Networks, Uncertainty Reduction and Strategic Decision-making in Social Movement Fields

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DECLARATION

I certify that the thesis, presented for examination for the PhD in Social Research Methods at the London School of Economics and Political Science, is solely my own work and that I consider it to be complete and fit for examination.

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My thesis consists of 56,620 words.

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It indeed takes a village.

ABSTRACT

Organisational efforts to bring about social change are riddled with choices. What is the appropriate course of action? Who best to collaborate with? How should finite resources, economic or otherwise, be spent? In this respect, the existence of Social Movement Organisations (SMO) — those entities with goals aimed at changing the state of society or protecting the status quo — is one characterised by great uncertainty. Thus a question of critical import to understanding SMOs' capacity to bring about change is how do they go about bridging information gaps when faced with strategic decisions?

In this thesis I argue that network structure affords SMOs a route to accessing information that may be used to manage uncertainty. My argument is built upon two simple observations: (a) populations of SMOs are constitutive of Social Movement Fields wherein these diverse organisations cooperate, compete and learn from one another through surveillance, comparison and mimicry; and (b) SMOs are embedded in rich webs of relations with peers, both online and offline, that enable and constrain their behaviour by governing access to informational resources that may be used for goal attainment.

The core novelty of this thesis arises from my recasting of SMOs' strategic actions as types of relationship formation in inter-organisational network scenarios that are comparatively overlooked — namely, multiplex and bipartite networks. This approach has the appealing property of making clear the effect of SMOs *on each other* — a key aspect of the institutional perspective on which this work is built — whilst also allowing me to more squarely address how network structure might guide action. Analytically, this leads me to focus on those micro-level network locales, i.e., the "local neighbourhoods", within which SMOs are embedded (e.g., triads) as they relate to tie formation *vis-á-vis* uncertainty reduction.

Methodologically, this thesis is also designed to demonstrates the sociological power of statistical models of networks in investigating the dynamics of social movement fields. The core strength of these models is their realistic handling of the constraints/benefits of social actors' structural positions with respect to their behaviour. This is in stark contrast to the variable-centred (i.e. atomistic) statistical frameworks typical of sociological studies of SMOs (e.g., OLS or logistic regression) which fail to account for these organisations' interdependence and thus provide poor representations of their agency as strategic actors.

Empirically, this work consists of three contained case studies of strategic action: (a) a longitudinal study of tactical implementation in the Palestinian National Movement; (b) a longitudinal study of financial patronage in the US Climate Change Countermovement; and (c) a cross-sectional study of online alliance formation amongst organisational members of the Hardest Hit Coalition, a UK-based anti-austerity issue campaign. Results overwhelmingly support my assertions that information useful in managing uncertainty with respect to strategic action is encoded into oft overlooked network structure. Extant sociological work has simply missed a number of interesting, sometimes counterintuitive, dynamics of Social Movement Fields.

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KEY ACRONYMS

SNA | Social Network Analysis

ERGM | Exponential Random Graph Model

SAOM | Stochastic Actor-Oriented Model

SMO | Social Movement Organisation

SMI | Social Movement Industry

SMS | Social Movement Sector

CHAPTER I

A "Bottom-Up" Approach to Social Movement Fields

Organisational efforts to bring about social change are riddled with choices. What is the appropriate course of action? Who best to collaborate with? How should finite resources, economic or otherwise, be utilised? In this respect, the existence of Social Movement Organisations (SMOs) — those entities with goals aimed at changing the state of society or protecting the status quo (Zald and Ash 1966) — is one characterised by great uncertainty. Thus a question of critical import to understanding these organisations' *capacity* to bring about change is how do they go about managing uncertainty when they must make strategic decisions?

In this thesis I argue that network structure facilitates surveillance and comparison within populations of SMOs and thus affords these organisations one route to accessing information that may be used to manage uncertainty (see Burt 2000). My argument is built upon two interlinked premises. The first is that populations of SMOs are constitutive of organisational fields within which actors cooperate, compete and learn from one another (Diani 2013; Larson and Lizardo 2015; Meyer and Staggenborg 2012; Minkoff and McCarthy 2005; see also DiMaggio and Powell 1983). Secondly, it follows that SMOs are embedded in rich webs of relations with peers, both online and offline (Diani 2000), that enable and constrain their behaviour by governing access to informational resources — the knowledge capital on which SMOs draw for organisational maintenance, mobilisation and goal-attainment (Cress and Snow 1996).

Here I start from the assumption that *social movement fields are manifest as inter-organisational networks* and thus this thesis is centrally focused on patterns of relations at the level of individual organisations. Accordingly, my empirical task it to demonstrate how, precisely, network structure might function to allow SMOs to bridge information gaps with respect to strategy. To do this, I take a novel analytical approach by recasting SMOs' strategic actions as types of relationship formation in various inter-organisational networks. This approach has the very appealing property of making clear the effect of SMOs *on each other* — a key aspect of the institutional perspective on which this work is built — whilst also allowing me to more directly address how network structure enables and constrains behaviour.

The core strength of this approach is the more realistic treatment of the various choices SMOs face and, by extension, their agency as strategic decision-makers (see Jasper 2004). This is in great contrast to the majority of work in social movement studies, as well as lay discourse, which tends to erroneously reify social movements as phenomena with no distinct components — if their constitutive parts are acknowledged at all. As Rucht (2004) argues, "it is time to abandon the simplified image of a two-party struggle between a (unified) movement and its (unified) opponent acting in some kind of a social vacuum...[as] social movements are internally differentiated actors operating within complex social settings..." (p. 197). Ultimately, one may only address those dynamics internal to social movements (here, the antecedents of strategic action) through reference to a constellation of adherents tied by various relationships, making networks a powerful mode of investigation.

I.1 A Systems Approach to Social Inquiry[1]

While the primary focus of this thesis is uncertainty reduction in the context of of social movement strategy, a secondary theme is the utility of the theories, methods and models of social

[1] Global refers to dynamics at the population level and local refers to micro processes at the level of interaction between individuals and their proximate other. Here, "global" and "macro" in addition to "local" and "micro" are used interchangeably.

network analysis (SNA) when studying populations of SMOs. Accordingly, I provide rationale for my epistemological commitment to what might be called "systems thinking" (see Cederman 2005). Given that I have assigned networks the most central explanatory role in this thesis, this discussion is also motivated by the very practical question of how to best study their dynamics.

Assumptions of linearity, both implicit and explicit, often accompany descriptions of social phenomena (see Abbott 1988). Yet, social dynamics exhibit a complexity that is qualitatively different from that of linear systems (Lopez-Paredes, Edmonds and Klugl 2012). For sociologists, this assumption often coincides with a view of the social realm as: (a) a deterministic system wherein institutions and norms constrain individual behaviour from the top down (Macy and Willer 2002) or; (b) a co-deterministic system wherein individuals shape social institutions while at the same time being constrained by them (Dépelteau 2008; Giddens 1984). Nonetheless, there is growing acknowledgement by analysts that the social world is highly complex, non-linear and self-organising (Cederman 2005; Salgado and Gilbert 2013; Hedström and Bearman 2009; Lazer et al. 2009; Macy and Willer 2002). Largely united under the umbrellas of complexity science, computational social science or, more specifically, computational sociology, scholars in this tradition deal explicitly with the interdependence of social actors and take a "bottom up" approach by investigating macro-social phenomena as emergent properties of micro, i.e., local-level interactions.

Analytically, this thesis is very much a part of this tradition. Specifically, this work is guided by the principles of Analytical Sociology (Hedström and Bearman 2009). This *mechanism-based* form of explanation is characterised by a variant of Max Weber's (1968) methodological individualism (See Haines 1988 for a review within the context of SNA) known as structural individualism — a doctrine which holds that the structure and change of social phenomena may be explained as the intended or unintended outcomes of individuals' actions. In accordance with this doctrine, *significant explanatory importance is attributed to the structures within which individuals*

are embedded (Hedström and Bearman 2009).[2] While there is no precise definition of "mechanism" within this framework, underlying its many conceptualisations is a focus on explicitly analysing observed regularities — here, network structure — by outlining, in detail, the manner in which they emerge (Hedström and Bearman 2009). Though I take up a network perspective, this is not a requirement of analytical sociology.

Furthermore, I note that here "emergence" exclusively denotes *weak emergence* as opposed to *strong emergence*. In the case of the latter, higher-level phenomena arise from lower-level phenomena but the properties of higher-level phenomena *cannot* be reduced to those at the micro-level. In contrast, weakly emergent higher-level phenomena arise from those at lower levels (and may also be unexpected given lower-level phenomena), however they are explicable from micro-level dynamics (see Chalmers 2006).

Given a "systems" (i.e., relational) orientation, it should come as no surprise that there is a need for concepts, theories and tools that are distinct (see Dépelteau 2008; Emirbayer 1997, Wellman 1983). While point metrics found in social network analysis (e.g., degree centrality) have been embraced by scholars of social movements, these metrics has historically been fed back into variable-centred regression frameworks (c.f., Wang and Soule 2012). To avoid such atomistic analysis, I exclusively employ statistical models for social networks (see Snijders, 2011 for a review) — namely, the cross-sectional Exponential Random Graph Models (ERGMs; Lusher, Koskinen and Robins 2012) and Stochastic Actor-Oriented Models (SAOMs; Snijders, van de Bunt and Steglich 2010), a longitudinal model for network dynamics. Generally speaking, ERGMs and SAOMs enable inference about how and, to some degree, why ties form in networks. The backbone of statistical inference when using these models consists of network statistics — micro-level networks configurations (i.e., small sub-graphs; also "network motifs") reflective of the "local neighbourhoods" (Pattison and Robins 2002) within which actors are embedded (e.g., triads).

[2] Throughout this thesis, structure is simply understood as the presence of regular patterns in the relationships between a set of social actors (Wasserman and Faust 1994) unless otherwise noted.

Critically, network statistics are understood to reflect the underlying social processes which lead to tie formation and are thus sites for theorising social action. More widely, ERGMs and SAOMs allow one to flexibly specify modes that feature multiple, potentially competing, social processes through simultaneous use of multiple network statistics. This enables models to holistically capture the emergence of some social system of interest. With respect to the remit of this thesis, network statistics are sites for theorising and testing hypothesised institutional action mechanisms in relational scenarios. Thus the configurations themselves are the focus of my arguments about uncertainty reduction in social movement fields.

I.2 Case Studies of Social Movement Strategy

To investigate whether or not network structure plays a role in the strategic decision-making of SMOs, I have carried out three case studies of network structure and the formation of one of three distinct strategic actions integral to SMOs' capacity to bring about social change. The first paper (Chapter II) explores how SMOs decide which tactics to implement. Dominant explanations of tactical choice in sociology fail to account for the temporal dimension of SMOs' relationships with tactics (i.e., initial versus continued use) and are silent on how SMOs manage an array of options. In contrast, I exploit the duality of strategy — the fact that SMOs implement one or more tactics from a set — to theorise and model tactical implementation as a process of active tie formation in an evolving bipartite graph.

Utilising 18 years of data on the implementation of 13 tactics by 31 organisational members of the Palestinian National Movement, I find evidence of peer referral — a heretofore undocumented means of uncertainty reduction in social movements. For two SMOs simultaneously implementing the same tactic, this dynamic sees one SMO actively mimic the other to implement a second, previously unused, tactic. This process serves to doubly interlock tactical repertoires and thus reinforce tactical overlap. While extant research on competition in social movement fields suggests that SMOs will ultimately dissolve double tactical interlocks to distinguish themselves

from niche-based peers, I find that these structures are enduring and likely the result of SMOs' attempts to avoid illegitimacy by violating institutionalised norms about how to "do" contention.

The second paper (Chapter III) explores the network-based determinants of alliance formation amongst a group of 55 health-related SMOs mobilised against austerity policies in the UK. In the paper, I investigate how the patterning of ties in co-occurring online and offline networks (e.g., hyperlinks between SMOs' webpages; ties on Twitter and Facebook; joint lobbying of UK MPs) combine to provide SMOs with information useful in their attempts to judge the suitability of a potential ally — a core component of social movement strategy. Results indicate that multiplex triads, i.e., triangles composed to two *different* types of ties (here, expressive and instrumental ties), play a key role in the formation of online alliances. Furthermore, results suggest that competitive pressure may lead some SMOs to pool resources flowing through the network at the cost of facilitating macro-level cohesion through forming alliances with peers online. This has the unfortunate effect of adversely impacting movement strength to the extent that it is related to the construction of a unified digital collective.

The final paper (Chapter IV) takes a slightly wider focus to explore the resource-related co-dependence of SMOs (i.e., producers of solutions to social problems) and grant-giving foundations (i.e., consumers of those solutions). Extant models of the financial patronage of SMOs by private foundations exclusively use population density to account for competition. However, density fails to reveal how SMOs win grants whilst neglecting the strategic decision-making of foundation-investors — a type of SMO in their own right. In the paper I recast patronage as a mutualistic network represented by a dynamic bipartite graph wherein SMOs and foundations cooperate across class whilst SMOs compete within class for financial support. In this network, a SMO's competitiveness rests with its position in a network-based prestige hierarchy and a foundation's propensity to invest is mediated by its structural position within the grant market.

While previous research has predicted a positive monotonic relationship between status and patronage, using SAOMs I find a tendency for status-based disassortativity in the mutualistic

system such that high-status foundations prefer to invest in low-status SMOs. I attribute this counterintuitive finding to foundations' preferences for grantees that can innovate around social problems. Relative to their peripheral counterparts, well-funded SMOs may suffer a rigidity of goals due to the risk of alienating an existing support-base through organisational change. Data consist of 3,261 grants given from 2003 to 2007 by 136 private foundations to 66 SMOs loosely mobilised against the notion of anthropogenic climate change.

I.3 Setting the Stage

Before advancing, it is necessary to mention a bit about the structure of this document. Chapters II, III and IV are each fully-contained pieces of academic work, with chapters III and IV already published as stand-alone articles. However, collectively, they firmly accord with the central question of this thesis, i.e., how, precisely, might networks allows SMOs to manage uncertainty when making a strategic decision? Note that each paper extensively reviews relevant literature from sociology, organisational studies, public administration and network science to advance theoretically grounded hypotheses for empirical assessment.

Finally, it is necessary to explain how I conceptualise "Social Movement Organisation" so as to draw a line between what, at first sight, will surely seem like heterogeneous entities across the three cases. A number of different organisational actors independent of government operate to bring about — or prevent — social change with the most popular nomenclature, among others, being "nonprofits", "interest groups", "NGOs" and "social movement organisations." To be sure, there is some difficulty in drawing clean conceptual boundaries between each type of organisation. Accordingly, Andrews and Edwards (2004) attempt to unify diverse bodies of work across the social sciences devoted to organisations working for or against social change by adopting the term "advocacy organisation" — entities that "make public interest claims either promoting or resisting social change that, if implemented, would conflict with the social, cultural, political, or economic interests or values of other constituencies and groups" (p. 481; see also Knoke 1986 on

"associations" and "interest groups"). While this thesis is deeply rooted in social movement studies, this wider vantage point on advocacy and social change has very much shaped this work. This is most evident in my drawing on a wider conceptual toolkit (e.g., insight from work on public administration and nonprofit accounting) for theorising the strategic behaviour of SMOs.

CHAPTER II

The Duality of Strategy and Institutional Constraints on Tactical Choice

Social Movement Organisations (SMOs) may take a number of routes in their pursuit of social change. Scholars have traditionally focused on diverse forms of protest such as sit-ins (Andrews and Biggs 2006), boycotts (King 2011) and strikes (Biggs 2005). However, movement adherents have at their disposal less contentious tactics such as lobbying (Will and Meyer 1993) and running for elected office (Kurzman and Türkoğlu 2015), discursive manoeuvres such as the distribution of propaganda and counter-spinning (Cammaerts 2012), self-harming actions such as suicide (Biggs 2013) and violent tactics such as the destruction of property and life (Beck 2008; Luft 2015). Despite extensive work on the effectiveness of tactics (McAdam 1983), the repertoires they constitute (Tilly 1978; 1993; Traugott 1995) and their effect on movement success (e.g., Taylor et al. 2009), there has been surprisingly little direct, systematic exploration of the process by which SMOs choose from a set of heterogeneous tactics.

Will a chosen tactic be successful? How will it be received by the state? How is it regarded by similar others? These questions underscore the costs-benefit analysis and the weighing of options inherent to tactical implementation (Klandermans 1984; Walker, Martin and McCarthy 2008) — though this is not to imply that SMOs are always rational (Larson 2013; Jasper 2004). Regardless, these questions highlight the risks associated with tactical implementation (e.g., failure,

unintended state response or retaliation, illegitimacy) and the importance of SMOs' perceptions of tactical efficacy (Kadivar 2013). While movement actors are likely to believe their choice of tactics to be effective, such beliefs are based on incomplete information (Larson 2013). Thus an empirical puzzle of critical import to the study of social movements is how SMOs bridge information gaps to manage uncertainty about the viability of tactics.

Here I adopt a cultural perspective that sees tactical choice as a process involving "gathering, interpreting, and evaluating information within contexts that may be changing, uncertain, and even contradictory." (Larson 2013:869). More specifically, I join a chorus of scholars to maintain that institutional processes shape SMOs' perceptions of tactical efficacy by incentivising surveillance, comparison and mimicry within organisational populations as a means of managing uncertainty (DiMaggio and Powell 1983; Larson and Lizardo 2015; Strang and Meyer 2003). Importantly, this perspective avoids both under-socialised and prescriptive explanations of strategy (i.e., "terrorist" versus "peaceful" organisations) whilst highlighting the importance of perceived tactical efficacy and the actions of peers.

