERGMS — three univariate models for the initial exploration of the distinct, simplex logics of alliance, positive nomination and information exchange, and two bivariate models (alliance-positive nomination, alliance-information exchange) which incorporate those configurations found to be explanatory in univariate analyses. Due to space constraints, univariate models for positive nomination and information exchange are not discussed in the main text. Output for these models may be found in Appendix B. ERGMs were fit using PNet (Wang et al., 2008) and XPNet, the bivariate alternative. Note that because these are cross-sectional models, it would be incorrect to say that one type of connection leads to another. In the absence

Table 2
Descriptive statistics.

	Type	Online	Weight	Vertices	Arcs/edges/non-null Dyads	Tie value Min/Max	Density	Average degree	Isolates	Missing vertices
Alliance	Directed	Yes	Binary	55	382	–	0.13	6.9	3	0
Positive nomination	Directed	Yes	Binary	55	173	–	0.06	3.1	16	2
Information exchange	Directed	Yes	Binary	55	1208	–	0.41	22	1	1
Co-lobbying	Undirected	No	Valued	55	34	0/5	0.02	1.2	40	0
Activist dependence	Directed	Yes	Binary	55	1318	–	0.44	24	1	1

of longitudinal data, it is only appropriate to say that there is an association between the two networks, which are assumed to be in equilibrium, in the manner dictated by the network configuration.

As the matrix for co-lobbying is symmetric, associations between this network and alliance are only explored at the dyadic level. This was done as it is not possible to jointly model directed and undirected networks using XPNet. Relatedly, activist dependence is only explored at the dyadic level as it is derived from a weighted symmetric matrix and there is no theoretical impetus for exploration of the larger system that these relations may constitute. In the ERGM specification these two relations are treated as dyadic covariates (see Table 1).

5.3.2. Specification and estimation

ERGMs for social networks take the following general form:

$$Pr(X = x) = \frac{1}{k(\theta)} \exp\left[\sum_{A} \theta_A Z_A(x)\right] \quad (2)$$

(i) $Pr(X=x)$ is the probability of observing the graph that has been measured.
(ii) $k(\theta)$ is a normalising term which ensures that the equation is a proper probability distribution.
(iii) A indexes a potential network configuration, such as an arc, reciprocated dyad, or transitive triad.
(iv) $\sum_A$ is the summation over all different configurations in a specific model.
(v) θ_A is the parameter weighting the corresponding configuration A.
(vi) $Z_A(x) = \prod_{x_{ij} \in A} x_{ij}$ is the general form of a network statistic corresponding to configuration A.
(vii) x is a collection of tie variables $[x_{ij}]$.

Eq. (2) describes a general probability distribution of graphs and is used to determine the particular probability of observing a network. The specific probability of observing any graph $[Pr(X=x)]$ depends upon both the network statistics $[Z_A(x)]$ and the non-zero parameters (θ_A) for all configurations A in the model. For the multivariate case, the network statistic $Z_A(x)$ may be a multigraph defined across ties from M networks such that it takes the following general form

$$Z_A(x) = \sum_{A \in A_k(i,j,m) \in A} \prod x_{ijm} \quad (3)$$

where A_k is a collection of isomorphic configurations, A, of tie-variables and x is a set of tie variables $(x_{ijm}, x \in M)$ across M networks. For directed networks, $x_{ijm} = 1$ if there is a tie from actor i to j in network m, otherwise $x_{ijm} = 0$.

For a detailed account of ERGM estimation and simulation using (X)PNet see Koskinen and Snijders (2013) and Snijders (2002). Upon convergence, model fit was assessed using the statistics proposed by Robins et al. (2009; note XPnet does not use triad census for bivariate models). For fitted statistics, Goodness of Fit (GoF) t-ratios should be less than 0.1 in absolute value, or very nearly so (given the stochastic nature of the goodness of fit process). The model is understood to represent key features of the observed network(s) well if GoF t-ratios for statistics proposed by Robins et al. are less than 2.0 in absolute value. GoF t-ratios larger than 2.0 are understood as being extreme and the model itself is understood to provide a poor summary of these statistics. While one does not expect excellent fit on all statistics, this approach is useful as it details exactly what a particular model can and cannot replicate. In respect of this practice and model transparency, those statistics where GoF t-ratios are greater than 2.0 are listed with their associated t-ratios at the bottom of the table presenting model output under "Extreme Features". The largest absolute value of the GoF t-ratios for fitted statistics are also given in the tables presenting output. Complete GoF results for all possible parameters included in XPNet are all available upon request. See Holland and Leinhardt (1970) for triad codes.