Extant research in this tradition has already yielded great insight into the growth and adaptation of tactical repertoires, most notably work on tactical diffusion (Biggs 2013; McAdams and Rucht 1993; Meyer and Whittier 1994; Soule 2004; 1999; 1997; Strang and Soule 1998; Whittier 2004; Wang and Soule 2012). However, I argue that an overlooked aspect of social movement organisational strategy is its duality — the fact that SMOs continuously select from a set of distinct, though not necessarily orthogonal, tactics (see Asal, Conrad and White 2014; Asal et al. 2014; and Ennis 1987 for similar arguments). Starting from a perspective that: (a) sees SMOs' repertoires as shifting portfolios of tactics that represent stocks of specialised knowledge (Wang and Soule 2012)[3] and (b) sees tactics as distinct cultural objects that sit in relation to SMOs (Ring-

[3] This usage of "tactical repertoire" is very different from Tilly's (1978) usage of the term, which described all of the tactics available for social movements in a given time and place. Here, I exclusively make use of Wang and Soule's (2012) conceptualisation of portfolios of tactics at the organisational level. Relatedly, here "tactic" refers to those small-scale and intentional efforts to articulate claims and demands (see Nella and Van Dyke 2004) whereas "strategy"

Ramirez, Reynolds-Stenson and Earl 2014), this duality emerges from the intersection of repertoires at the level of social movement industries and social movement sectors.[4] In this respect, populations of SMOs are sites of colliding tactical repertoires which individually represent egocentric networks of SMOs' immediate ties to tactics (i.e., a one-step neighbourhood) and collectively constitute a bipartite network of SMOs indirectly tied by their simultaneous implementation of one or more tactics.[5]

As implementation of a tactic by a SMO represents a vote of confidence in the utility of that tactic, I argue that the structural position of SMOs in the SMO-Tactic bipartite network affords access to information that may be used to manage uncertainty when deciding which tactic to implement (see Burt 2000). Of particular interest here is the process of positive feedback (Biggs 2005; 2003) through which a SMO's perception of the efficacy of and risk associated with a given tactic is recursively shaped as tactics are continuously (re)implemented across the organisational population. Fundamentally, this shaping functions by transforming SMOs' expectations which, in turn, induces modification of repertoires by those SMOs that have the opportunity to act, beginning the process anew.[6]

To be sure, the notion of intersecting or, rather, *overlapping* repertoires is not new, neither at the level of individual SMOs (Wang and Soule 2012) or whole movements (Olzak and Uhrig 2001). However, approaching overlap as constitutive of a dynamic bipartite graph invites novel analysis of the manner in which SMOs select from a set of interdependent tactics by shifting focus to the contextual nature of their strategic decisions — a prerequisite for dealing explicitly with the agency

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denotes large-scale, multidimensional plans about how movements might ultimately achieve their goals (see Meyer and Staggenborg 2012).

[4] A social movement industry is the set of all SMOs "that have as their goal the attainment of the broadest preferences of a social movement" (McCarthy and Zald 1977:1219). A social movement sector is the aggregation of all SMIs in a given place at given time. Here, SMOs are understood to be organisations with goals aimed at restructuring society, changing the state of a group of individuals and/or maintaining the status quo (Zald and Ash 1966).

[5] While work on diffusion has been foundational to understanding the micro-level dynamics of the portability of strategy, it is limited by its singular focus on tactical adoption, i.e., the *initial* uptake of a behaviour, as opposed to repetition of behaviour through time. Biggs (2013) provides an extended discussion of these differences.

[6] The process by which SMOs choose and ultimately implement a tactic are, arguably, distinct, such that there may be elapsed time between initial selection and implementation. Relatedly, there may be tactics that were selected but were never implemented. Notwithstanding, for analytical simplicity and due to the use of observational data on implementation, I treat selection and implementation as coterminous and use the two terms interchangeably throughout.

of SMOs (Jasper 2004). Nonetheless, some repertoire overlap is a forgone conclusion — if only because analysts are more likely to recognise some organisational behaviour as a "tactic" when it is used by multiple SMOs. Further still, one can reasonably expect any two SMOs to be engaged in consciousness raising or some form of protest, what some have called the defining feature of social movements relative to routine political action (Taylor and Van Dyke 2004). Thus I explore the role of network structure in shaping SMOs' propensity to implement tactics by advancing, and making a first attempt at answering, the much more interesting research questions of: (a) under what conditions do SMOs exhibit a preference for moving beyond initial tactical overlap by *choosing to reinforce* the intersection of their tactical repertoires?; and (b) should SMOs decide to reinforce tactical overlap, do they also *actively preserve* such reinforcement over time as opposed to moving to distinguish themselves from peers? Together, these questions simply ask where does tactical overlap come from and what might sustain it?

In the spirit of analytical sociology (Hedström and Bearman 2009), I investigate the reinforcement and durability of tactical overlap by focusing on a micro-level dynamic new to social movement studies that is posited to help drive the the evolution of the SMO-Tactic bipartite network. Specifically, I examine SMOs' preferences for the creation and dissolution of *double interlocks* (Koskinen and Edling 2012). These bipartite network structures, also known as four-cycles (Pattison and Robins 2002; Robins and Alexander 2004), see two SMOs implement the same two tactics. With regard to their appropriateness as sites for examining tactical overlap, double interlocks are the most local form of redundancy in bipartite networks and the simplest biclique (Borgatti and Everett 1997).

For the purposes of answering my research questions, tactical overlap is recast as the number of simple interlocks (i.e., two-stars) between two SMOs. By investigating SMOs' preferences with respect to double tactical interlocks, I am able to outline what role, if any, network structure plays in guiding tactical implementation. Ultimately, my research questions are principally a matter of network closure, or moving from the intermediate three-path to the four-cycle (Figure I).

Indeed, double interlocks are somewhat analogous to the triangle in a one-mode network (i.e., the simplest one-mode clique save the foundational single edge), driving clustering in both bipartite networks (Robins and Alexander 2004) and their unimodal projections (Koskinen and Edling 2012).

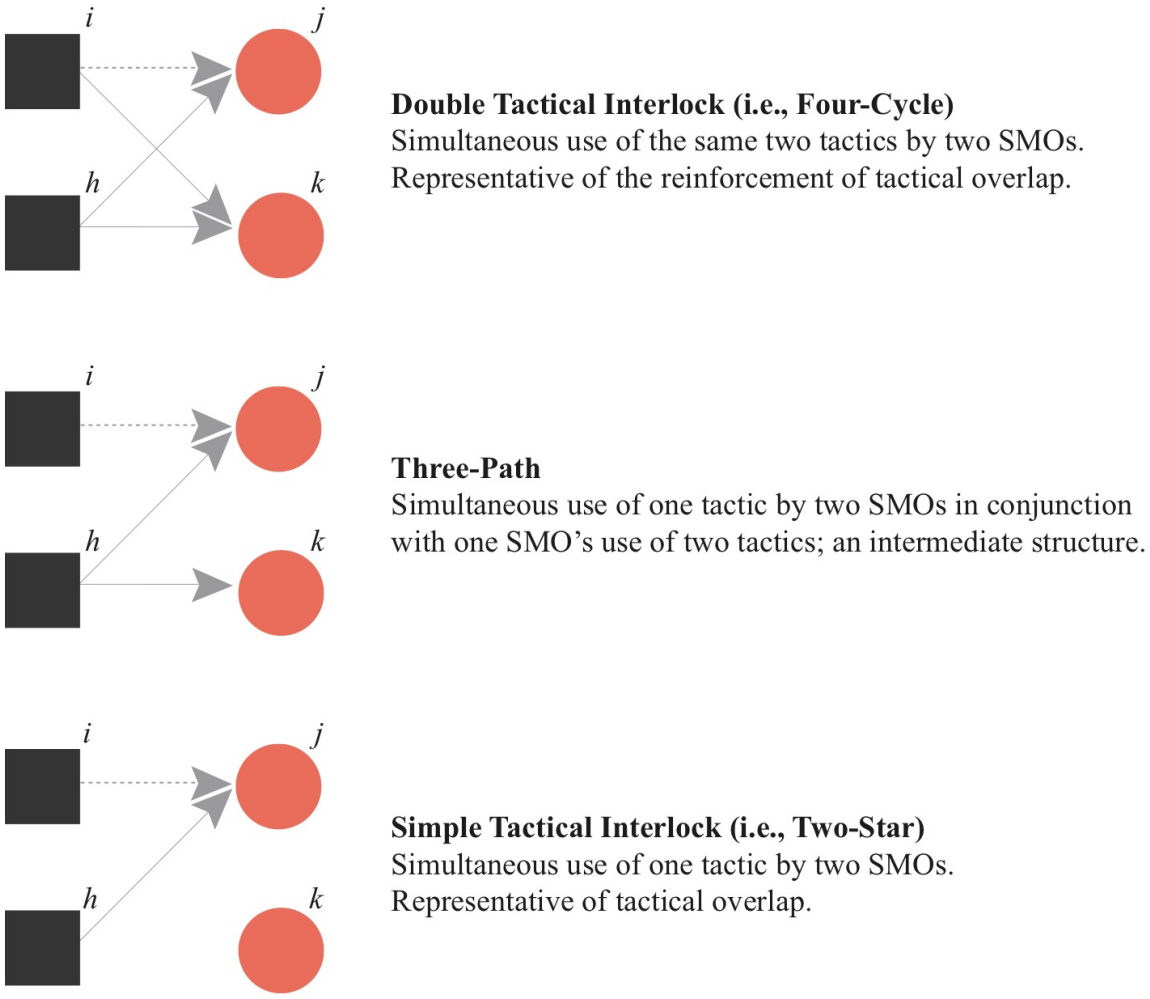


Figure 1 | The double tactical interlock and its lower-order (i.e., nested) configurations. Squares represent SMOs and Circles represent tactics. Solid arrows represent the state of the network at time *t*. Dashed arrows represent a hypothetical tie change as the network evolves to its state at t^{+1}.

The empirical scenario consists of the implementation of 13 tactics, both contentious and institutionalised, by 31 organisational members of the Palestinian National Movement operating within and across the Palestinian Territories, Lebanon and Jordan between 1987 and 2004. The Palestinian National Movement serves as an especially useful case study given its diverse organisational actors that have historically favoured a wide-range of tactics. Furthermore, mobilisation in oppressive states is an ideal scenario for the exploration of organisations' attempts

to manage uncertainty as the risks of tactical implementation are magnified, such that even peaceful contention may prove fatal.

II THE DUALITY OF STRATEGY

While tactical choice is intentional and strategic, tactics are also vehicles for communicating collective identity (Taylor and Van Dyke 2004; Taylor, Rupp and Gamson 2004) and a means of building boundaries amongst collective actors (Klandermans and de Weerd 2000; Taylor 1998). In this respect: (a) tactics are best positioned as distinct cultural objects with which SMOs establish relationships (e.g., Irish feminists' "abortion boats" [Taylor 1998], the LGBT community's "drag shows" [Taylor et al. 2004]); and (b) the interlinking of tactics constitute a larger meaning structure of interdependent practices (see Mohr 1998).

Utilising principle component analysis, Ennis (1987) provides an early example of the utility of the formal modelling of the relationships between tactics. In his framework, tactics are embedded in a latent space and are positioned next to one another through co-occurrence, which he suggests indicates activists' perceptions of similarity. More recently, Ring-Ramirez et al. (2014) directly analyse the network created from the co-deployment of tactics at protest events with blockmodels to show how structurally equivalent tactics occupy distinct roles (e.g. public disruption vs. outright violence). Such roles are shown to be indicative of shared meaning and cultural logics of compatibility.

Here I advocate for a different approach to the structural analysis of SMOs and tactics. Both Ennis and Ring-Ramirez et al. are concerned with theorising and empirically analysing tactical repertoires as lattices of interconnected behaviours, ultimately using such structures to make indirect inferences about choice of tactics. Instead, I adopt a perspective at the intersection of cultural sociology and social network analysis to underscore the process of choosing cultural objects and how it might be guided by network structure (see Breiger and Puetz 2015; Polletta 2004). Specifically, I take a step backward to focus directly on the system produced by colliding

tactical repertoires. In the language of graph theory, a bipartite graph of SMOs and tactics is produced when organisational members of set *A* each implement one or more tactics from set *P*. Work in the style of Ennis and Ring-Ramirez et al. focuses on the unimodal projection of this *AP* structure as *PP* — a network of tactics tied by the number of SMOs that jointly implement them.[7] Cognate work, whether directly or indirectly, has vigorously explored features of the converse unimodal projection *AA* in work on SMOs and the number of tactics they share (e.g., Olzak and Unrig 2001; Wang and Soule 2012).

As analysts of networks have long argued, the duality inherent to social structure raises a number of challenges when attempting to prioritise one node set over another (Breiger 1974; Breiger and Pattison 1986). More problematically, projection of bipartite networks leads to a loss of valuable information and can be shown to produce spurious results in analyses of unimodal projections (see Borgatti and Everett 1997; Newman et al. 2001). Thus I follow Breiger et al. (2014; also see Breiger 2009 and Goldberg 2011) to view actors' positions in an "intersecting lattice of variables" (p. 24) as inherently interesting even though it exists on an alternative plane of social interaction from direct connections between actors (e.g., through information exchange). Ultimately, I preserve the integrity of the *AP* structure for both theorising and analysis to reposition "repertoires" as a SMO's configuration of immediate ties to tactics in this structure. This allows me to use the SMO-Tactic network to explore the *antecedents* of tactical overlap, whereas previous research focuses exclusively on its effects (e.g., Jung, King, Soule 2014; Wang and Soule 2012; Olzak and Unrig 2001). This presents tie formation in the bipartite network, i.e., *the manifestation of choice*, as the empirical puzzle to be explained.

[7] Work on protest events suffers from the same issue, i.e., projection of a bipartite network of events and tactics to a network of tactics tied by the number of events at which they co-occur (e.g., Ring-Ramirez et al. 2014).

III. LOCALISED POSITIVE FEEDBACK AND THE REINFORCEMENT OF TACICAL OVERLAP

In answering my research questions, I draw on the notion of *positive feedback* (Biggs 2005; 2003) — a type of of self-reinforcing process that "feeds on itself to the point where there is a continual increase or decrease of some variable, and there is no true point of equilibrium" (Boulding 1968:103). More concretely, I argue that the SMO-Tactic bipartite network is characterised by positive feedback such that implementation of a tactic at time t encourages its further implementation at time t^{+1}. While it may be "attractive to treat each decision about an issue, tactic, or alliance as discrete, the choices of the past heavily constrain present possibilities." (Meyer and Staggenborg 2012:4). Thus path dependency, both temporal and structural, may lead a SMO to favour (avoid) use of a tactic due to the action (inaction) of its peers.

As a process, positive feed back has the very appealing property of capturing inspiration for action via the transformation of SMOs' expectations. When faced with uncertain outcomes and competing options, the actions of others provides critical information. For a witnessing SMO, implementation of some tactic, in and of itself, by peers suggests the possibility of favourable outcomes. Further still, witnessing actual outcomes is invaluable, again providing key information that allows a SMO to calibrate its own expectations of success or failure. These two modes of inspiration are rooted in the idea that an actor may act simply because others have done so (Biggs 2003; see also Koopmans 2004).[8]

Use of positive feedback as a lens through which to view tactical implementation is strongly supported when considering tactical overlap as a form of cultural similarity (Jung et al. 2014) and how it might function as a means of surveillance, information exchange and uncertainty reduction (see Soule 1997). The tactics employed by social movements are a major dimension of their culture

[8] Biggs (2003) maintains that movement actors do not continuously decide on whether or not to employ a tactic and thus action by other groups presents tactics for initial consideration. In contrast, I view SMOs as strategic actors who do indeed periodically survey the state of the composition of their tactical repertoire and who also may be encouraged to focus more directly on a specific tactic given the behaviour of peers. The difference in interpretation of positive feedback here is likely due to Biggs' focus on the collective mobilisation of *individuals* as opposed to organisations.

such that tactics emerge as symbols of the movement itself (Polletta and Jasper 2001). For example, consider the ecological sabotage of Earth First! (Balser 1997), the Freedom Rides carried out by the Congress of Racial Equality and the Student Nonviolent Coordinating Committee or, in stark contrast, the cross-burnings of the Ku Klux Klan. As SMOs become increasingly coupled via the use of similar tactics, they become primed for sharing knowledge (Jung et al. 2014; Wang and Soule 2012). Thus to the extent that tactics are catalysts for the formation of collective identity and shared meaning, the *formation* of double interlocks represents an opportunity for SMOs to subscribe to an institutional movement logic (IML; Larson and Lizardo 2015) — the "cultural template embedded in the practices and relations of social movement actors that provide them with a focus of attention, source of meaning and identity, and vision of how to 'do' contention." (p. 62). Critically, these logics stem from inter-organisational comparison and are rooted in the selection and combination of key organisational elements, namely, issues, targets and tactics. By extension, the *preservation* of double tactical interlocks represents SMOs' adherence to field-based norms of legitimate strategic behaviour and their attempt to avoid penalization from peers by deviating from that which is expected (Polletta, 2004, Blee 2013). This leads me to advance the following hypotheses (see Figure 1 for an aid).

> Hypothesis 1: There will be a tendency for SMOs i to begin implementing the tactic j at time t^{+1} that *is not currently apart of their repertoire at time t* when j is implemented by the SMO h with whom i simultaneously implements another tactic k at time t.

> Hypothesis 2: There will be a tendency for SMOs i to continue implementation of the tactic j at time t^{+1} that *is currently a part of their repertoire at time t* when j is also implemented by the SMO h with whom i simultaneously implements another tactic k at time t.

Students of resource mobilisation will surely wonder what role competition is expected to play in the formation and preservation of double tactical interlocks. On this matter, recent work investigating knowledge transfer in inter-organisational networks via extra-dyadic links (Hernandez, Sanders and Tuschke 2015) gives rise to a rival set of expectations. Tactical overlap breeds redundancy (Jung et al. 2014) and thus increased niche-based competition over scarce moral,

material, informational and human resources (Olzak and Uhrig 2001). By avoiding the implementation of tactics that create double interlocks, SMOs are able to prevent further spillover of strategic knowledge (Hernandez et al. 2015) and, ultimately, serve their need to differentiate in order to counter competitive pressure (McCarthy and Zald 1977; Soule and King 2008). By extension, there is good reason to expect that competitive pressure, and the subsequent need to maintain distinctiveness, should limit the *long-term viability* of double tactical interlocks irrespective of SMOs' preferences for or against their creation. This leads me to hypothesise that:

> Hypothesis 3: There will be a tendency for SMOs *i* to avoid implementing the tactic *j* at time t^{+1} that *is not currently apart of their repertoire at time t* when *j* is implemented by the SMO *h* with whom *i* simultaneously implements another tactic *k* at time *t*.

> Hypothesis 4: There will be a tendency for SMOs *i* to stop implementation of the tactic *j* at time t^{+1} that *is currently a part of their repertoire at time t* when *j* is also implemented by the SMO *h* with whom *i* simultaneously implements another tactic *k* at time *t*.

Here I make no *a priori* commitment to either the IML or competition scenario as more plausible than the other as extant scholarship provides compelling support for both. In the present context, I instead look to empirically observed dynamics to adjudicate on the two.

IV THE PALESTINIAN NATIONAL MOVEMENT

The Palestinian National Movement stands as an especially strong case for the examination of tactical implementation in social movements. Palestinian SMOs have a rich history of diverse organisational behaviour, regularly employing an array of contentious and non-contentious actions. For example, consider *Ḥarakat al-Muqāwamah al-ʾIslāmiyyah*, better known as Hamas. Born at the inception of the First Intifada (1987) out of ideological fissures over strategy within the Muslim Brotherhood (Robinson 2004), Hamas has long espoused armed-struggle and a hard-line Islamist ideology. Yet, despite its extreme rhetoric, the organisation has employed a number of different tactics which, given its original charter, may seem surprising or even contradictory (Swiney 2007). Though often classified as a straightforward terrorist organisation by the United States government,

among others, the activities of Hamas betray simple classification. Indeed, its large network of religious, medical, educational and political institutions has allowed the organisation to effectively deliver a number of social services critical to the public (Berman 2011; Robinson 2004) and thus mobilise significant popular support. Furthermore, the organisation has a history of consideration of and participation in electoral politics below the national level (Swiney 2007) and in 2006 went on to take the majority in the Palestinian parliamentary elections.

The diversity of Hamas' tactical repertoire is not unique amongst the SMOs of the Palestinian National Movement wherein organisations such as Fatah and the Islamic Action Front have also engaged in a wide swathe of behaviours. While some readers may question: (a) the degree to which theories of social movements — typically developed using case studies of Western, often American, movements — may be applied to the Palestinian case; and (b) the extent to which any conclusions drawn here may illuminate understanding about tactical implementation in social movements in general, I follow a number of scholars (Diani 2008; Hasso 2001; Singerman 2004) to eschew a view of activism in the Middle East as inherently different or peculiar relative to the Western variety.

My focus on the Palestinian National Movement is further spurred by my assertions that institutional dynamics and competition are key, potentially opposing, components of tactical implementation. These claims are much less tenuous when focusing on a population of SMOs that are geographically proximate as one can reasonably expect the governing of IMLs (see Larson and Lizardo 2015). While some readers may take issue with this assumption, it may be useful to consider empirical evidence suggesting the diminished role of direct connections in tactical diffusion (Andrews and Biggs 2006) and the importance of comparison within cultural categories (Soule 1997).

Data come from the Minorities at Risk Organisational Behaviour-Middle East project (MAROB-ME; Asal, Pate and Wilkenfield 2008) which documents the behaviour of 112 organisations who represent one of 12 ethnic groups and who are largely mobilised against local,

national or international authority structures from 1980 to 2004.[9] The MAROB-ME data's repeated assessment of the diverse behaviour of these SMOs across 25 years is a boon analytically, with the dataset possessing detailed information on 31 organisational members of the Palestinian National Movement operating within and across the Palestinian Territories, Jordan and Lebanon (Table I). Following Duggan and Chenoweth (2012), I limit my analysis to the period of 1987 to 2004 as it covers three defining moments of the Palestinian National Movement, namely the First Intifada (1987-1993), the Oslo Lull (1993-2000), and the Second Intifada (2000-2004).[10]

[9] MAROB-ME team members constructed the dataset using an omnibus information search inclusive of: (a) scholarly books and journal articles; (b) the qualitative analytic summaries, risk assessments, and group chronologies for ethnic groups in the Minorities at Risk database (http://www.cidcm.umd.edu/mar/mar_data.asp#qualitativemar); (c) human rights reports by the US State Department (http://www.state.gov/g/drl/rls/hrrpt/); (d) reports by select human/minority rights monitoring organisations (http://www.cidcm.umd.edu/mar/generalLinks.asp?regionId=8); and (e) Lexis-Nexis and Factivia.

[10] The MAROB-ME data disaggregates umbrella organisations/coalitions. A limitation of the data in this respect is that it attributes the actions of umbrella organisations/coalitions to the largest/most significant organisation under the umbrella (Asal et al. 2008) if it is not clear which individual organisations took part in actions. With respect to the present analysis, this likely leads to an inflated picture of the behaviour of Fatah and the Popular Front for the Liberation of Palestine.

Further still, the dataset features national chapters which are allowed to have differing values for actor attributes and relations to tactics. For example, Hamas is coded as Hamas (Palestinian Territories), Hamas (Lebanon), Hamas (Jordan). Given that the Palestinian National Movement has a history of fractionalisation (McLauchlin and Pearlman 2012), I maintain the diction between chapters, modelling them as separate entities.

Table I: SMOs of the Palestinian National Movement ^

SMO	*Home Country*	*Established*	*Religious/Secular*
1 Al-Sa'iqah	Lebanon	1967	Secular
2 Asbat Al-Ansar†	Lebanon	1985	Religious
3 Black September Organization	Jordan	1971	Secular
4 Democratic Front for the Liberation of Palestine - PT	PT	1969	Secular
5 Democratic Front for the Liberation of Palestine - Jordan	Jordan	1969	Secular
6 Democratic Front for the Liberation of Palestine - Lebanon	Lebanon	1969	Secular
7 Fatah Revolutionary Council	Lebanon	1974	Secular
8 Fatah the Uprising (al-Fatah-Intifada) - PT	PT	1983	Secular
9 Fatah the Uprising (al-Fatah-Intifada) - Lebanon	Lebanon	1983	Secular
10 Fatah - PT	PT	1959	Secular
11 Fatah - Jordan	Jordan	1959	Secular
12 Fatah - Lebanon	Lebanon	1964	Secular
13 Hamas - PT	PT	1987	Religious
14 Hamas - Jordan	Jordan	1987	Religious
15 Hamas - Lebanon	Lebanon	1987	Religious
16 Jordanian People's Democratic Party†	Jordan	1989	Secular
17 Muslim Brotherhood/Islamic Action Front†	Jordan	1945	Religious
18 National Movement for Change†	PT	1995	Secular
19 Palestinian Democratic Union†	PT	1991	Secular
20 Palestinian Hezbollah†	PT	Unknown	Religious
21 Palestinian Islamic Jihad	PT	1979	Religious
22 Palestinian Liberation Front – PT (Abbas Faction)	PT	1977	Secular
23 Palestinian Liberation Front – Lebanon (Yaqub/Ashqar Faction)	Lebanon	1977	Secular
24 Palestinian National Initiative†	PT	2002	Secular
25 Palestinian People's Party (Palestinian Communist Party)	PT	1982	Secular
26 Palestinian Popular Struggle Front – PT (Ghosheh Faction)	PT	1967	Secular
27 Palestinian Popular Struggle Front – Lebanon (Majid Faction)	Lebanon	1967	Secular
28 Popular Front for the Liberation of Palestine - General Command	Lebanon	1968	Secular
29 Popular Front for the Liberation of Palestine - PT	PT	1967	Secular
30 Popular Front for the Liberation of Palestine - Lebanon	Lebanon	1967	Secular
31 Revolutionary Palestinian Communist Party	Lebanon	1982	Secular

†SMO only has domestic bases
^ PT = Palestinian Territories

IV.1 Specification of the tactical set for analysis

The most comprehensive of its kind, the MAROB-ME dataset includes notable tactical classes missed in analyses based on the Dynamics of Collective Action (McAdam et al. 2009; DCA) and Prodat (Olzak and Uhrig 2001) datasets (e.g., "participation in electoral politics", "lobbying foreign governments for support"; in contrast see Table 1 of Olzak & Uhrig, 2001 and Table A1 of Wang & Soule, 2012). Furthermore, it features both domestic and transnational actions (e.g. "domestic insurgency" versus "solo cross-border raids") and has the added benefit of not determining inclusion of organisations based on their use of a specific tactic (e.g. suicide bombing) or by their participation in specific protest events.

Notwithstanding, a constraint of the MAROB-ME data is the coarseness sometimes exhibited in its classification of behaviour. Whereas previous research incorporates counts of very specific actions at protest events (e.g., "torch-passing" or "flag waving" as in Wang and Soule 2012), the MAROB-ME dataset sometimes aggregates multiple distinct actions into a single tactical class. For example, "hosting a radio show", "having a print publication" and "leafleting" are all coded as "education and propaganda." This is in contrast to "lobbying government officials" which has its own category. In this respect, *models of tactical choice presented here reflect SMOs' selection amongst tactical classes that vary in the number of included activitie*s. Relative to the DCA and Prodat data, the strength of the set of tactical classes in the MAROB-ME dataset is its breadth of documented behaviours. However, the classes themselves may be quite shallow in terms of the different actions included. Relatedly, the MAROB-ME coding is somewhat ambiguous as to the degree to which a tactic is violent. For example, "leading a rally" is included in the protest classes alongside "leading a riot". Ultimately, this weakens the internal validity of any violent/non-violent distinction one might attempt to draw. This led me to categorise tactical classes as to whether or not they are contentious (i.e., disruptive).

Nonetheless, the benefits of the MAROB-ME dataset as a source of information on choice from a wide array of tactical classes by diverse organisations across space and a long span of time

outweigh drawbacks. In total, the MAROB-ME dataset provides information on 17 tactical classes. I exclude classes that have not been used at least once in the 1987 to 2004 period. This only includes ethnic cleansing (MAROB-ME Code: ORGST10). Furthermore, I also exclude cross-boarder insurgency alliances (ORGST8B) and inter-organisational cooperation (ORGST11) as the collective nature of these tactics violate the assumptions of the statistical model employed here (discussed further in Section V.1). Additionally, I combine the two target-specific domestic protest classes (domestic protest with a domestic target, DOMORGPROT; domestic protest with a transnational target, TRANSPROTARG) into a single class to ensure models reflect choices between tactics and not targets, though this is not to imply that the two are independent (see Larson and Lizard 2015 and Meyer and Staggenborg 2012). Finally, a limitation of the protest classes is that they only reflect the *highest* level of protest a SMO led during a given year. This ranges from taking the lead on "verbal opposition" (e.g. print publications and letters to the pubic) to leading a mass demonstration (greater than 10,000 participants). Here I throw out those instances where the protest classes indicate that SMOs' led on "verbal opposition". This ensures that models reflect choice between qualitatively different tactics, in this latter case between strategic communication and leading collective demonstrations. Together, these exclusions result in 13 tactical classes for analysis (Table 2).

Table II: Tactics

Tactic	MAROB-ME Code	Description	Contentious
Education and Propaganda	ORGST1	Does the SMOs have a radio show, print publications, foreign offices and/or leaflet and distribute materials?	No
Lobbying Local Officials	ORGST2	Does the SMO send members to lobby and/or participate in negotiations with government officials?	No
Electoral Politics	ORGST3	Does the SMO have members that are in office and/or running for office?	No
Soliciting External Support (i.e., Transnational Consciousness Raising)	ORGST4	Does the SMO maintain foreign offices and/or have leadership that meets with foreign officials or foreign organisations to secure support?	No
Non-coercive Collection of Local Support	ORGST5	Does the SMO hold events soliciting financial, material or personnel support?	No
Forcefully Securing Local Support	ORGST6	Does the SMO forcefully secure financial, material or personnel support?	Yes
Civilian Attack	ORGST7	Does the SMO carry out attacks on non-security state personnel (e.g. civil service personnel, elected representatives, and other government representatives that are not members of bodies such as the police and military)?	Yes
Guerrilla Attack	ORGST8	Does the SMO partake in guerrilla activity or civil war in its home state?	Yes
Solo Cross-Boarder Raids	ORGST8A	Does the SMO individually carry out cross-boarder raids against government personal of an external country? Here, "cross-boarder" denotes territories entered from the home country of a SMO in a given year.	Yes
Administering Rebel Areas	ORGST9	Does the SMO control movement into/out of/through territory? This includes instances where the SMO establishes governing structures and maintains infrastructure such as roads.	Yes
Provision of Social Services	ORGST12	Does the SMO provide social services in the area(s) of education, healthcare or poverty alleviation?	No
Domestic Protest Leadership	DOMORGPROT + TRANSPROTARG	Is the SMO the *sponsor of and/or largest participating organisation in* acts of symbolic resistance (e.g. sit-ins, blockage of traffic) or a demonstration, rally, strike or riot (at any scale) in the SMO's home country?	Yes
Transnational Protest Leadership	TRANSPROTLOC	Is the SMO the *sponsor of and/or largest participating organisation in* acts of symbolic resistance (e.g. sit-ins, blockage of traffic) or a demonstration, rally, strike or riot (at any scale) outside of the SMO's home country?	Yes

Models are fit using 17 31x13 binary adjacency matrices, one for each year of study (1987–2003), where x_{ijt} represents whether or not the i_{th} SMO used the j_{th} tactic in the t_{th} year. These matrices are both the main dependent and independent variable as the future state of the SMO-Tactic network at t^{+1} is understood to be solely determined by its state at t, conditional on the effects based on SMOs' and tactics' attributes. An 18^{th} matrix for the year of 2004 is used for out-of-sample prediction (discussed in Section VI). Between 1987 and 2003, the average repertoire size (i.e., outdegree) is 2.08, network density ranges from 0.10 to 0.18, and the number of instances of tactical implementation ranges from 0 (Palestinian National Initiative) to 84 (Hamas – Palestinian Territories).

V STOCHASTIC ACTOR-ORIENTED MODELS

V.1. Model Assumptions

I test my four hypotheses using Stochastic-Actor Oriented Models (SAOMs). These are a class of models which enable statistical inference about network evolution on the basis of a series of observed networks. These models are defined in terms of an actor's (i.e., ego's; the SMO's) choices in establishing its *outgoing* ties to some alter (here, tactics), easily suiting my requirement that models of tactical implementation deal directly with SMOs' agency. Furthermore, SAOMs account for the interdependence of choice options, elevating structural and temporal path-dependency to an explanatory role which allows me to avoid an under-socialised view of organisational decision-making. This is in stark contrast to the multinomial logit models used in previous analyses of choice between tactical categories in social movements (e.g., Asal et al. 2014 and Wang and Piazza 2016). As SAOMs are quite different from those models typically found in the sociological literature, I briefly review their key assumptions, giving justifications for their application when necessary, and provide details on the estimation procedure. Snijders, van de Bunt and Steglich (2010) and Ripley et al. (2015) provide extensive additional information.

The key assumptions of SAOMs are as follows: (a) network evolution happens in continuous time via one tie change at a time (micro-steps); (b) network evolution is the result of a Markov process — for a given point in time, the current state of the network probabilistically determines its further evolution, disallowing effects from earlier periods; (c) only one actor (probabilistically determined) may change just one tie at a time, disallowing coordination; (d) tie changes are reactionary, depending on one another sequentially (i.e., path dependency), and are based on ego's structural position, ego's and potential alters' attributes, and ego's perception of the rest of the network; and, finally, (e) actors only need limited information (varies by configuration) to make their decisions.[11]

Two points deserve further discussion. The first concerns the extent to which it is reasonable to assume that SMOs modify their tactical portfolios by adding or removing one tactic at a time. I maintain that this is the safest assumption to make as the modification of tactical portfolios is not without costs. A complete overhaul of strategy (i.e., changing all tactics) would be very expensive in terms of the resources used in adopting tactics and adeptly implementing them. This would also represent quite a radical shift in terms of organisational identity, potentially alienating peer SMOs and supportive individuals. Arguably, these costs would decrease with the fewer tactics a SMO changes simultaneously. Given that the size of tactical repertoires tends to be small and the pace of change slow (see Taylor and Van Dyke 2004), the incremental assumption of the SAOM seems justifiable.