Finally, the complicated structure of the models presented here made convergence difficult to obtain. This required conditioning on the densities of the observed networks as this improves convergence considerably by limiting the distribution of simulated graphs to those with densities equal to those of the observed networks (see Snijders et al., 2006; Snijders and Van Duijn, 2002).

6. Results

6.1. Univariate analysis of alliance

The model summarising processes in the alliance network is given in Table 3. There are strong positive tendencies for SMOs to reciprocate alliances and for allied SMOs to form dense regions of the network. This is coupled with a negative tendency for alternating 2-paths outside of those nested in transitive triads, indicating that SMOs tend to form a direct alliance with those whom they indirectly support. Moreover, results indicate that SMOs tend to form alliances with those whom they are structurally equivalent to based on the receipt of alliances from multiple third others (AT-D). This is alongside a tendency against a SMO allying itself with another SMO when both are allies of the same third others (AT-U). However, there are positive tendencies for these shared out-ties and shared in-ties to persist outside of closed triads as structural holes.

6.2. Bivariate analyses

6.2.1. Bivariate analysis: alliance and positive nomination

The bivariate model for alliance and positive nomination is presented in Table 3. Generally speaking, there were no major changes in the values of the estimates between the bivariate model and the univariate model for alliance. However, the alternating-in-star configuration (A-in-S), used to control from indegree centralisation, does not retain its significance in the bivariate model. Regarding the positive nomination network, specification was altered slightly from the exploratory univariate dimension (Appendix B) for parsimony. Despite being significant, configurations for alternating 2-paths, in-2-stars and out-2-stars were

Table 3
Univariate and bivariate ERGMs.[a,b]

	Univariate		Positive nomination		Information exchange	
	Estimate (θ)	Standard error (s.e.)	θ	s.e.	θ	s.e.
Alliance (A)						
Reciprocity	**0.971**	0.228	**0.797**	0.257	**0.835**	0.255
Sink	1.347	0.717	1.404	0.706	1.087	0.723
Indegree centralisation (A-in-S)	**0.602**	0.299	0.546	0.291	0.192	0.304
Transitive closure (AT-T)	**1.163**	0.125	**1.108**	0.125	**1.048**	0.126
Popularity closure (AT-D)	**0.185**	0.092	**0.280**	0.100	**0.318**	0.094
Activity closure (AT-U)	−**0.255**	0.091	−**0.352**	0.091	−**0.277**	0.073
Alt. 2-paths (A2P-T)	−**0.095**	0.010	−**0.070**	0.013	−**0.056**	0.013
Shared in-ties (A2P-D)	**0.109**	0.019	**0.094**	0.019	**0.103**	0.018
Shared out-ties (A2P-U)	**0.152**	0.010	**0.116**	0.019	**0.083**	0.018
Co-occurring network (B)						
Reciprocity	–	–	0.159	0.396	**1.952**	0.168
Mixed-2-star	–	–	–	–	**0.075**	0.004
Isolates	–	–	**2.628**	0.577	–	–
Transitive closure (AT-T)	–	–	**1.279**	0.204	−0.114	0.150
Cyclic closure (AT-C)	–	–	0.233	0.126	–	–
Popularity closure (AT-D)	–	–	−0.177	0.198	–	–
Activity closure (AT-U)	–	–	−0.342	0.218	–	–
Alt. 2-paths (A2P-T)	–	–	–	–	−**0.046**	0.019
Shared out-ties (A2P-U)	–	–	–	–	−0.057	0.030
Bivariate						
Dyadic covariate: A/activist dependence	–	–	**0.342**	0.095	**0.317**	0.103
Dyadic covariate: A/co-lobbying	–	–	**0.288**	0.111	**0.286**	0.112
Entrainment (Arc AB)	–	–	**1.348**	0.227	**0.886**	0.189
Exchange (reciprocity AB)	–	–	**0.832**	0.236	**0.678**	0.191
Popularity (In-2-Star AB)	–	–	0.027	0.016	**0.077**	0.009
Activity (Out-2-Star AB)	–	–	−0.017	0.012	0.004	0.010
Mixed-2-Star AB	–	–	0.009	0.015	−**0.076**	0.010
Mixed-2-Star BA	–	–	−**0.029**	0.014	−**0.041**	0.010
Multiplex transitive closure (AT-T-BAB)	–	–	−**0.524**	0.123	0.624	0.338
Multiplex cyclic closure (AT-C-BAB)	–	–	−0.194	0.130	0.243	0.322
Multiplex popularity closure (AT-D-BAB)	–	–	**0.218**	0.071	−0.354	0.291
Multiplex activity closure (AT-U-BAB)	–	–	**0.226**	0.084	−0.502	0.323
	Largest GoF *t*-ratio: 0.02 Extreme features: triads — 021C (−2.203), 030T (2.686)		Largest GoF *t*-ratio: 0.09 Extreme features: *None*		Largest GoF *t*-ratio: 0.11 Extreme features: 3-Out-Star B (2.049); AKT-C B (−3.604)	