The second point concerns the extent to which it is reasonable to assume that SMOs do *not* modify their tactical portfolios *en masse*. Though this assumption is consistent with cultural explanations of SMOs' tactical choice and positive feedback, the degree to which it is tenuous will depend on the tactic in question. For tactics such as "participation in electoral politics", this seems a safe assumption. However, for those tactics where SMOs are generally expected to coordinate, such

[11] Formally, it is assumed that actors have *full* information about the network and other actors.

as for a protest event, this assumption is clearly violated. This resulted in my exclusion of the inter-organisational cooperation tactical class (ORGST11).

Some readers may wonder why I did not employ network configurations capturing multiplexity, i.e., the co-existence of multiple distinct relationships amongst the same set of actors (e.g., perceptions of influence and information exchange), to account for inter-organisational collaboration. A very reasonable approach to modelling coalition membership is as an affiliation network of SMOs and the alliances they participate in. Unfortunately, the assumptions about actors' behaviour built into the SAOM disallow the modelling of networks that are the product of collective (i.e., multilateral) action. This is because the data generating process of these structures is such that many ties may form simultaneously. An alternative approach is to use the bipartite extensions for Exponential Random Graph Models as these models are agnostic about, though not incompatible with, arguments about agency and tie formation (see Leifeld and Cranmer 2015). However, SAOMs are favoured here precisely because of their assumptions about agency and their more advanced handing of bipartite networks. These issues led me to use membership in three key coalitions amongst the 31 SMOs as independent variables (discussed in Section V.4). With regard to protest, I skirt violation of the individual action assumption as the MARBO-ME data only codes a SMO as employing protest as a tactic when the SMO leads a protest (i.e., it is the sponsor and/or largest participant).

Despite these modifications, source data used to code the coalition building variable in the MARBO-ME dataset revealed joint actions amongst the Palestinian SMOs at various points in time outside of coalitional partnerships (e.g., Fatah and the Democratic Front for the Liberation of Palestine ran on a joint-ticket in a West Bank Election in 1989, joint attacks in the name of the "Unified Command" of the Popular Front for the Liberation of Palestine and Democratic Front for the Liberation of Palestine). For those years where SMOs were found to jointly implement some tactic, I treat the relationships between collaborating SMOs and the appropriate tactical class as missing. For those SMOs with multiple chapters represented in the data (e.g., Hamas), the

relationship between each chapter and the jointly implemented tactic is treated as missing with relevant distinctions made for those tactics, such as protest, that may be domestic or transnational. For example, Fatah and Hamas led a march in Nablus in 1989 (Greenberg and Sela 1989). In this case, both chapters of Hamas and Fatah in the Palestinian Territories receive missing values for the implementation of domestic protest while the chapters of Hamas and Fatah located in Jordan and Lebanon receive missing values for the implementation of *transnational* protest. While these are not ideal strategies for disentangling individual from joint implementation of tactics, the aggregate approach to coding organisational behaviour used to construct the MAROB-ME dataset precludes a more nuanced approach. In total, just 82 SMO-Tactic dyadic observations are treated as missing across the entire study period. Reported levels of missingness for network observations reflect these changes.

V.2 Estimation

Data takes the form of waves (i.e., network panel data). The SIENA algorithm (Ripley et al. 2015) used to estimate SAOMs with the Method of Moments conditions on the first wave and then simulates changes between each subsequent wave via the probabilistic and sequential micro-steps. Each additional micro-step changes the state of the network leading to the context within which actors are embedded to be ever changing (Zeggelink 1994). During this process, the average frequency with which actors get the *opportunity* to change their ties is determined by the rate function $\lambda_i(p, \alpha, m)$, an exponential distribution of waiting times. Here, the rate function is a product of two factors in the form

$$\lambda_i(\rho, \alpha, m) = \lambda_{i1}\lambda_{i2} = \rho_m \times \exp\left(\sum_{h=1}^{n} \alpha_h v_{hi}\right) \quad (1)$$

where p_m is the baseline rate of change for a given period $m \in M$ where the number of periods of change in M is equal to the number of waves W (i.e., years of study) minus one. α_h is the estimated effect of actor i's covariate v_{hi} on i's rate of change. With regard to interpretation, α_h may be though of as "speeding" differences between actors during the simulations, determining which actors will make a micro-step. Positive values of α_h indicate that an effect is related to more frequent change, whereas the converse for negative α_h.

Should an actor get the opportunity to act, the objective function (2) determines the probabilities of various tie changes in the network. Similar to generalised linear models, this function is a linear combination of various effects.

$$f_i(x) = e_i(\beta, x) + c_i(\zeta, x) + d_i(\gamma, x)$$
$$= \sum_{k=1}^{n} \beta_k s_{ik}(x) + \Delta^{+} \sum_{l=1}^{n} \zeta_l s_{il}^{+}(x) + \Delta^{-} \sum_{l=1}^{n} \gamma_l s_{il}^{-}(x) \quad (2)$$

$f_i(x)$ is the value of the objective function for actor i given a potential new network state x. $s_i(x)$ are the posited effects of interest associated with the network, actor attributes, or dyadic covariates. Here the objective function consists of three parts: (a) the evaluation function; (b) the creation function; and (c) the maintenance or durability function. The creation function $c_i(\zeta, x)$ models the implementation of new tactics previously unused by ego ($\Delta^{+} = 1$ for new tactics, 0 otherwise) where a positive value for ζ indicates a tendency for ego to create ties which move the network into a state where there is a higher occurrence of the effect, whereas the converse for negative ζ. The durability function $d_i(\gamma, x)$ compares continued use of those tactics already in ego's repertoire with termination of use ($\Delta^{-} = 1$ for tactics already in use, 0 otherwise) such that positive values of γ indicate a tendency for ego to maintain ties which move the network into a state where there is a higher occurrence of the effect, whereas the converse for negative γ. These two functions are contrasted with the evaluation function $e_i(\beta, x)$ which assumes symmetry in ego's propensity to

implement new tactics (creation) and continue using old ones (durability) such that β simply reflects the tendency for ties to exist given some effect while providing no information on where the tie "came from" as in the creation and durability functions. Table III helps to imagine what the odds refer to in each case where the relevant comparison is the probability of green cases to that of blue cases.

Table III: Tie Evaluation, Creation and Durability

Tie Evaluation		*Tie Creation*		*Tie Durability*	
t	t^{+1}	t	t^{+1}	t	t^{+1}
$i \quad j$	$i \rightarrow j$	$i \quad j$	$i \rightarrow j$	$i \quad j$	$i \rightarrow j$
$i \rightarrow j$	$i \rightarrow j$	$i \rightarrow j$	$i \rightarrow j$	$i \rightarrow j$	$i \rightarrow j$
$i \rightarrow j$	$i \quad j$	$i \rightarrow j$	$i \quad j$	$i \rightarrow j$	$i \quad j$
$i \quad j$	$i \quad j$	$i \quad j$	$i \quad j$	$i \quad j$	$i \quad j$

Event scenarios for tie evaluation, creation and durability used for comparison. Log odds in SAOMs refer to comparison of the probability of green cases to that of blue cases.

Here the linear combination of the evaluation, creation and durability functions is understood as representing the *attractiveness* of moving from network x^0 to x^1 for a given actor. From this perspective, estimates reflect the dynamic tendencies of actors who have the opportunity to move from x^0 to x^1 by changing a single tie. With regard to the substantive focus on this paper, this linear combination captures the *short-term* objectives of an actor.[12] Given the opportunity to act (i.e., the modification of the tactical repertoire), the action chosen by a SMO follows the logic of discrete choice models (McFadden 1973; Maddala 1983).

For each micro-step where ego gets the opportunity to consider a tie change, ego is assumed to make the change that maximises equation 2 (given a random element) relative to x^0. Actions include: (a) implementation of a tactic unused in x^0 determined by $e_i(\beta, x) + c_i(\zeta, x)$; (b) stopping

[12] This assumption finds support when considering contention based on "strategic adaptation", i.e., iterative, trial-and-error action guided by simple decision rules, versus "strategic anticipation", i.e., forward-looking, somewhat predictive, decision-making stemming from deliberation on several alternatives and consideration of others' reactions to them. In his discussion of the two, Koopmans (2004:30) argues that the former more realistically describes social movement strategy than the latter due to the complexity of the social environment and its requirement that actors simply learn from their past actions — though this process of learning may be rendered less effective by opportunity structures.

the implementation of a tactic used in x^0 determined by $e_i(\beta, x) + d_i(\gamma, x)$; and (c) no change to ego's tactical repertoire should $f_i(\beta, x^0) > f_i(\beta, x^1)$.

The estimated parameters β, ζ, and γ are all expressed as log odds which weight the effects. Estimates of zero indicate that the effect plays no role in network dynamics. Significance of the effects α, β, ζ, and γ is determined with Wald-type tests using *t*-ratios — the absolute value of the ratio of the moment estimate to its standard error.

V.3 Time Heterogeneity

Given the slow evolution of repertoires, network dynamics are expected to emerge over an extended time horizon (see Biggs 2013). Indeed, Jaccard indices (a measure of similarity between adjacency matrices; Table IV) indicate that the SMO-Tactic network is remarkably stable across the 17-year study period. Notwithstanding, SAOMs were originally designed for the assessment of network dynamics over much smaller time periods and are typically applied to time spans of a few years.[13] Though there is no technical reason barring their use with a large number of waves, there is a question as to the degree to which α, β, ζ, and γ vary over time.

I also note the substantive role variability in ζ and/or γ may play in the Palestinian context. Specifically, the First and Second Intifada, both major uprisings, likely served as particularly acute opportunities for inter-organisational surveillance and could have pushed multiple SMOs into using similar tactics. Thus heterogeneity of parameter estimates for the reinforcement and maintenance of tactical overlap for the years in which these uprisings occurred is a confounding factor that should be assessed and controlled for if observed.

Together, these factors led me to use an unrestricted SAOM allowing for time heterogeneity in all effects (see Lospinoso et al. 2011 for a technical treatment of unrestricted SAOMs). Briefly, the objective function now takes take the form:

[13] I am only aware of one study (Kinne 2013) employing SAOMs for the analysis of long-term network dynamics.

$$f_i^{(m)}(x) = \sum_{k=1}^{n} (\beta_k + \delta_k^{(m)}) s_{ik}(x) + \Delta^{+} \sum_{l=1}^{n} (\zeta_l + \rho_k^{(m)}) s_{il}^{+}(x) + \Delta^{-} \sum_{l=1}^{n} (\gamma_l + \phi_k^{(m)}) s_{il}^{-}(x) \quad (3)$$

Where $\delta_k(m)$, $\rho_k(m)$, and $\phi_k(m)$ represent the time-dummy interacted effect parameter for effect k in period m. By convention, for the first period $\delta_k(m)$, $\rho_k(m)$, and $\phi_k(m)$ each = 0 $\forall\ k \in K$ such that the first period represents the base period. Significance of $\delta_k(m)$, $\rho_k(m)$, and $\phi_k(m$ in periods after the first is determined using the score-type tests of Schweinberger (2012). These consist of tests for joint-significance across all effects, periods and individual estimates of $\delta_k(m)$, $\rho_k(m)$, and $\phi_k(m)$, effect-wise significance (i.e., is this effect time heterogeneous across all periods?), period-wise significance (i.e., is this period time heterogeneous across all effects?) and individual significance of $\delta_k(m)$, $\rho_k(m)$, and $\phi_k(m)$ for each period. Note that should a time dummy be included in a model, whether or not it is significantly different from zero is determined by the same Wald-type test as α, β, ζ, and γ.

At present, there is no formal strategy for adjudicating on the very large amount of information from the various time tests. As time heterogeneity of different parameters is often related — especially for degree-based effects — I give priority to time-dummies for the baseline density effect and those effects based on indegree and outdegree. With this directive, I iteratively included individual estimates of $\delta_k(m)$, $\rho_k(m)$, and $\phi_k(m)$ until all effect-wise and the global joint-significance test for time heterogeneity were failed. *p*-values for the global joint-significance tests are given with model output. Table IV provides detailed information summarising network change across the seventeen years of study as well as the percentage of missingness for observation periods.

Table IV: Summary of Network Change 1987 – 2003

Period Number	*Period (Year)*	*0 → 0*	*0 → 1*	*1 → 0*	*1 → 1*	Jaccard Index	*Missing Ties (%)*	*SMO Births*	*SMOs That Become Inactive*	*Active SMOs*
1	*1987 → 1988*	346	15	5	36	0.643	1 (0%)	0	0	19
2	*1988 → 1989*	316	18	5	43	0.652	21 (5%)	1	1	19
3	*1989 → 1990*	309	12	12	48	0.667	22 (5%)	1	0	20
4	*1990 → 1991*	322	9	7	54	0.771	11 (3%)	2	0	22
5	*1991 → 1992*	321	7	10	53	0.757	12 (3%)	1	0	23
6	*1992 → 1993*	313	10	2	58	0.829	20 (5%)	1	0	24
7	*1993 → 1994*	308	9	14	55	0.705	17 (4%)	0	0	24
8	*1994 → 1995*	317	11	12	56	0.709	7 (2%)	1	0	25
9	*1995 → 1996*	317	12	8	59	0.747	7 (2%)	1	0	26
10	*1996 → 1997*	315	7	16	54	0.701	11 (3%)	1	0	27
11	*1997 → 1998*	324	11	9	52	0.722	7 (2%)	0	1	26
12	*1998 → 1999*	331	8	9	54	0.761	1 (0%)	0	0	26
13	*1999 → 2000*	321	19	7	55	0.679	1 (0%)	0	0	26
14	*2000 → 2001*	316	12	13	61	0.709	1 (0%)	2	0	28
15	*2001 → 2002*	311	10	16	56	0.683	10 (2%)	0	1	27
16	*2002 → 2003*	317	7	9	56	0.778	14 (3%)	1	0	28

Jaccard Index: Measure of stability indicating the proportion of ties that remain the same between two successive waves. A series of Jaccard indices greater than 0.3, reflects a process of steady change.

0 → 0: Number dyads that remained empty from wave t to t^{+1}
0 → 1: Ties created from wave t to t^{+1}
1 → 0: Ties terminated from wave t to t^{+1}
1 → 1: Ties maintained from wave t to t^{+1}

V.4 Dependent and Independent Variables

The dependent variable is the number of double tactical interlocks created and destroyed by a SMO. This is measured using the square root of the number of four-cycles centred on some focal SMO *i*, where the specific tie x_{ij} (i.e., implementation of tactic *j* by SMO *i*) is of theoretical interest. Four-cycles are counted as

$$\sqrt{\sum_{j,k,h;j\neq k;j\neq h;k\neq h} x_{ij}x_{ik}x_{hj}x_{hk}} \tag{4}$$

where *i* and *h* are SMOs and *j* and *k* are tactics. Here the square root is used as it is much more reasonable to assume that the tendency to create double interlocks is stronger when tactical overlap is low and that increased overlap tempers such a tendency (i.e., a falling marginal effect). As controls, I also include counts of two-stars and three-paths as these configurations are lower-order to four-cycles. Substantively, two-stars capture SMOs' tendency to form simple tactical interlocks while three-paths capture SMOs' tendency to implement tactics that are implemented by other SMOs with large tactical portfolios.

I also include two more effects that control for relevant structural dependencies in the network. Following Wang and Soule (2012), I include an effect capturing the impact of tactical repertoire diversity, and indication of experience and skill, on a SMO's propensity to take up new tactics. The effect, here called *outdegree activity*, is measured as $x_{i+}\sqrt{x_{i+}}$ where x_{i+} indicates the outdegree of *i*. I use the square root as Wang and Soule find that SMOs with larger repertories are more likely to implement tactics up to a certain point where after the effect diminishes, which they attribute to organisational overload. As a SMO's tactical expertise is likely to shape its perceptions of the viability of tactics relative to the behaviours of peers, I also include an effect capturing assortative mixing to control for the covariance between organisational knowledge (outdegree;

repertoire size) and the popularity of tactics (indegree) measured as $\sum_j x_{ij}\, x_{i+}x_{+j}$ where x_{+j} indicates the indegree of j.

The cultural similarity born from shared ideologies is an alternative means of managing uncertainty in tactical implementation. Additionally, collaborative linkages amongst SMOs have been found to fuel tactical diffusion as they are sites of information exchange and organisational learning (Wang and Soule 2012). Further still, geographic proximity may be expected to play a role in the institutional diffusion of tactics. Political opportunities and constraints leading adherents to look to one another for guidance are likely to fall along geographic lines (e.g., state policies). Relatedly, percolation of information about tactics may be area-specific (Soule 1997).

Each of these factors constitute cultural categories within which SMOs may learn from another, thus their exclusion would confound conclusions about the reinforcement and maintenance of tactical overlap. As my hypotheses are fundamentally questions of path dependency relative to network structure, I take a unique approach to isolating network effects relative to each cultural category. Specifically, I employ two effects that capture homophilous tactical implementation by combining networks structure and attribute values.

To account for SMOs' increased propensity to use a tactic because of geographic proximity, I use an effect capturing the popularity of tactics within SMOs' home countries (MARBO-ME code: ORGLOC).[14] For ideological similarity, I include an effect for the popularity of tactics amongst SMOs with the same religious identification (RELORG) as the Islamist/Secularist cleavage is one of the most salient aspects of the identity of the Palestinian National Movement (see Robinson 2004). For a focal SMO *i*, these popularity effects are measured as the number of SMOs *h*

[14] Of the 31 SMOs used in analysis, the MAROB-ME data indicates that just seven spend the length of time of which they are represented in the MAROB-ME data fully based in their home country. The remaining 24 spend all, or some large part, of the time that they appear in the data operating bases both within and outside of their home countries. While the present analysis is best understood to be of a population of organisations uniformly operating at a sub-regional level constituted by the Palestinian Territories, Jordan and Lebanon, it is likely that groups will be more inclined to watch peers within their home country when deciding on strategy. Table I indicates which SMOs operate only with domestic bases.

implementing a tactic *j* that is also implement by *i*, where SMOs *h* are only counted if *i* and *h* have the same covariate value *v*. Formally this is given as:

$$\sum_j x_{ij} \sum_h x_{hj}\, I\{v_i = v_h\} \tag{5}$$

To account for SMOs' increased propensity to use a tactic because of coalition membership, I employ an effect capturing the comparison between the covariate value of SMO *i* to the covariate-related composition of tactic *j*'s one-step neighbourhood such that positive estimates indicate that *i* prefers those tactics *j* with neighbourhoods that are increasingly similar to *i*. This effect is measured as the sum of the centred similarity scores between the focal SMO *i* and the covariate-average amongst *i*'s alters' (i.e., the implemented tactics *j*) neighbours. Formally, it is given as:

$$\sum_{ij} x_{ij} \left(SIM(\acute{v})_{ij} - \widehat{SIM^v}\right) \tag{6}$$

where the similarity scores $SIM(\acute{v})_{ij}$ are yielded by

$$SIM(\acute{v})_{ij} = \frac{\Delta - \left|v_i - \breve{v}_j^{(-i)}\right|}{\Delta} \tag{7}$$

Δ is the observed range of the covariate *v* and $\breve{v}_j^{(-i)}$ denotes

$$\breve{v}_j^{(-i)} = \begin{cases} \dfrac{\sum_{h \neq j} x_{hj} v_h}{x_{+j} - x_{ij}}, & if\ x_{+j} - x_{ij} > 0 \\ 0, & if\ x_{+j} - x_{ij} = 0 \end{cases} \tag{8}$$

$\widehat{SIM^v}$ is the mean of all similarity scores, x_{+j} indicates the indegree of *j* and $x_{ij} = 1$ if SMO *i* implements tactic *j* and 0 otherwise.

I focus on coalitions as these arrangements are a means of accessing resources, informational or otherwise, and coordinating strategy. Specifically, I employ membership in three major coalitions during the study period: (a) the Palestinian Liberation Organisation (PLO) — a secular, nationalist umbrella organisation created in 1964 that would grow to become an independent entity for determining the course of the Palestinian National Movement (Parsons 2012); (b) the Palestinian National Salvation Front (PNSF) — a leftist/nationalist union established in 1984 to oppose the accords between Yasser Arafat and Jordan calling for a confederated Jordanian-Palestinian state in the Occupied Territories (Mattar 2005; Strindberg 2000); and (C) the Alliance of Palestinian Forces (APF) — a union of secularist and Islamist groups established in the wake of the 1993 Oslo Accord designed to rival the Palestinian Authority and derail the Oslo-based peace process via a commitment to armed struggle (Strindberg 2000).

Table V details coalition membership and dates of affiliation. While the PNSF is never formally dissolved, it is effectively subsumed by the APF as all of it members join this latter coalition in late 1992/1993 with Khalid al-Fahoum, the PNSF secretary-general, attending APF meetings (Strindberg 2000). This led me to code membership in the PNSF and the APF as a single variable where prior to 1993 a SMO receives a value of "1" if it is a member of the PNSF and a value of "1" after 1993 if it is a member of the APF. Sources for years of membership include Strindberg (2000), Mattar (2005) and the MAROB-ME source data for the variable ORGST11. As with any question of history, there will be points on which to disagree. However, I have tried to find the most objective and complete information possible on these three coalitions.

As organisational age is an omnibus proxy for organisational resources, aptitude at survival and institutional support (Sing and Lumsden 1990), it is used here to control for variability in repertoire size with an effect weighting SMOs' activity by their age, i.e., $x_{i+}v_i$. I also include an effect for organisational age on rates of tactical change to account for rigidity of behaviour over time in accordance with equation 1. Finally, I include an effect for whether or not a tactic is

contentious (Table II) on the popularity of that tactic with $\sum_j x_{ij}\, v_j$. Table VI provides descriptive statistics for the monadic independent variables and reports their percentage of missingness.

V.5 Missing Data and Dynamic Boundary Specification

It is not uncommon for SMOs to have been born prior to the year in which they first appear in the MAROB-ME data. For example, Palestinian Islamic Jihad (PIJ) was formed in 1979, however, it first appears in the MAROB-ME data in 1986. As it is implausible to assume that PIJ took *no* action from 1979 to 1985, I assume that source material failed to document its behaviour. Arguably, this assumption also applies when SMOs "leave" the MAROB-ME data prior to 2004. As one cannot definitively rule out implementation of various tactics when such discrepancies arise, I model SMOs as entering the network in the first year that they appear in the MAROB-ME data and leaving the network after the last year for which data is available. No SMO exits and then re-enters the network.

To formally account for the changing composition of the population of SMOs, I use the method of joiners and leavers to model changes as exogenous events (i.e., actors join or leave the network at fixed time points where neither events or entry/exit times are determined by the model). In their original formulation of the method, Huisman and Snijders (2003:266) assign a value of zero to the relations of actors in the periods before they join the network and carry forward the last observed values of their relations after they leave. Two additional options include: (a) giving relations a value of zero before actors join the network and treating relations as missing after the actor leaves the network; and (b) treating relations as missing whenever an actor is not in the network. In the present context, the first two approaches are undesirable due to the discrepancies discussed above. Thus, I employ the third approach of using data only when it is available.

SAOMs may be fit to data with missingness at both the network and actor level. Missingness up to ten percent up will not normally cause difficulties with analysis so long as that missingness is actually non-informative. Should one encounter more than 20 percent missingness

on any variable, estimates may be affected (Ripley et al. 2015:32). The calculation of target statistics during the simulations only uses non-missing data, however, missing values are imputed to carry out simulations *as if* data were complete. For covariates, missing data is replaced with the global mean. For network data, the last observed tie value is carried forward. Should there be no earlier value, then ties receive the value of zero.

Table V: Coalition Membership 1987-2004

SMO		*Palestine Liberation Organisation*	*Palestinian Nat'l Salvation Front*	*Alliance of Palestinian Forces*
1	Al-Sa'iqah	—	1987-2004	1993-2004
2	Asbat Al-Ansar	—	—	—
3	Black September Organization	—	—	—
4	Democratic Front for the Liberation of Palestine – PT	1987-1993; 2000-2004	—	1993-1997
5	Democratic Front for the Liberation of Palestine - Jordan	1987-1993; 2000-2004	—	1993-1997
6	Democratic Front for the Liberation of Palestine - Lebanon	1987-1993; 2000-2004	—	1993-1997
7	Fatah Revolutionary Council	—	—	—
8	Fatah the Uprising (al-Fatah-Intifada) - PT	—	1987-2004	1993-2004
9	Fatah the Uprising (al-Fatah-Intifada) - Lebanon	—	1987-2004	1993-2004
10	Fatah – PT	1987-2004	—	—
11	Fatah – Jordan	1987-2004	—	—
12	Fatah – Lebanon	1987-2004	—	—
13	Hamas – PT	—	—	1993-2004
14	Hamas – Jordan	—	—	1993-2004
15	Hamas – Lebanon	—	—	1993-2004
16	Jordanian People's Democratic Party	—	—	—
17	Muslim Brotherhood/Islamic Action Front	—	—	—
18	National Movement for Change	—	—	—
19	Palestinian Democratic Union	1987-2004	—	—
20	Palestinian Hezbollah	—	—	—
21	Palestinian Islamic Jihad	—	—	1993-2004
22	Palestinian Liberation Front – PT (Abbas Faction)	1987-2004	—	—
23	Palestinian Liberation Front – Lebanon (Yaqub/Ashqar Faction)	1987-1993	1987-2004	1993-2004
24	Palestinian National Initiative	—	—	—
25	Palestinian People's Party (Palestinian Communist Party)	1987-2004	—	—
26	Palestinian Popular Struggle Front – PT (Ghosheh Faction)	1987-1991; 1993-2004	—	—
27	Palestinian Popular Struggle Front – Lebanon (Majid Faction)	1987-1991	1987-2004	1993-2004
28	Popular Front for the Liberation of Palestine – General Command	—	1987-2004	1993-2004
29	Popular Front for the Liberation of Palestine – PT	1987-1991; 2000-2004	1987	1993-1999
30	Popular Front for the Liberation of Palestine – Lebanon	1987-1991; 2000-2004	1987	1993-1999
31	Revolutionary Palestinian Communist Party	1987	—	1993-2004

Table VI: Descriptive Statistics (Global) — Monadic Covariates

Variable	*Mean*	*Similarity Score*	*Min*	*Max*	*%Missing ^*
PLO Membership	0.361	0.5449	0.00	1.00	0
PNSF_APF Membership	0.384	0.5309	0.00	1.00	0
Organisational Age (Log)[†]	2.856	—	0.00	4.10	3.02 %
Contentious Tactic	0.538	—	0.00	1.00	0

^ Excluding missingness from when organisations are not active in the network.
[†] Variable centred at its mean.

VI RESULTS

Table VII presents the results of the SAOMs. Model 1 only includes the structural effects. Model 2 adds effects to control for time heterogeneity. Model 3 adds monadic controls for organisational age and tactic type. Model 4 is the full model and sees the addition of controls for homophilous tactical implementation. Across all four models, SMOs have, on average across the 16 periods of change, an average opportunity to modify their portfolios with respect to approximately one tactic. For Models 1, 2, 3 and 4, the range of rates of change across the 16 periods is 0.80-2.13, 0.66–2.08, 0.63–2.00, and 0.64–2.15, respectively, indicating that, at most, SMOs may have an average of 2 opportunities to evaluate and, possibly, change their repertoires (depending on the period). Such incremental change is consistent with extant accounts of repertoire evolution.

The estimate for the effect of age on rates of change is negative and significantly different from zero, confirming expectations of behavioural rigidity over time. As in Wang and Soule (2012), models consistently indicate a tendency for experienced SMOs to implement new tactics over time, with the strength of this effect increasing greatly during the 7th (1993-1994) and 8th (1996-1997) periods. Models also consistently indicate a tendency for SMOs with diverse tactical portfolios to implement tactics that are not widely implemented across the population of SMOs, i.e., out-indegree *disassortativity*, though this effect is not very strong.[15] Furthermore, models consistently indicate that SMOs tend to preserve simple interlocks and stop implementing tactics that are also implemented by SMOs with large repertoires (three-paths, Durability).

[15] Substantively, this effect is likely the result of very experienced SMOs attempting to differentiate themselves through implementation of more fringe tactics.

Table VII: Stochastic Actor-Oriented Models for Tactical Implementation 1987-2003

	Model 1	Model 2	Model 3	Model 4
Rate Effects	p_m	p_m	p_m / α_h (s.e.)	p_m / α_h (s.e.)
Average Rate of Change Across 16 Periods	1.446	1.423	1.421	1.441
Organisational Age (Log) x Rate of Change			-0.220 (0.100)	-0.189 (0.092)
Structural Effects	β (s.e.)	β (s.e.)	β (s.e.)	β (s.e.)
Four-Cycles (Creation; H1/H3)	**1.001 (0.424)**	**1.039 (0.458)**	**1.220 (0.448)**	**1.124 (0.466)**
Four-Cycles (Durability; H2/H4)	**1.729 (0.609)**	**2.005 (0.684)**	**2.191 (0.736)**	**2.001 (0.674)**
Three-Paths (Creation)	**0.186 (0.072)**	**0.130 (0.066)**	0.109 (0.064)	0.102 (0.066)
Three-Paths (Durability)	**-0.246 (0.085)**	**-0.239 (0.090)**	**-0.224 (0.089)**	**-0.245 (0.098)**
Two-Stars (Creation)	-0.231 (0.127)	-0.125 (0.117)	-0.097 (0.116)	-0.132 (0.127)
Two-Stars (Durability)	**0.485 (0.166)**	**0.436 (0.173)**	**0.373 (0.161)**	**0.392 (0.178)**
Outdegree Activity (*Sqrt*)	**1.473 (0.351)**	**1.340 (0.443)**	**1.402 (0.452)**	**1.410 (0.472)**
Period 7		**1.239 (0.630)**	**1.310 (0.612)**	**1.230 (0.577)**
Period 10		**1.664 (0.660)**	**1.677 (0.661)**	**1.585 (0.631)**
Out-Indegree Assortativity	**-0.032 (0.010)**	**-0.031 (0.012)**	**-0.034 (0.013)**	**-0.030 (0.014)**
Outdegree (Density)	**-4.485 (0.670)**	**-4.120 (0.805)**	**-4.089 (0.809)**	**-4.489 (0.817)**
Period 2	—	0.658 (0.354)	0.639 (0.359)	0.512 (0.381)
Period 3	—	0.108 (0.302)	0.089 (0.315)	-0.604 (0.447)
Period 5	—	-0.280 (0.386)	-0.272 (0.414)	-1.496 (0.881)
Period 6	—	1.027 (0.525)	1.052 (0.550)	0.899 (0.522)
Period 7	—	**-3.476 (1.806)**	**-3.664 (1.758)**	**-3.373 (1.659)**
Period 10	—	**-4.975 (1.899)**	**-5.020 (1.888)**	**-4.714 (1.801)**
Period 11	—	-0.212 (0.394)	-1.043 (0.538)	-0.944 (0.528)
Period 12	—	-0.217 (0.406)	-0.198 (0.421)	-0.203 (0.396)
Period 13	—	0.587 (0.329)	0.377 (0.373)	0.423 (0.391)
Period 14	—	-0.031 (0.367)	-0.687 (0.449)	-0.662 (0.466)
Monadic Controls				
Alter Popularity x Contentious Tactic	—	—	-0.242 (0.150)	-0.249 (0.155)
Period 11	—	—	**1.685 (0.629)**	**1.669 (0.635)**
Period 14	—	—	**1.298 (0.531)**	**1.318 (0.551)**
Ego Activity x Organisational Age (Log)	—	—	0.050 (0.117)	0.022 (0.119)
Period 13	—	—	**1.470 (0.709)**	**1.366 (0.667)**
Mixed Structure-Attributes Effects				
Indegree Popularity x Religious Identification	—	—	—	-0.006 (0.034)
Period 3	—	—	—	0.134 (0.101)
Period 5	—	—	—	-0.166 (0.107)
Indegree Popularity x Home Country	—	—	—	**0.173 (0.054)**
Period 5	—	—	—	0.521 (0.290)
PLO Membership: In-Alter Distance 2 Similarity	—	—	—	-0.343 (0.275)
PNSF/APF Membership: In-Alter Distance 2 Similarity	—	—	—	**0.724 (0.267)**
Global Joint-Test for Time Heterogeneity p-value	0.001	0.181	0.378	0.135

*Significance determined by Wald-type test of t-ratios which equal abs(β/s.e.$_\beta$); **BOLD** estimates are significantly different from zero with t-ratio > 2 approx. $p < 0.05$; Note that for rate parameters tests of this type do not apply*
Estimation Settings (All Models): Number of Sub-phases in Phase 2 = 4, Phase 3 Iterations = 5000
The overall maximum convergence ratio for all models is < 0.1 in absolute value
All Effect-wise joint significance tests for time heterogeneity are failed. See Ripley et al. (2015) for details

Results consistently indicate that SMOs exhibit a strong preference for the creation of four-cycles. Substantively, this effect indicates that Palestinian SMOs tend to reinforce tactical overlap as opposed to actively avoid it. Additionally, there is a consistent and strong tendency to preserve four-cycles. Above I argued that even if SMOs were to capitalise upon the uncertainty-reduction benefits inherent to four-cycles, heightened competition should limit the long-term viability of such structures. Nonetheless, results very clearly indicate the durability of double tactical interlocks amongst Palestinian SMOs. Recall that I use the square root of the number of four-cycles centred on some focal SMO, thus the tendency to create and preserve four-cycles is stronger at lower levels of tactical overlap. However, this falling marginal effect is very different from an explicit preference against the formation and maintenance of double tactical interlocks.

Hypothesised dynamics do not change with the addition of time-based effects, monadic covariates or those effects designed to capture homophilous implementation. Unsurprisingly, Model 4 indicates that SMOs tend to implement the same tactics as those peers in their home country. Furthermore, Model 4 indicates that PNSF/APF membership does play a role in the implementation process. This estimate indicates that SMOs who are members of the PNSF/APF tend to implement tactics when an above average percentage of those other SMOs implementing that tactic are also PNSF/APF members.[16]

VI.1 Out-of-Sample Prediction

In the preceding paragraphs I have claimed that double tactical interlocks are both a preferred and enduring feature of the Palestinian National Movement. Yet an unanswered question is how plausible are these models? At this time, information-theoretic measures of fit (e.g., AIC or BIC) have not been developed for SAOMs. Instead, the current best practice is to assess the

[16] I fit an additional model (not shown) with: (a) an interaction between SMOs' experiencing of any state violence (MAROB-ME Code: STATEVIOLENCE) in the year prior and the alter popularity effect for contentions tactics; and (b) an interaction between organisational age and the alter popularity effect for contentious tactics. These were chosen the model the impact of state counter-pressure and organisational formalisation on SMOs' preferences for disruptive behaviour (see Wang and Piazza 2016). Neither interaction was significant and main results hold.

plausibility of the networks generated from parameter estimates using auxiliary statistics that were not explicitly fit by models but are still features of the observed network that should be faithfully represented. The SAOM goodness-of-fit (GoF) procedure compares observed values for auxiliary statistics at the end of each observation period to simulated values for those same statistics at the end of each period. The overall difference between observed and simulated statistics is then assessed using a joint Mahalanobis distance test (see Ripley et al. 2015).