[a] Bold indicates a significant estimate, i.e., the ratio of θ to the s.e.$_\theta$ is greater than two.
[b] The absolute value of convergence t-ratios for all parameters in all models are less than 0.1, the requirement for convergence (see Koskinen and Snijders, 2013).

removed. These configurations are nested in the triangle variants reflecting the four types of closure discussed in Section 4. Their removal enables a simpler model, allowing one to control for triangulation processes distinct to the positive nomination network in order to isolate those operating across layers. As expected given the large number of isolates (16), results indicate the there is a very strong tendency for SMOs to make and receive zero positive nominations. Moreover, when SMOs positively nominate one another it tends to happen only in transitive triads.

Regarding the multivariate parameters, results collectively indicate a significant relationship between the alliance and positive nomination networks, with eight of the twelve bivariate effects being significantly different from zero. At the dyadic level, positive nomination, activist dependence and co-lobbying are all entrained with alliance. Additionally, there is quite a strong tendency for the exchange of alliance and positive nomination. At the degree level, there are significant associations between the two networks in the form of mixed-2-stars (BA), indicating that organisations who are positively nominated do not tend to form alliances with others. The inverse also applies, i.e., SMOs who form alliances with others tend not to be positively nominated. There is no evidence to suggest that positive nomination of others impacts the likelihood that an SMO will receive allies (mixed-2-stars AB). Finally, three of the higher-order configurations for multiplex triangulation were significant. Results indicate a tendency against the closure of multiple positive nomination 2-paths via an embedded alliance (negative AT-T-BAB). In this scenario, SMOs do not tend to form alliances with those organisations to whom they indirectly express affirmation. This is contrasted with a positive tendency for shared in-ties from third others (AT-D-BAB) and shared out-ties to multiple third others (AT-U-BAB) to lead to alliance formation. In the first scenario, SMOs tend to ally themselves with those whom they are equivalent to with respect to affective support. In the second scenario, SMOs tend to ally themselves with those whom they agree with in their selection of multiple third others for the receipt of affective ties.

6.2.2. *Bivariate analysis: alliance and information exchange*

The multiplex model for alliance and information exchange is also presented in Table 3. As the bivariate models are quite large and internally complex, specification played a central role in achieving convergence. Practically, this sometimes meant reducing the number of configurations at the cost of less than satisfactory fit for not explicitly modelled network statistics, thus representing a limitation of the current specification. To achieve convergence, the information exchange component of the bivariate model was simplified whereby only significant effects from the exploratory univariate model (Appendix B) were retained. Transitive closure was also included as it accounts for triangulation, a key process in social systems. Univariate results indicate a very strong and positive tendency for reciprocity. As expected given the zero-order correlation of the in and outdegree distributions ($r = 0.82$, $p = 0.00$), there is a positive tendency for mixed-2-stars. However, there is a

negative tendency for multiple 2-paths between SMOs, indicative of a tendency for lower-order 2-paths between organisations.

Results of the alliance-information exchange model also indicate that multiplexity plays a notable role in alliance formation. Of the twelve bivariate configurations involving alliance and information exchange, seven were significant. At the dyadic level are significant associations between alliance and activist dependence, co-lobbying and information exchange. Additionally, there is a tendency for the reciprocal exchange of alliance and information. Finally, at the degree level there are also significant associations between the two networks. Results indicate that the same SMOs tend to be information sources and receive allies (positive in-2-star), SMOs that choose others as information sources do not tend to receive allies (negative mixed-2-star AB), and SMOs that are information sources do not tend to form alliances with others (negative mixed-2-star BA). Note that for the negative mixed-2-star effects the inverse also applies, i.e., SMOs that receive alliances do not tend to select other SMOs in the organisational fields as information sources (negative mixed-2-star AB) and SMOs that ally themselves with others do not tend to be chosen as information sources (negative mixed-2-star BA).

7. Discussion

Through his analysis of the interplay between familial and organisational ties Gould (1991) clearly demonstrates the importance of the interaction of multiple networks, both emergent and prescribed, for the organisation of social movement actors. To be sure, "the impact of structure [on mobilisation] cannot even be appreciated without taking multiplexity into account" (Gould, 1991, p. 727). While movement scholars have adopted the most general aspect of his argument (i.e., social ties matter), paradoxically, they have ignored the more intriguing foundation upon which it is built — the integral role of multiplexity in the coordination of social movement actors. This has effectively limited theoretical understanding and empirical insight as to the ways in which networks knit a constellation of political actors together for the purpose of social change. This work is to serve as a corrective to that trend. Results confirm the first hypothesis and provide strong support for the second, collectively indicating that multiplexity plays a distinct role in the formation of alliances between SMOs and is a key mechanism in the structuring of social movement organisational fields. I have shown that there are significant associations between alliance and a series of additional networks at the dyadic, degree and triadic levels. These results suggest that scholarship on movement coalitions has failed to give a thorough account of the precise manner in which social ties matter. Furthermore, the complex and intricate nature of these models also suggests that the metaphors widely used in this body of work are poor representations of the network processes within populations of SMOs.

7.1. Competition and collaboration: a note on the univariate model for alliance

While the crux of this paper is about multiplexity, it is worth setting the stage by commenting on the alliance network itself across the bivariate models. The most striking element of the univariate alliance dimension of these models is that estimates suggest both competition and collaboration between SMOs. On the one hand, reciprocity and transitive closure — configurations work on civic networks has shown to be representative of the integration of the wider organisational field — play very important roles (as indicated by the size of estimates). However, the positive tendency for popularity closure and negative tendency for activity closure suggest a core-periphery structure when interpreted jointly. Estimates for these configurations indicate clustering among SMOs receiving the same organisational allies (positive AT-D) whereas those SMOs that ally themselves with the same multiple third others tend not to form cohesive subgroups (negative AT-U and positive A2P-U). Additionally, results indicate the persistence of structural holes between those SMOs with the same third others as allies (positive A2P-D) over and above the shared in-ties (out-2-stars) nested in closed triangles.

Given the persistence of these structural holes, the tendency for popularity closure may seem peculiar. Alliances themselves are a resource, particularly online where the winning of hyperlinks has implications for organisational success by means of increased visibility (Ackland and O'Neil, 2011), and the boundaries drawn by (not)linking may have direct implications for funding and policy decisions (Young and Leonardi, 2012). Thus popularity closure may be attributed to a form of competitive embeddedness (Trapido, 2007)[17] whereby the likelihood of cooperation increases due to competition between two organisations. Premised on there being no a priori reason to expect that the knowledge gained from competition should be less conducive to cooperation than that resulting from non-competitive exchange, the causal logic outlined by Trapido (2007) states that competition fosters awareness and repeated interaction, which breeds familiarity and trust, which, in turn, leads to cooperation. While movement scholarship has discussed contending hypotheses about how competition and collaboration affect alliance formation between SMOs in the face of scarce resources (c.f. McCammon and Campbell, 2002; Okamoto, 2010), these results indicate that these two processes are not mutually exclusive nor inversely related (as would be evidenced by a negative AT-D estimate) and may operate simultaneously.

7.2. Multivariate models of alliance and co-occurring networks

Exploration of the embeddedness of alliance directly links this work to a long tradition of research in economic sociology and organisational studies on the embeddedness of action, broadly interpreted, in social structure. In line with this work positive nomination, activist dependence, co-lobbying and information exchange were expected to increase the likelihood of alliance formation, understood here to be an instrumental tie (Pilny and Shumate, 2012). Results strongly support the entrainment and exchange of these relations with alliance.[18]

Such a large degree of entrainment suggests that trust, the "open-handed expectations" (Uzzi, 1996; p. 680) bred from establishing new relations alongside existing ties, is a component of alliance formation. Yet alliance may incur costs. Strategic decision-making is a key aspect of collective action. Within individual SMOs, the costs and benefits of establishing coalition relations are weighed, and activists generally understand the trade-offs required to maintain aspects of their individual organisation and establish these collaborative ties (Balser, 1997; Staggenborg, 1986). From this perspective, the layering of an alliance on top of additional relations may also be viewed as an attempt by SMOs to better manage these trade-offs by minimising uncertainty and building alliances with those organisations in whom they have already invested. Indeed, the layering of ties has been empirically shown to reduce

[17] While Trapido advances this concept within the context of inter-firm competition, insights may prove useful for describing competition and collaboration between organisations, broadly interpreted, over various types of resources.

[18] To assess robustness of dyadic conclusions I also ran a logistic regression quadratic assignment procedure (see Borgatti et al., 2013; Dekker et al., 2007). Results (Appendix C) indicate that positive nomination, information exchange and activist dependence are all significantly associated with alliance formation, largely confirming the multiplex dyadic estimates in the bivariate ERGMs.

uncertainty at the dyadic level in networks of advocacy groups (Heaney, 2014).