Currently the SAOM GoF procedure and the Huisman and Snijders (2003) method for composition change do not combine properly (Ripley et al. 2015:52). While one could use structurally determined values (see Ripley et al. 2015:30) to account for composition change, this disallows use of creation and durability effects as their estimation requires use of either the Huisman and Snijders method or constant composition. As it would be quite unreasonable to ignore the changing composition of an organisational population over 17 years; I pursue an alternative strategy. Scholars in political and management science (e.g., Cranmer and Desmarais 2011; Kinne 2013; Koskinen and Edling 2012) have fruitfully assessed the plausibility of statistical models of networks by fitting models to observation waves $w_1 \ldots, w_n$, simulating a number of hypothetical networks for wave w_{n+1} using estimates from the wave $w_1 \ldots, w_n$ model and then comparing distributions of features from the simulated networks to those of the observed network for w_{n+1}. This is a form of out-of-sample prediction/forecasting. While not used as widely in sociology as in sibling social sciences, given a researcher's careful consideration of the degree to which it is safe to assume that the data generating process will remain the same for a given time period, out-of-sample prediction represents a powerful way to assess a series of models (see Gleditsch and Ward 2013 and Ward 2016 for an introduction to and spirited defence of prediction/forecasting in politics). Because I execute this procedure for one period, such an assumption is on solid ground. As for network composition, between 2003 and 2004 no SMOs enter or exit the network.

Typically, scholars employing out-of-sample prediction with estimates obtained from models of networks focus on the prediction of edges. However, edge-prediction alone is not always

the best means of assessing model performance as the presence or absence of edges *per se* is not associated with those network motifs (e.g. transitive triads) or macro-level network features (e.g., degree distributions) of theoretical and substantive interest. For this study, edge-prediction (i.e., will a SMO implement a given tactic in the next year?) has clear relevance — particularly with regard to contentious tactics. Nonetheless, I keep with the large majority of the statistical networks literature by also assessing relevant auxiliary statistics.

My strategy for judging fit is as follows. For Models 2, 3 and 4 in Table VII, I fit a second SAOM for the 2003-2004 period. For this second SAOM, parameters are fixed at the values in Table VII and the algorithm used to estimate SAOMs is exploited to simulate networks that depend only on the parameter values and the state of the 2003 network (see Ripley et al. 2015:84 on simulation with SAOMs using the R package RSiena).[17] I then use separation plots (Greenhill, Ward and Sacks 2001) to judge the predictive performance of the models, highlighting use of civilian attacks given the great interest in such behaviour by scholars of social movements and the Middle East. Finally, I supplement separation plots with distributions of auxiliary statistics using the native SAOM GoF procedure. For the *AP* bipartite graph, I use the mode *A* (SMOs) outdegree distribution and the mode *P* (Tactics) indegree distribution as auxiliary statistics. All GoF assessments are based on 10,000 simulated networks.

[17] Because this SAOM is for one period, the estimation algorithm disallows time-based effects, thus the estimates for those time-dummies appearing in models do not play a role in simulations.

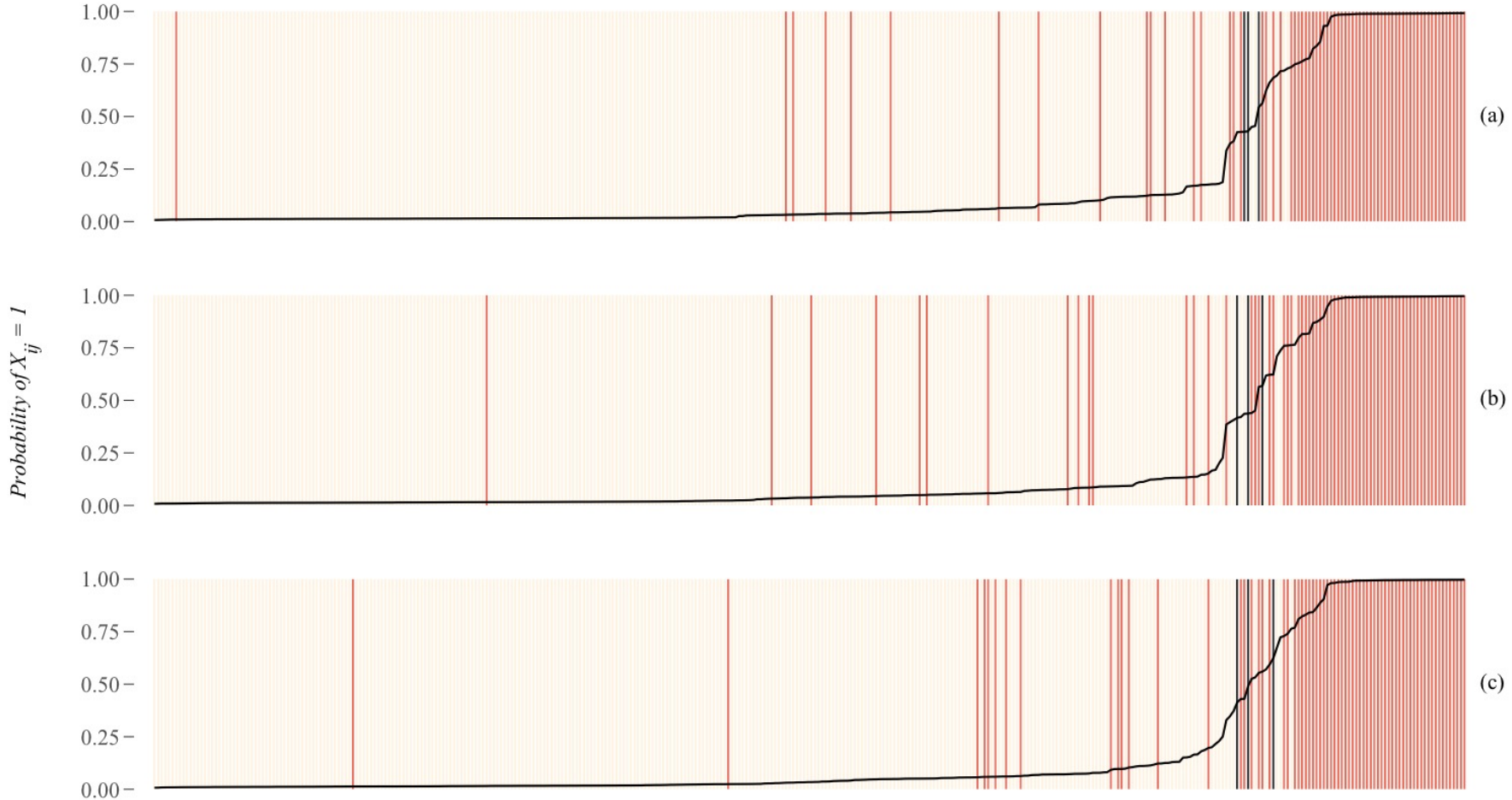


Figure 2 | Predicted values (i.e., for a given edge, the proportion of 10,000 simulated edges identified as present) arranged in ascending order from left to right. Red vertical lines indicate actual instances of tactical implementation where tan vertical lines indicate non-implementation. Black vertical lines denote the three instances of attacks on civilians in 2004. The black horizontal line is a plot of the predicted values (y-axis) for implementation/non-implementation. Models 2, 3 and 4 correspond to panels (a), (b), and (c), respectively.

Figure 3 | Goodness-of-Fit for outdegree and indegree distributions for models 2, 3 and 4, corresponding to panels (a), (b), and (c), respectively. Distribution of observed values given by solid red line. Dashed lines represent the 95% confidence interval for simulated statistics for each observed value. Distributions are cumulative and based of of 10,000 simulated networks. For example, across all waves 24 SMOs had an outdegree equal to four or less. *p*-values (x-axis) are given for a test of Mahalanobis distance. Box plots indicate the distribution of each statistic

Figure II presents the separation plots which arrange the predicted values (i.e., for a given edge, the proportion of 10,000 simulated edges identified as present) in ascending order from left to right. Red vertical lines indicate actual instances of tactical implementation where tan vertical lines indicate non-implementation. Black vertical lines denote the three instances of attacks on civilians in 2004. The black horizontal line is a plot of the predicted values (y-axis). These plots enable the evaluation of a model's predictive power through visual inspection of the degree to which the model places the mass of probability (black horizontal line) on actual instances of implementation (red vertical lines). This is indicated by a large degree of separation between the red and tan lines, where a "good" model clusters the large majority of red lines on the right-most end of the plot. Finally, the sum of the predicted probabilities of all (non)events yields a count of the expected number of total events predicted by this model. This is then compared to the total number of observed events for a complementary take on model performance.

The separation plots indicate that all models perform very well with regard to segregating instances of tactical implementation from non-implementation. Furthermore, all models correctly allocate a moderate to strong probability to the implementation of terrorists attacks by the Democratic Front for the Liberation of Palestine (Palestinian Territories), Palestinian Islamic Jihad, and the Popular Front for the Liberation of Palestine (Palestinian Territories). Models 2, 3, and 4 predict 68.6, 68.7, and 68.9 instances of tactical implementation, respectively. In 2004, there were 73 instances of tactical implementation. Relative to this metric, all models perform quite well — each predicting total instances of implementation roughly four short of the observed instances.

Figure III presents degree distributions. As with separation plots, all models perform similarly well. *p*-values for the Mahalanobis distance test are inset. The null hypothesis is that simulated and observed distributions of auxiliary statistics are the same. Both this test and visual inspection jointly indicate how well a model reproduces observed features of the network. Though *p*-values are less than 0.5 for the outdegree distributions, the plots show that the simulated and observed degree distributions are largely in agreement. Generally, these models over-represent

outdegrees equal to 3 and 4 whilst fitting other outdegrees very well. Fit for the indegree distributions is excellent.

Lacking any extreme deviations in performance across models, I turn to theory to decide which model is indeed "best". In this respect, Model 4 is clearly superior solely on the grounds of a more plausible specification. However, it is worth noting that the qualitative difference in predictive power between Model 2 and Model 4 as indicated by separation plots, predicted total instances of implementation, and degree distributions suggests that the structural dependencies alone capture quite a bit of variation in tactical implementation relative to explanations typically found in the sociological literature.

VII DISCUSSION

Assessment of tactical repertoires, both their composition and their evolution, is a foundational dimension of social movement research. Recent scholarship by Wang and Soule (2012) has convincingly demonstrated the utility of conceptualising and analysing repertoires as portfolios of activities at the level of individual organisations as opposed to a set of actions defined at the level of whole movements or particular periods of times. This shift in focus has the very appealing properties of being more analytically tractable and of making clear the locus of action in social movement fields — groupings of diverse SMOs who both cooperate, compete and learn from one another (Diani 2013; Larson and Lizardo 2015; Meyer and Staggenborg 2012; Minkoff and McCarthy 2005). However, scholars have yet to empirically address how, precisely, SMOs come to decide which tactics to implement when faced with an *array* of competing options. This is a striking omission as "without examining the act of selecting and applying tactics, [scholars] cannot adequately explain the psychological, organizational, cultural, and structural factors that help explain these choices" (Jasper 2004:2).

Here I have attempted to address the tactical choice process directly and in doing so emphasised the manner in which the choices of SMOs might be shaped by those of their peers.

Adopting an institutional perspective on organisational behaviour and a cultural perspective on networks, I have expanded upon Wang and Soule's (2012) portfolio-based view of tactical repertoires — recasting them as egocentric networks — to argue that the system produced from the collision of repertoires at the level of organisational populations provides some indication as to how SMOs manage multiple routes to social change. Analytically, I have underscored the importance of the dynamics of SMO-Tactic bipartite networks, specifically as they relate to uncertainty reduction, for explaining SMOs' initial and continued tactical implementation. In operationalising these dynamics, I have looked to double tactical interlocks as sites of organisational learning, competition and differentiation.

Results from a series of SAOMs provide strong support for Hypothesis 1 and evidence against Hypothesis 3. This indicates the operation of an action mechanism known as peer referral (Koskinen and Edling 2012). For two SMOs simultaneously implementing the same tactic, this dynamic sees one SMO actively mimic the other to implement a second, previously unused, tactic. Here, referral arises in response to localised positive feedback (i.e., a rich-get-richer processes on the part of tactics) based on the "first-mover" behaviour of a niche-based peer. This process induces the formation of double tactical interlocks which, in turn, reinforces tactical overlap. Importantly, this dynamic indicates that *agreement* on one tactic may serve as the crucible for innovation with respect to another, supporting the observation that when new tactics appear, they are often beside old ones (Wang and Soule 2016).

In the context of the reinforcement of overlap, Hypothesis 4 leads to an expectation of temporally limited referral whereby SMOs copy peers to learn about new tactics but ultimately destroy double interlocks due to a need to distinguish themselves. However, estimates from SAOMs indicate that SMOs actively preserve double tactical interlocks. This stands as evidence against Hypothesis 4 and evidence in support of Hypothesis 2, strongly buttressing observations that endogenous institutional processes may facilitate stability in social movements (Larson and Lizardo 2015).

Nonetheless, Hypotheses 3 and 4 stem from the well documented need for SMOs to compete for diverse resources and jockey to maintain distinct identities. While the active creation of double tactical interlocks may be read as counter to arguments around increasing tactical overlap and heightened niche-based competition (Olzak and Uhrig 2001), I posit that competition is the very impetus for the organisational surveillance and mimicry inherent in the formation of such micro-level structures. My position is based on the notion of competitive embeddedness (Trapido 2007) which posits that familiarity and trust between organisations are positively associated with the intensity of competition between them. Thus competition may not alienate peer SMOs, instead increasing surveillance and information sharing between them.

As to the active preservation of double tactical interlocks, creation of such structures leads to a situation where SMOs are faced with two competing costs. On one hand, creating double tactical interlocks actively fuels competitive pressure and contributes to a SMO's redundancy. On the other hand, once a SMO's tactical repertoire becomes intertwined with those of its peers, dissolving double interlocks risks violation of institutionalised norms it has subscribed to. This places SMOs in a position where they must choose between heightened competitive pressure or failing to continue behaviour that has been deemed legitimate, i.e., just and right from the perspective of movement adherents (Biggs, 2013). Results above suggest that the costs of reneging on legitimate action outweighs the costs associated with competition — an assessment that makes all the more sense when considering the principled nature of movement actors and that their "instrumental calculations are always tempered by their cultural commitments" (Polletta 2004:164; see also Blee 2013 on "norm circles"). Notwithstanding, empirical evidence indicates that SMOs that *do not* drop tactics used in the past (i.e., tactical generalists) may enjoy increased chances for survival (Soule and King 2008). Thus, the true costs of competition may not be as immediately apparent to SMOs compared to those of illegitimacy (e.g., a disaffected support base, lack of peer support).

VII.1 Innovations and Limitations

The idea that tactical overlap leads to increased sharing of tactics is not new. As Wang and Soule (2012) detail in their study of the diffusion of tactics at protest events, tactical overlap increases inter-SMO transfer of novel tactics up until a point where after anything more than moderate similarity hampers the transfer process. However, here I make two important contributions to the sociological study of social movements by empirically showing that: (a) SMOs may exhibit a preference for the reinforcement of tactical overlap and thus are not universally opposed to fostering niche-based competition if there are suitable benefits (here, reduction of uncertainty about appropriate behaviour); and that (b) SMOs may actively maintain tactical overlap over long periods of time as opposed to moving to distinguish themselves in an attempt to avoid illegitimate standing and, possibly, peer sanction. Furthermore, by focusing on network structure and positive feedback, I link SMOs' reinforcement of tactical overlap to the transformation of their expectations based on the actions of peers which, in turn, provides evidence in strong affirmation of arguments that implementation of one tactic is not independent of the implementation of others (Strang and Soule 1998:285; Wang and Soule 2016).

Additionally, I empirically show that the structural positions of tactics and SMOs *relative to each other* combine to directly impact initial and continued implementation. In these respects, SMOs' preferences for tactics evolve with account to factors that extant models of tactical diffusion and tactical choice in the sociological literature fail to address. Had I focused on the composition of tactics at the level of the Palestinian National Movement or on use of a single tactic in isolation of others, the micro-level dynamics of choice and, by extension, organisational agency, would have been obfuscated. Further still, by presenting tactical implementation as a process that unfolds within a *dynamic* network, I was able to provide provocative answers to the important questions of where does tactical overlap come from and what might sustain it at the organisational level? Even if one were to maintain the integrity of the SMO-Tactic network, peer referral and the durability of double interlocks are fundamentally temporal processes (Koskinen and Edling 2012). Thus I also make an

applied methodological contribution to social movement studies by demonstrating the power of a statistical networks approach when analysing strategic decision-making.