Despite being beneficial to individual actors, processes at the degree level suggest that such generalised dyadic embeddedness may come at a cost to macro-level cohesion. That SMOs who give information (i.e., are followed) and are positively nominated do not tend to ally themselves with others (negative multiplex mixed-2-star BA) indicates the existence of selectivity in the establishment of alliances based on the receipt of relational resources and entrained alliance. Though the alliances explored here are hyperlinks, the associational calculus driving their formation may be viewed as a dilemma of costs (Shumate, 2012). Hyperlinking to an organisation contributes both to the collective goals of the hyperlink sender and receiver (collective visibility) and to the individual goals of the receiver by contributing to their individual visibility. Yet receiving hyperlinks yields authority, particularly from the perspective of dominant search engines (Rogers, 2013), and receiving hyperlinks without awarding them to others comes with prestige benefits (Kleinberg, 1999) — both potentially garnering more individual visibility and thus more awareness of a particular SMO's grievances and goals. While results pertaining to a lack of indegree centralisation (non-significant A-in-S), a measure of global hierarchy, are consistent with past research concluding that hyperlink networks of SMOs are relatively decentralised (c.f. Ackland and O'Neil, 2011), degree-based processes do suggest local-level hierarchy whereby some SMOs net allies without establishing alliances with other SMOs.[19]

The dilemma of visibility associated with local-level hierarchy has been well documented in work on social movement coalitions around the tension between group cohesion and organisational distinctiveness. Obach (2004, p. 23) labels this tension the "coalition contradiction" whilst Hathaway and Meyer (1993) refer to it as "cooperative differentiation". Regardless, the takeaway is simple — SMOs require some degree of uniqueness to win the resources required to preserve their individual organisations even as distinctiveness weakens their ability to integrate with other organisations and engage in coalition work. Still, there are benefits to be had through cooperation. With the sacrifice of individual visibility social movement organisations may garner legitimacy in new areas and, through coalitions, reach new audiences (Staggenborg, 2010). Drawing on empirical evidence for large tendencies for reciprocity and transitive closure, previous work on online alliances between non-governmental organisations has concluded that the internal costs of losing individual prestige are outweighed by the external costs of disconnection and the overall benefits of collective visibility (Shumate and Lipp, 2008). Indeed, these tendencies are also found here. However, the bivariate models suggest that an overly collaborative view of social movement organisational fields may be spurious, at least online.

To emphasise this point, consider the following scenario between organisations *i*, *j*, *k* and *h* and the intricately nested network configurations they are embedded in. Recall that the multiplex mixed-2-star BA estimates indicate that the receipt of some tie *hi* (positive nomination and/or information exchange) decreases the likelihood of the alliance *ik*. Estimates also indicate a strong tendency for *hi* to be entrained with alliance, which itself tends to be entrained with activist dependence and co-lobbying. Furthermore, consider the multiplex popularity estimate for alliance and information exchange (in-2-star AB) which indicates that *i*'s selection as

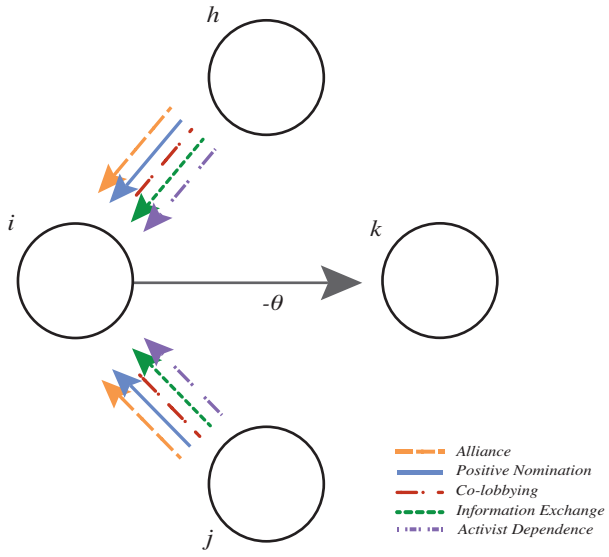


Fig. 4. Opportunistic alliance formation. Here, organisation *i* enjoys the resource-related benefits that come with having a platform for grievances (information exchange), the implicit support of others SMOs (activist dependence), the legitimacy that comes from collective claims making (co-lobbying), votes of solidarity (positive nomination), and increased prestige (alliance) without establishing an alliance to *k*.

an information source by *h* is associated with the alliance *ji*. Next, consider evidence for the entrainment of the alliance *ji* with the other relations under study in the fashion of the *hi* dyad. And, finally, consider related evidence for local-level popularity in the alliance network within triangles (positive shared-out-ties effect), dictating the occurrence of the in-2-star *hij*. Taken together, these processes suggest that some SMOs pool relational resources, whereby they enjoy the benefits accrued from their structural position in the form of having a platform to share grievances (information exchange) and potentially shape broader movement goals and tactics, the implicit support of other SMOs (activist dependence), the legitimacy that comes from collective claims making (co-lobbying), votes of solidarity (positive nomination), and increased prestige (allies), while choosing not to associate themselves with other organisations via an online alliance (Fig. 4).

Substantively, this suggests that some SMOs approach collaboration opportunistically whereby organisational maintenance supersedes the pursuit of group cohesion in importance. Given that the organisations studied here are highly professionalised charities, this is somewhat unsurprising as these entities are in direct competition for visibility and the finite financial and social resources it may yield. While it must be said that the magnitude of the multiplex mixed-2-star and in-2-star effects are quite small across both models, these results do lend further support to the simultaneous operation of cooperation and competition and demonstrate that such behaviour may operate both within and across network layers.

Arguably, the most convincing evidence for the import of multiplexity in understanding alliance formation is at the triadic level as it is here where the relational contexts within which alliance is embedded becomes most evident. As Gulati and Gargiulo (1999) argue, the configurations of relations at the triadic level serve as indirect channels of information and a means of assessing reputation and thus provide cues about the appropriateness of some potential organisational partner. Results indicate that these cues also operate via multiplex triangles and provide strong support for the notion of social movement alliances as structurally embedded in multiple network layers.

The tendency against alliance formation in the presence of indirect nomination compared with a tendency for alliance formation in the face of agreement on and/or co-citation by third others

[19] Specifically, the non-significant A-in-S configuration suggests that star-based tie patterns do not drive indegree dispersion. However, given the large tendency for clustering, there still may be actors with high indegrees in the triangulated regions of the network whereby high-indegrees are precisely the result of triangulation. See Lusher and Robins (2013) for a similar interpretation.

suggest that mirrored selection is a much more potent signal of the suitability of a potential ally than indirect nomination. This may be attributed to information on the appropriateness of a potential alliance partner being much more complete in the agreement scenario due to direct confirmation of expressive similarity. A critical component of movement alliances rests with congruence in identity. Imperfect information around identity may contribute to uncertainty around similarity of values and beliefs. Given that identity may directly influence the patterning of ties in fields of civic organisations (Diani and Pilati, 2013), identity-based ties may be used to judge the appropriateness of alliance relative to collective identity. Furthermore, completeness of information is particularly salient for bureaucratic SMOs, such as those studied here, as these groups typically avoid uncertainty (Morris, 1984).

Given the extensive operation of multiplexity at the triadic level when alliance is in the presence of positive nomination, the lack of a distinct role for information exchange in multiplex closure was surprising. One explanation may lie with the affective nature of positive nomination, making it more apt in facilitating the formation of cohesive subgroups. Specifically, positive nomination and alliance cluster SMOs together whereas the instrumentality of information exchange and alliance make them apt for the union of clusters of SMOs at the macro-level. The duality of alliance is indicative of its ability to feature collaborative and competitive processes. In the context of previous work on micro–macro integration in civic networks, the operation of positive nomination and information exchange in this manner is perhaps to be expected. However, together the composition of effects across the two bivariate models suggest that the task of micro–macro integration is shared not only across multiples types of co-occurring instrumental and expressive ties but that it is also dispersed across multiple levels of multiplex structure.

7.3. Generalisability of results and suggestions for future research

Drawing from work on social movements and inter-organisational networks, I have attempted to theoretically and empirically demonstrate the importance of multiplexity in understanding alliance formation in social movement organisational fields. The work here represents an important first exploration of those cross-network processes that give rise to alliance and the structure of fields of civic organisations more generally. Nevertheless, there are some aspects of this work that deserve mention as they qualify its generalisability.

The most obvious of these qualifications lies with the digital nature of the relations analysed here. While few would dispute the existence of some role played by digital media in social movement mobilisation and organisation, it is important to not overly extrapolate from digital trace data. More work must be done around the co-existence and interaction of online and offline relations between SMOs before definitive conclusions about the importance of multiplexity and the processes I have detailed here can be advanced. Relatedly, I have attempted to extend the notion of coalition relation, specifically alliance, to include hyperlinks. This is not without conceptual caveats. Traditionally, coalition relations are symmetric ties between two SMOs and/or a grouping of multiple SMOs in effort to bring about some change. While results suggest that theories of social movement alliance formation are relevant online, more work is needed on: (a) the degree to which the phenomenology of the establishment of formal alliances coincides with that of hyperlink creation; and (b) the precise manner in which SMOs perceive hyperlinks between themselves and other movement adherents at the organisational level.