While my singular focus on the Palestinian National Movement has allowed an in-depth analysis of the rich dynamics of tactical implementation, comparative cases are needed — both within and outside of the Middle East. Although analyses of single movements tend to be the rule as opposed to the exception in sociology, results of my analysis must be qualified as the likelihood of observing the reinforcement and maintenance of double tactical interlocks is arguably much higher *within* a movement than it would be *between* movements. This is because baseline levels of competition are lower and agreement on issues and goals is higher within a given social movement industry. This does not weaken the validity of my results. However, this limitation represents and important scope condition — dynamics around the formation and dissolution of double tactical interlocks observed here may be weaker or altogether different should one focus on inter-organisational surveillance and learning across movements as Olzak and Uhrig (2001) do.[18]

Also, I again highlight how the MAROB-ME data codes tactical classes as an additional limitation. Though I have built my analysis upon diverse classes of tactics, the raw number of options from which SMOs choose from in my models is on the smaller end of the scale. Consider, for example, Soule and King (2008), and their use of 17 protest tactics, and Wang and Soule (2016), who use 57 protest tactics, versus the 13 tactical classes used here. All things considered, the likelihood of tactical overlap amongst SMOs is much higher in the MAROB-ME data due to multiple tactics being collapsed into circumscribed classes. This is akin to measurement issues in residential segregation related to defining the boundaries of spatial subareas, namely aggregation effects (see Reardon and O'Sullivan). This leads me to make a broad call for further research exploring the sensitivity of the above results to variation in the size of the tactical choice set.

On a related note, using tactical classes can sometimes lead to "toy" decision scenarios. For example, it seems unlikely that SMOs decide whether or not they are going to engage in "education

[18] I am indebted to Susan Olzak for making these excellent points, as well as those below related to aggregation effects, in direct correspondence.

and propaganda" as a broad class of activity. Instead, they are more likely to deliberate on a particular action (e.g., producing newsletters or flyers/posters). Going forward, comprehensive datasets are needed that track populations of SMOs over a number of years and that combine the depth of tactical behaviour seen in the DCA and Prodat datasets with the breadth of tactical classes found in the MAROB-ME data without aggregation.

Despite these limitations, results suggest that four-cycles and, more broadly, bipartite networks are useful sites for theorising and empirically testing strategic action mechanisms in social movements. Logical next steps for future research in this vein include investigation of SMOs' differential tendencies to create and dissolve double tactical interlocks across the organisational life course and at various repertoire sizes. New work might also explore whether double interlocks formed via the implementation of a previously unused contentious tactic are more or less temporally robust. In this latter scenario, the principle question is whether or not SMOs follow peers when they take up particularly risky behaviour and do SMOs continue engaging in risky behaviour after they have directly experienced costs and benefits.

Future work might also expand on my actor-oriented and choice-focused research design to investigate change in the combination of issues, targets and tactics that underpin institutional movement logics. Like tactical choice, the selection of targets and issues are characterised by duality. Again echoing Meyer and Staggenborg (2012), strategic choices are interdependent and thus it is likely that choice of target and/or issue will enable or constrain choice of tactic (see Walker et al. 2008; Wang and Piazza 2016), and vice versa. The analytical framework I have outlined here may very easily be extended to accommodate co-evolving bipartite networks representative of these three systems of choice. Potential research questions are not limited to peer referral and cross-network four-cycles (i.e., shared choice of issues leading to selection of the same target and/or implementation of the same tactic). Other interesting lines of inquiry include the relationship between repertoire size and breadth of targets and whether hybrid (i.e., multi-issue organisations) tend to select popular targets.

CHAPTER III

Multiplexity and Strategic Alliances[19]

As mentioned at the outset of this thesis, 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 Melucci 1996 and Touraine 1981). 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 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.[20] Scholars taking a network perspective (Diani 2015, Mische 2008 and Wang and Soule 2012; see Diani and McAdam 2003 for a review) have successfully

[19] *Text, tables and figures comprising this chapter are duplicated in their entirety from the published work: Simpson, C. R. (2015). Multiplexity and strategic alliances: The relational embeddedness of coalitions in social movement organisational fields. Social Networks. Issue 42, p. 42-59. http://dx.doi.org/10.1016/j.socnet.2015.02.007*

Note: In the published version of this chapter, I originally used the phrased "social movement organisational field" as opposed to "social movement field". These phrases are equivalent, however, I use the latter here for consistency.

[20] Broadly, relationships between SMOs range from those that are informal and largely ad-hoc to fusion via mergers (Cornfield and McCammon 2010). While this heuristic is problematised in light of new relations that are digital in nature (e.g. following on Twitter, or liking on Facebook), 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.

argued against holist thinking and lobbied for the more appropriate conceptualisation of movements as a constellation of both SMOs and individual activists.[21] 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.[22] 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.

In this chapter 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 (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 (Figure 1).[23]

[21] 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.

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

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

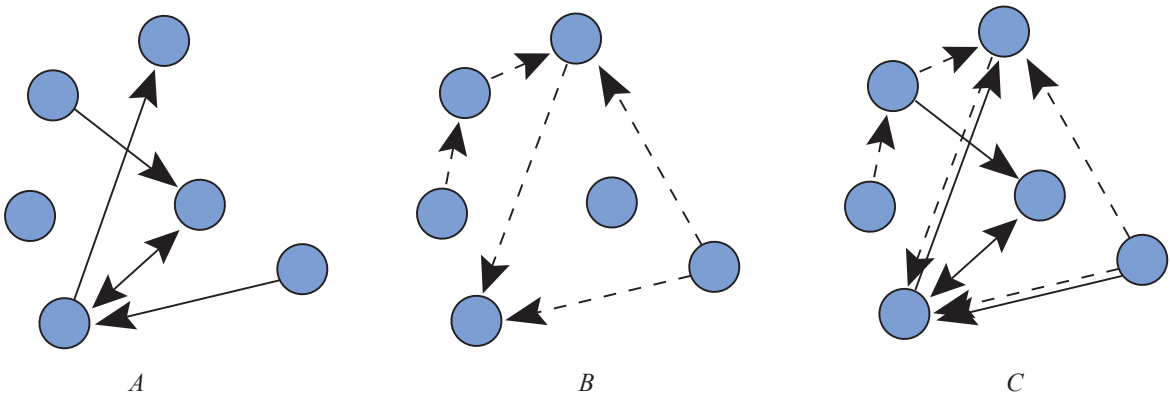


Figure 1 | Slices of a multilayered network. Simplex view of relationship one (A), simplex view of relationship two (B), and multiplex view of both relationships (C).

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 fields — 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).[24] 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,

[24] 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 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 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).

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).[25] 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 and 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

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

which bind political actors (González-Bailón et al. 2011) and thus comprise, in part, the structure of social movement 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.[26] 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 and 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 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

[26] The original notion of an associational space or "issue network" (Rogers 2010a; 2010b) 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.

see Dysart 2002, Garrido and Halavais 2003, González-Bailón 2007, Kleinberg and Lawrence 2001, Park 2002 and Tremayne 2004).[27]

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 minsters) 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 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 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

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

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 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 (Okamoto 2010) must consider how both may operate jointly within and across network layers.[28]

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

[28] 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 which 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).

presentation of the case study, data and methods (Section 5), and a substantive discussion (Section 7) following results in Section 6.

II 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 and 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 and 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).[29]

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 (Osa

[29] 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.

2003, Arnold 2011 and Park 2008 provide alternatives). Such an approach effectively neglects the array 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 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.

III 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 and 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 and 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 and Zhao and Rank 2013). This is because one tie, while forming a unique relational context, often entails another (Shipilov and Li 2012 and White 2008).

Scholars from organisational studies have convincingly argued for the importance of multiplexity in light of the potential bias of simplex analyses (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 and 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 (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.

IV HYPOTHESES

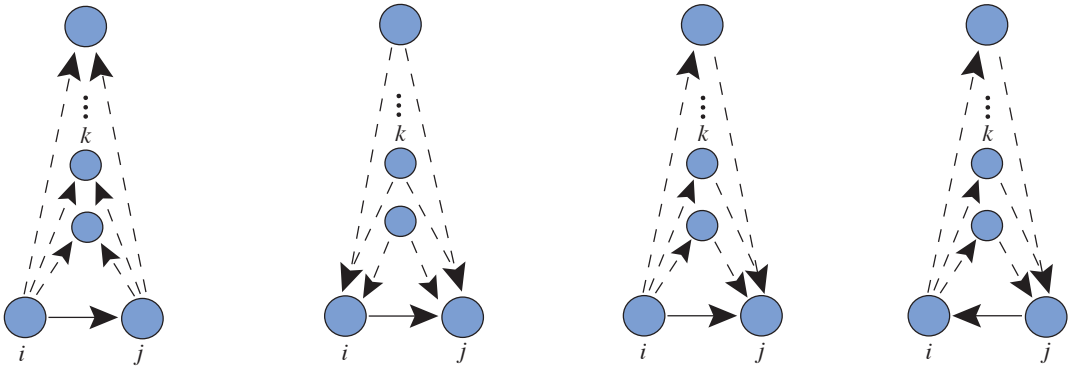
Work on civic networks directs attention to multiplex dynamics located in dyads and triads. Of these two structures, dyads are the more obvious sub-graphs through which multiplexity may be expected to structure alliance. Specifically, I focus on entrainment and exchange. Entrainment represents the degree 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 elementary of network forms, I expect that:

Hypothesis 1: 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*.



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

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

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

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

Figure 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 (dashed). Solid lines represent hyperlinked alliance. The codes in parenthesis are the identifiers used to specify a multivariate ERGM in XPNet. Reproduced with permission from Gijs Huitsing.

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 (Figure 2). I utilise each type of multiplex closure to model alliance, expecting that:

Hypothesis 2: 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.

V DATA AND METHODS

V.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.

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).[30] 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

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

Benefits Consortium (DBC),[31] 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

[31] 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 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 of 2013 are well established entities that have seen little fluctuation in membership from 2011.

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.[32]

V.2 Co-occurring networks of interest

Positive nomination: Affective ties between organisations provide social support, establish a sense of identity and belonging and transmit normative expectations (Umphress et al. 2003). As a tool for social movement actors, Facebook has traditionally received scholarly attention around the

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

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; Harlow 2012 and 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.[33] 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

[33] 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.

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 and 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 and 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).

$$x_{ij} = \begin{cases} 1 \; if \; \varphi_i > \varphi_j; \\ 0 \; otherwise \end{cases} \tag{1}$$

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.

V.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 the websites of all 55 SMOs in the HHC and retrieving the direct connections between each of their websites.[34] 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

[34] 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.

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.

Table II: 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	Undirected	Yes	Binary	55	824	—	0.28	15	1	1

V.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; Figure 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.

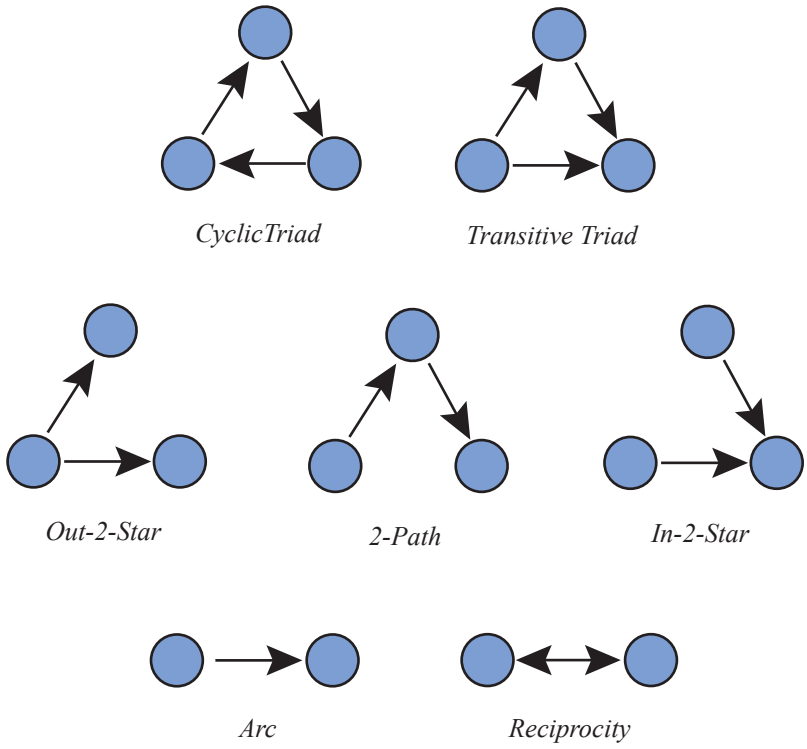


Figure 3 | Hierarchy of lower-order network configurations. From bottom to top, with arcs being the simplest, configurations increase in complexity.

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 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).

V.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) Σ_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

$$Z_A(x) = \sum_{A \in A_K} \prod_{(i,j,m) \in A} x_{ijm} \tag{3}$$

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 and Snijders and Van Duijn 2002).

VI RESULTS

VI.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.

Table III: Univariate and Bivariate ERGMs * †

	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		*Largest GoF t-Ratio: 0.09*		*Largest GoF t-Ratio: 0.11*	
	Extreme Features: Triads — 021C (-2.203), 030T (2.686)		*Extreme Features: —*		*Extreme Features: 3-Out-Star B (2.049); AKT-C B (-3.604)*	

* **BOLD** indicates a significant estimate, i.e., the ratio of θ to the s.e.$_\theta$ is greater than two
† 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).

VI.2 Bivariate analyses

VI.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 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.

VI.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 II.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).

VII 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 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.

VII.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) whereby the likelihood of cooperation increases due to competition between two organisations.[35] Premised on there being no a priori reason to expect that

[35] 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.

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 (McCammon and Campbell 2002 and 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.

VII.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.[36]

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 and 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

[36] To assess robustness of dyadic conclusions I also ran a logistic regression quadratic assignment procedure (see Borgatti, Everett and Johnson 2013, and Dekker, Krackhardt and Snijders 2007). Results (Appendix II.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.

alliances with those organisations in whom they have already invested. Indeed, the layering of ties has been empirically shown to reduce 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 (Ackland and O'Neil 2011), degree-based processes do suggest local-level hierarchy whereby some SMOs net allies without establishing alliances with other SMOs.[37]

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

[37] 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.

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 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 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 (Figure 4).

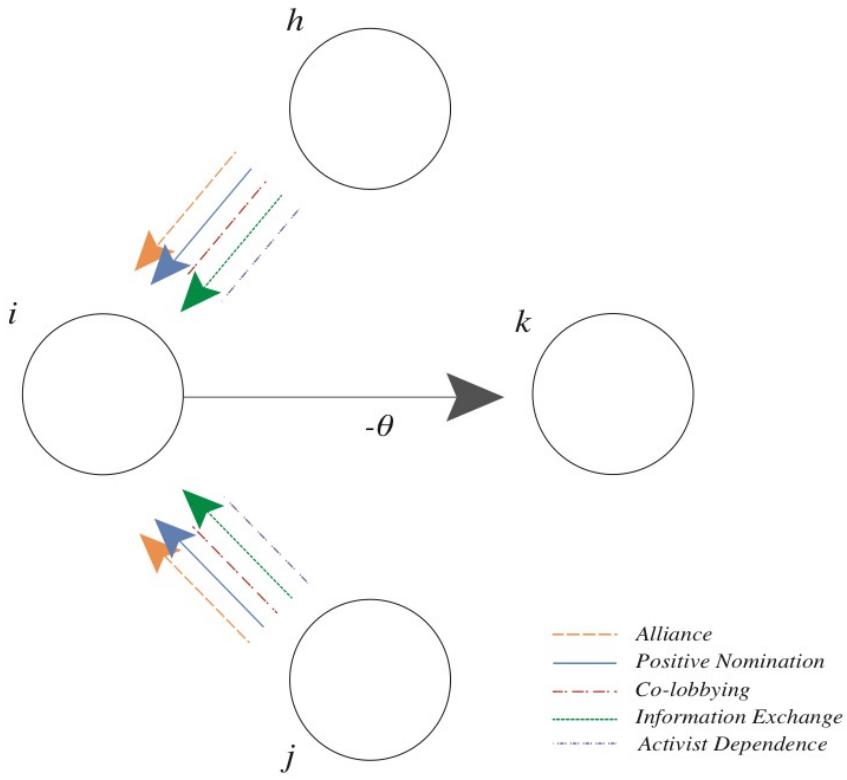


Figure 4 | Opportunistic alliance formation. Here, organisation *i* enjoys the resource-related benefits that come with having a platform for grievances (information exchange), the implicit support of others SMOs (activist dependence), the legitimacy that comes from collective claims making (co-lobbying),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

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 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.

VII.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 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 to the network to explain its formation as opposed to combining endogenous processes and exogenous predictors in the form of actor attributes.[38] 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.

[38] Mathematically, the dyadic covariates used here are treated as exogenous predictors in this framework. Here I mean individual attributes of actors and dyads that are not inherently relational.

APPENDIX II.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.

APPENDIX II.B

Univariate ERGMs for Positive Nomination and Information Exchange *†

	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
* **BOLD** indicates a significant estimate, i.e., the ratio of θ to the s.e.$_\theta$ is greater than two	*Largest GoF t-Ratio: 0.04*		*Largest GoF t-Ratio: 0.06*	
† The absolute value of convergence t-ratios for all parameters in all models are less than 0.1, the requirement for convergence (see Koskin and Snijders 2013).	*Extreme Features: Triad 030T (2.005)*		*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)*	

APPENDIX II.C

Logistic Regression Quadratic Assignment Procedure (LR-QAP)

	Coefficient	*Odds Ratio*	*t-statistic*	*P-Value*
Parameters				
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-Square*d: 0.115

*** Significant at the 99% Confidence Level
** Significant at the 95% Confidence Level

APPENDIX II.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/

CHAPTER IV

Prestige and Success Within a Bipartite Market for Solutions to Social Problems[39]

The considerable wealth of private foundations has fuelled examination of the ways in which endowed institutions may influence both beneficiaries and the broader socio-political environment. For those taking social movement organisations as their focus, inquiry around foundation giving has been devoted to detailing the degree to which goal displacement occurs in the face of lucrative grant dollars. However, this work has adopted a fairly narrow view of foundation contributions, failing to complicate an implicit assumption of invariability in the allocation of capital amongst heterogeneous SMOs. This has coincided with a lack of acknowledgement and direct treatment of the agency of foundations — a type of SMO in their own right — as strategic decision-makers.