Another qualification rests with the use of data on the relational patterns of organisational members of a specific issue campaign as opposed to a comprehensive population of SMOs representative of a large-scale movement. This necessitates further exploration of these issues via comparative analyses of the role of multiplexity in alliance formation across different populations of SMOs in diverse social movements.

The final qualification rests with the choice of model and specification. While the equilibrium assumption of the cross-sectional exponential random graph model is not wholly unreasonable, a longitudinal model of alliance formation is required to detail causality between co-occurring networks and alliance. Furthermore, the ERGMs used here are not social selection models (Robins et al., 2001) in that they only use processes endogenous[20] to the network to explain its formation as opposed to combining endogenous processes and exogenous predictors in the form of actor attributes. The assumption of the former scenario is tantamount to a view of all SMOs in this population as homogenous. Just as in simplex networks, actor attributes may be expected to play a key role in disentangling the formation of multiplex networks as individual characteristics help shape the embeddedness of actors across relational contexts (Zhao and Rank, 2013). However, it would be unreasonable to assume spuriousness of the results here in their absence due to the complex, interdependent nature of networks. Regardless, if social space is inherently dynamic and action is embedded in various network locales (Pattison and Robins, 2002) comprised of multiple network layers then it is the simultaneous interaction of structure and attributes that account for emergent processes in a social setting (Robins et al., 2001). It is this dualism in the operation of social phenomena that makes multiplexity indispensable to structural explanations of social movement processes.

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Appendix A. Some additional notes on hyperlinking as an associational practice

There have been a number of academic conversations about the nature of hyperlinks and the degree to which they are useful as a tool for sociological inquiry. One of the most visible issues is the degree to which hyperlinking is competitive or antagonistic in nature. As with all research, some assumptions have to be made. I have based my interpretation of hyperlinking as collaborative versus hostile largely on the context — relations amongst members of an aggrieved population of professional SMOs with broadly aligned goals. Alternatively, consider the case of tabloid and celebrity gossip websites where one may expect to see both positive and negative commentary on a range of actors and events. In this scenario an assumption of representational communication is much less robust given the sardonic nature of these digital spaces. When ascribing meaning to hyperlinks found in this corner of the Web there is a reasonable expectation that connections are not affirmative, instead potentially being used to connect readers to content, individuals or organisations that are being ridiculed or criticised. In the case of strategic organisational actors, such as a set of NGOs or government agencies, collaborative hyperlinking is a much more reasonable assumption. For a further discussion see Rogers (2013) on the online politics of association.

[20] Mathematically, dyadic covariates are treated as exogenous predictors. Here I mean individual attributes of actors and dyads that are not inherently relational.

Appendix B. Univariate models for positive nomination and information exchange

Univariate ERGMs.[a,b]

	Positive nomination		Information exchange	
	Estimate (θ)	Standard error (s.e.)	θ	s.e.
Reciprocity	0.497	0.369	**2.037**	0.155
Mixed-2-star	–	–	**0.075**	0.004
Isolates	**2.641**	0.552	–	–
Transitive closure (AT-T)	**1.279**	0.194	0.432	0.317
Cyclic closure (AT-C)	0.115	0.123	−0.129	0.285
Popularity closure (AT-D)	−0.173	0.191	−0.182	0.303
Activity closure (AT-U)	−0.233	0.200	−0.258	0.295
Alt. 2-paths (A2P-T)	**−0.110**	0.034	**−0.214**	0.073
Shared in-ties (A2P-D)	**0.116**	0.018	0.147	0.074
Shared out-ties (A2P-U)	**0.114**	0.046	**0.158**	0.074
	Largest GoF *t*-ratio: 0.04 Extreme features: Triad 030T(2.005)		Largest GoF *t*-ratio: 0.06 Extreme features: Isolates (2.633); 2-in-stars (2.046); 3-in-stars (3.048); Indegree Dist. Skew (2.397); Corr. Coef. in/outdegree Dist. (−13.612); Global clustering Ctm (2.241); Triads — 120C (−3.538), 120D (5.477), 120U (3.459), 030C (−3.736), 021C (−2.335), 021U (2.402)	

[a] Bold indicates a significant estimate, i.e., the ratio of θ to the s.e.$_\theta$ is greater than two.
[b] The absolute value of convergence t-ratios for all parameters in all models are less than 0.1, the requirement for convergence (see Koskinen and Snijders, 2013).

Appendix C. Logistic Regression Quadratic Assignment Procedure (LR-QAP) for alliance

Parameters	Coefficient	Odds ratio	*t*-statistic	*P*-value
Intercept	−3.124	0.044	−25.495	–
Positive nomination	1.241***	3.459	7.178	0.000
Information exchange	1.528***	4.611	11.611	0.000
Activist dependence	0.422**	1.526	3.594	0.026
Co-lobbying	0.254	1.290	1.592	0.128

$n = 2970$; permutations: 10,000; Model *P*-value: 0.000; *R*-squared: 0.115.
** Significant at the 95% confidence level.
*** Significant at the 99% confidence level.

Appendix D. List of organisations in the hardest hit campaign

1	Action for Blind People	https://www.actionforblindpeople.org.uk/
2	Action for Myalgic Encephalomyelitis (M.E.)	http://www.afme.org.uk/
3	Action on Hearing Loss/Royal National Institute For Deaf People	http://www.actiononhearingloss.org.uk/
4	Age UK	http://www.ageuk.org.uk/
5	Ambitious About Autism	http://www.ambitiousaboutautism.org.uk/
6	Arthritis Care	http://www.arthritiscare.org.uk/
7	Breast Cancer Care	http://www.breastcancercare.org.uk/
8	British Lung Foundation	http://www.blf.org.uk/
9	Cancer and Leukaemia in Childhood (CLIC) Sargent	http://www.clicsargent.org.uk/
10	Carers UK	http://www.carersuk.org/
11	Child Poverty Action Group (CPAG)	http://www.cpag.org.uk/
12	Citizens Advice Bureaux	http://www.citizensadvice.org.uk/
13	Crohn's and Colitis UK (NACC)	http://www.crohnsandcolitis.org.uk/
14	Cystic Fibrosis Trust	https://www.cysticfibrosis.org.uk/
15	Deafblind UK	http://www.deafblind.org.uk/
16	Disability Rights UK	http://www.disabilityrightsuk.org/
17	Drugscope	http://www.drugscope.org.uk/
18	Every Disabled Child Matters	http://www.edcm.org.uk/
19	Haemophilia Society	http://www.haemophilia.org.uk/
20	Hafal	http://www.hafal.org/
21	Inclusion London	http://www.inclusionlondon.co.uk/
22	Learning Disability Coalition	http://www.learningdisabilitycoalition.org.uk/
23	Leonard Cheshire Disability	http://www.lcdisability.org/
24	Livability	http://www.livability.org.uk/
25	London Advice Services Alliance (LASA)	http://www.lasa.org.uk/
26	Macmillan Cancer Support	http://www.macmillan.org.uk/
27	Mencap	http://www.mencap.org.uk/
28	Meningitis Research Foundation	http://www.meningitis.org/
29	Mind (The National Association For Mental Health)	http://www.mind.org.uk/
30	Motor Neurone Disease (MND) Association	http://www.mndassociation.org/

31	Multiple Sclerosis (MS) Society	http://www.mssociety.org.uk/
32	Muscular Dystrophy Campaign	http://www.muscular-dystrophy.org/
33	National AIDS Trust	http://www.nat.org.uk/
34	National Autistic Society (NAS)	http://www.autism.org.uk/
35	National Deaf Children's Society (NDCS)	http://www.ndcs.org.uk/
36	National Rheumatoid Arthritis Society (NRAS)	http://www.nras.org.uk/
37	National Union of Students	http://www.nus.org.uk/
38	Parkinson's UK	http://www.parkinsons.org.uk/
39	Repetitive Strain Injury (RSI) Action (RSIA)	http://www.rsiaction.org.uk/
40	Rethink Mental Illness	http://www.rethink.org/
41	Royal College of Psychiatrists	http://www.rcpsych.ac.uk/
42	Royal National Institute of Blind People (RNIB)	http://www.rnib.org.uk/
43	Scope	http://www.scope.org.uk/
44	Scottish Association for Mental Health	http://www.samh.org.uk/
45	Sense: The UK Deafblind Charity	http://www.sense.org.uk/
46	Sue Ryder	http://www.sueryder.org/
47	The Guide Dogs For The Blind Association	http://www.guidedogs.org.uk/
48	The Papworth Trust	http://www.papworth.org.uk/
49	The Stroke Association	http://www.stroke.org.uk/
50	The Trades Union Congress (TUC)	http://www.tuc.org.uk/
51	The UK Disabled People's Council (UKDPC)	http://www.ukdpc.net/
52	Transport for All	http://www.transportforall.org.uk/
53	United Response	http://www.unitedresponse.org.uk/
54	Vitalise	http://www.vitalise.org.uk/
55	Welsh Association of ME & CFS Support (WAMES)	http://www.wames.org.uk/

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