Owing to an almost universal handling of resource derivation as an independent variable, previous scholarship on patronage – the allocation of grants to SMOs with nonprofit status by private foundations – has effectively black boxed the competitive dynamics which underpin financial investment. Though research on the effects of patronage is valuable, it

[39] *Text, tables and figures comprising this chapter are duplicated in their entirety: Simpson, C. R. (2016). Competition for foundation patronage and the differential effects of prestige on the grant market success of social movement organisations. Social Networks. Issue 46, p. 29-43. http://dx.doi.org/10.1016/j.socnet.2016.02.001*

inevitably raises questions around how, precisely, does such financial support come about. The omission of a direct treatment of competition amongst SMOs is curious given that capital is one of the most visible of movement resources and that the notion of competition is a prominent aspect of resource mobilisation theory (McCarthy and Zald 1977).

Traditionally, scholars of social movements and, more generally, scholars working within the organisational ecology tradition invoke density dependence (i.e., regulation of population growth rates through constraints associated with the number of organisations in existence) in their attempts to capture competitive pressures within populations of organisations (Soule and King 2008 in the context of SMOs). Yet density dependence is intentionally vague about competitive dynamics in order to parsimoniously capture long-term demographic processes (e.g., on the order of decades) across various types of organisational populations (see Carroll and Hannan 1989, p. 527). In order to avoid conflation of two related, but distinct, concepts, it is more appropriate to view the intensity of competition as a function of density relative to the amount of available resources (Hannan and Freeman 1987, p. 918).[40] Therefore, I break with previous research to explore a scenario where density is largely fixed, alongside making an assumption of finite resources, in order to explicitly model the allocation of capital to SMOs by foundations. Without a more complete account of systems of patronage, understanding of resource-related outcomes and, more broadly, a SMO's potential for survival is incomplete. Thus my concern here lies not with the effects of patronage. Instead, I exclusively investigate its antecedents – leading me to ask what explains the allocation of capital to professional SMOs by private foundations?

[40] Scholars of strategy have explicitly modelled competition with an eye to relational dynamics for some time. In particular, see Poldony, Stuart and Hannan's (1996) model of competition in the semiconductor industry which, similarly to the model presented here, integrates organisation-environment dynamics with organisational attributes. Also see Stuart and Podolny (1996).

In answering this question, I maintain the importance of the structure that foundations and SMOs co-create via the formation of ties of patronage which ostensibly bind two separate organisational fields. Specifically, In this chapter I again take a relational perspective and argue for a re-conceptualisation of the grant market as a mutualistic network that may be modelled as a dynamic bipartite graph.[41] Within this network a population of foundations and a population of SMOs cooperate across classes to mutual advantage and SMOs compete within-class for finite financial resources.[42] Mutualistically, SMOs benefit from financial investment as it allows them to meet their primary goal of survival and continue their pursuit of social change goals which may broadly align with those of their patrons (McCarthy and Zald 1973 and McCarthy and Zald 1977). Concurrently, foundations benefit from financial investment in SMOs as contracted services give foundations a route to cost minimisation and flexibility in financial commitments relative to shifts in the public's prioritising of various social problems (Faulk 2011).[43]

As the mutualistic system evolves, a foundation's perception of the quality of various SMOs is continuously shaped as its helps produce a network-based prestige hierarchy by

[41] A bipartite network is composed of two classes of entities where there are relationships between classes and no relationships within classes. The prototypical example in the organisational literature is a network of interlocking directorates. Bipartite networks are also known as "two-mode" or "affiliation networks."

[42] From this perspective, competition connotes a struggle of conflicting interests (Ely 1901) akin to a rivalry between actors who seek something not all may obtain (Stigler 1987). Functionally, competition is a selective process that sees the survival of the fit (Ely 1901) and is understood to be a property of the relationship between actors as opposed to the state of some market (Trapido 2007; Vickers 1995). Importantly, here there are no normative elements attached to competition, whether as a market state or a relational property, with regard to the degree to which it is good or bad for resource derivation in social movements.

[43] The rationale behind this conceptual model comes from Saavedra, Reed-Tsochas and Uzzi (2008). Taking serious the ecological metaphor found in much organisational research, these authors develop a simple bipartite model of cooperation and apply it to plant-animal pollinator networks and to producer-consumer inter-organisational networks. In an intriguing development, the authors find that a number of structural features (e.g., within-class degree distributions, modularity) of networks composed of manufactures and contractors in the New York garment industry (1985 to 2003) exhibit striking similarities to those observed in the pollinator networks. See also Saavedra et al. (2011).

While it is unreasonable to expect the determinants of cooperative behaviour in ecological scenarios to map directly to those governing the interaction between foundations and SMOs, empirical evidence suggests that there is overlap in general dynamics. Thus the term "mutualistic" is appropriate for those organisational scenarios where two distinct classes of actors closely cooperate to mutual advantage.

dynamically adjusting its status-conferring gesture (i.e., grant giving) in accordance with the aggregated action of other grantors in the system.[44] Such path-dependency results in self-reinforcing status rankings of SMOs which directly impact foundations' propensity to invest. Based on an assumption of information asymmetry in markets, these dynamics may be attributed to mimetic processes within a population of foundations which induces copying amongst grantors as a strategy to manage high levels of uncertainty about the quality of SMOs (DiMaggio and Powell 1983 and Galaskiewicz and Wasserman 1989).

Nevertheless, a foundation's funding decision is not independent of its own structural position (i.e., its outdegree; portfolio breadth), here understood to be an indicator of status to the extent that it captures a grantor's role as a major provider of capital to some population of SMOs. In this respect, a mutualistic model of patronage hosts two status hierarchies which operate in tandem to endogenously drive network dynamics that structure the population of foundations and SMOs (see Podolny et al. 1996, p. 662). Thus the empirical objective of this work is to detail those dynamic, status-based tendencies on the part of foundation-investors that lead to the emergence of the mutualistic network. Ultimately, this requires approaching the mutualistic network as both the independent and dependent variable as its future state is understood to be determined solely by that of the present.

The empirical scenario is the financial patronage of 66 professional SMOs with formal charitable status that have been linked to the Climate Change Countermovement.[45]

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[44] While grant giving is fundamentally an event, i.e., money is given by party A to party B at time *t*, it is unreasonable to assume that the decision to invest is independent of past decisions. In this sense, financial patronage creates monetary relationships between foundations and SMOs. This approach to patronage is in line with previous work in social movement studies on grant giving and social control which implicitly assumes sustained relations between foundations and SMOs as opposed to isolated events.

[45] While idyllic images of SMOs resonate with the organisational structure and tactics typically employed by grassroots organisations, the boundary between a SMO, an interest group and a nonprofit is best described as porous. While I primarily address the social movement dimension of the 66 organisations under study, their charitable status and professionalised nature lead me to adopt Andrews and Edwards' (2004) umbrella notion of "advocacy organisation" in order to have a wider conceptual toolkit for thinking about how these organisations seek external financial support. However, nonprofits may be viewed as distinct political entities in their own right (LeRoux and Goerdel 2009).

Primary data, a subset of that collected by Brulle (2013), consists of 3621 grants given by a population of 136 largely conservative private foundations to the 66 SMOs from 2003 to 2007. This was supplemented with the collection of various organisational information (e.g. total revenue, administrative expenses) using the IRS Form 990 in 2014.

Hypotheses are tested using Stochastic Actor-Oriented Models (SAOMs; Snijders 1996 and Snijders 2001), a type of agent-based model for the statistical inference of longitudinal network dynamics (Snijders and Steglich 2013 and Snijders et al. 2010). Results from a series of SAOMs indicate a dynamic tendency (see Section 3.3) for degree disassortativity – the inverse relationship between the cumulative activity of foundations and the cumulative advantage (Merton 1968 and Price 1976) of SMOs. This suggests parallel but opposite funding logics based on structural position within the grant market. The first sees a SMO's cumulative advantage being driven by a global herd mentality on the part of peripheral foundation-investors, i.e., those with narrow portfolios. In this scenario, the stability and trustworthiness signalled by possessing a number of patrons serves to attract investors on the edge of the mutualistic system that may have limited finances and/or information about the population of SMOs and thus must efficiently assess the risk of a potential backing.

Concurrently, the tendency for cumulative activity in the presence of high-status avoidance indicates that major foundations *prefer to invest in peripheral, low-status SMOs*. Counter to the expectation of "status-based homophily" found in the organisational literature, this suggests that foundations may perceive the possession of many benefactors as "locking in" a SMO's immediate goals. I maintain that this is due to the risk of alienating an existing support base through the organisational change required to adapt to an ever-shifting agenda of social problems. Collectively, these results indicate that the status of SMOs leads to differential outcomes across the population of foundation-investors and that previous research

suggesting a positive monotonic relationship between nonprofits' grant market status and foundations' propensity to invest (Faulk et al. 2016) is too simplistic.

The outline of this paper is as follows. In Section 2 I review previous work in social movement studies on resource derivation in order to clarify the monetary relationship between SMOs and foundation patrons with the aid of historical data on giving. This is supplemented with a discussion of cognate work in public administration on the funding of nonprofits to outline what might be called an "informed donor model" constitutive of traditional approaches to assessing nonprofits' competitiveness for grants. I then move on to discuss the utility of a network perspective in capturing foundation-SMO funding dynamics relative to prestige, presenting hypotheses related to operation of status in the patronage system in Section 3. In Section 4 I detail the case study, data and SAOMs. Results follow in Section 5 and I conclude with a discussion in Section 6.

II FINANCIAL RESOURCE DERIVATION AND SOCIAL MOVEMENT ORGANISATIONS

Stemming from McCarthy and Zald's (1977) classic distinction between a movement's direct beneficiaries and its conscientious constituents – individuals and organisations, typically elites, who do not stand to receive direct tangible benefits from the achievement of movement goals – scholarship on resource derivation has been most concerned with the impact of the source of support on movement goals and tactics (see Pichardo 1988for an overview). This work typically explores internal, i.e., "indigenous", support versus external aid and social control. Arguments primarily take the form of one of two hypotheses: (a) elite support leads to the transformation of SMOs' goals, ultimately de-radicalising the movement (Haines 1984, McAdam 1982, Morris 1981 and Morris 1984); or (b) elite support channels SMOs into more publicly palatable entities through professionalisation (Jenkins and Eckert

1986 and Wilson 1983). While scholarship in this area has proved potent in facilitating conversation about resource derivation, it is silent with regard to explanations for variation in the distribution of resources amongst SMOs relative to their individual characteristics or their structural position in relevant markets.

Failure to fully characterise competition may largely be attributed to the positioning of resource derivation as an independent variable and using it to drive arguments about social control. However, the relative importance of external support varies from movement to movement (Cress and Snow 1996), calling into question the implicit universality of statements about the role of elite patrons. Further still, SMOs are likely to receive a combination of internal and external support (Edwards and McCarthy 2004).

Of particular concern here is the well documented tendency for private foundations to fund *professional* SMOs involved in public interest movements.[46] As Jenkins (1998) details, professional SMOs constitute the core of such movements and there is little evidence to suggest that professional SMOs have displaced the indigenous operations of empowerment movements. From 1953 to 1977 foundation giving to SMOs rose from $85,700 to just over $25 million and grew steadily through the 1980s to blossom at approximately $90 million in 1990. Of the total number of grants given from 1953 to 1980, 69.5 percent (75.5 percent of grant dollars) went to professional SMOs (Jenkins 1998 and Jenkins and Halcli 1999). Given that such a large proportion of foundation giving goes to professionalised affairs, it is peculiar that previous work has not studied how capital is allocated more directly. Save organisational militancy, existing scholarship on resource derivation has little to say on what aspects of

[46] Following Jenkins (1998), movements may be in the public interest or geared towards empowerment and SMOs themselves may be indigenous or professional. As their name suggests, empowerment movements attempt to redistribute power relative to marginalised groups based on such things as race or sexual orientation whilst public interest movements pursue broad collective goods such as environmental protection or consumer rights. Professional SMOs are staff driven entities that derive their resources from institutions and isolated constituencies, and represent, rather than directly mobilise, their beneficiaries. 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.

professional SMOs impact the likelihood of financial support. This is perhaps due to scholarship in this area painting a rather thin picture of foundations' attendant concerns and, more broadly, their agency as strategic actors. McCarthy et al. (1991) point to formal charitable status and financial responsibility as facilitative of the receipt of grants, however. In light of this gap, I turn to cognate discussions in public administration where scholars of nonprofits have actively explored how a number of organisational traits impact the degree to which foundation patrons are won.

II.1 Traditional explanations of foundation patronage

If social movement scholars have overlooked the various motives of foundations, scholars in public administration have similarly failed in their treatment of nonprofit agency and strategic awareness. As Frumkin and Kim (2001) note, much of this research has focused on donor motivation relative to changes in the funding environment whilst failing to extensively characterise recipient organisations. Scholarship in this area has explored the effects of such things as the "price" of purchasing charitable output (Weisbrod and Dominguez 1986), the impact of taxation on corporate giving (Navarro 1988) and the degree to which government contributions displace those by charitable organisations (Brooks 2000). An alternative to these foundation-centric approaches is advocated by Frumkin and Kim who emphasise the strategic positioning of nonprofits. Starting with an assumption that the market for charitable contributions is characterised by information asymmetry (Akerlof 1970), this perspective sees nonprofits actively court potential patrons by communicating the importance of their mission and operational excellence.

While mission is the most obvious means of positioning, organisational inertia leads to the rigidity of aims and thus learned excellence through repeat behaviour. This ties radical change in mission to a risk of alienating an existing support base that may harbour specific

expectations of organisational action. Notwithstanding, the proliferation of nonprofits with broadly similar goals has resulted in foundations' compassion fatigue (Frumkin and Kim 2001) and a need for nonprofits to stand out. Given the intractability of mission adaptation and competitive pressure within goal-based niches, financial efficiency has emerged as a more viable strategy for organisations to best their rivals (Frumkin and Kim 2001).[47]

This shift towards efficiency is characterised by the public's demand of greater transparency in charitable activity, nonprofits' acute awareness of bottom lines and foundations' expectations of lower cost ratios. Efforts to economise promise increased organisational legitimacy and heightened donor confidence for those that streamline their operations, particularly with regard to how much is spent on management and fundraising.

Financial benchmarking on the part of foundations is largely a strategy to manage risk, moving descriptions of grants away from the notion of gifts to that of investments which contract nonprofits in accomplishing foundation patrons' mission-related goals. Foundation altruism is embedded in a self-interest framework (Faulk 2011, Graddy and Morgan 2006 and Jenkins 1998) and thus these organisations invest in nonprofits (i.e., grant giving) to maximise their utility relative to bringing about mission-related social change or maintaining the status quo (see Bartley 2007). Drawing on Coase (1937) and Faulk (2011) argues that the outsourcing of services reduces the costs foundations face when tackling the complex problems their missions tie them to in addition to affording foundations flexibility in funding priorities as the agenda of public problems evolves.

An emphasis on efficiency measures, typically derived from the IRS tax document Form 990, constitute what might be called an "informed-donor model." Despite the seeming

[47] It is worth noting that the drive towards efficiency and increased performance is largely attributed to heightened pressure on nonprofits to professionalise (Frumkin 1998; Hwang and Powell 2009). In this respect, many of the arguments about the institutional channelling of SMOs (see McCarthy et al. 1991) resonate with trends in organisational behaviour across the nonprofit sector.

comprehensiveness of the 990 and the relative ease with which foundation decision-makers can use it to access centralised organisational information, debates about the usefulness of such data to potential funders are inconclusive (see Tinkelman and Mankaney 2007 for a review and critique of this work). Concerns around the utility of the metrics in the informed-donor model are further compounded in light of issues related to the accuracy of financial reporting and outright accounting malfeasance on the part of nonprofits in attempts to capture more support through the illusion of efficiency (see Krishnan et al. 2006).

II.2 Network-based status signals and patronage

Given such impediments to the quality of objective metrics, how might foundations overcome information asymmetries and mitigate the uncertainty associated with grant giving? Alternatively, what traits of SMOs might better capture their competitiveness in the grant market? Past research (Galaskiewicz 1997, Galaskiewicz et al. 2006 and Galaskiewicz and Wasserman 1989, also see Podolny 1993) suggests network-based signals of status – prestige accorded to individuals from accumulated acts of deference that may vary in their level of formality, ritualism and self-evidence (Podolny and Lynn 2009) – may serve as proxies for the quality of nonprofit services, ultimately becoming a means of acquiring some resource. Largely rooted in DiMaggio and Powell's (1983) thesis on mimetic isomorphism and an understanding that networks provide access to information that allows organisations to manage risk (Burt 1983), this line of reasoning posits that organisations will copy the behaviour of those respected others when information about quality is poor. As Galaskiewicz et al. (2006, p. 343–344) state, "in hard-to-evaluate situations, it is easier to look at organisation *j*'s network partners and ascertain *j*'s value using the status of these partners than evaluate potential returns objectively."

Whereas previous work by Galaskiewicz and colleagues is primarily concerned with: (a) status signals stemming from brokers who connect previously unconnected grantors and grantees in extra-organisational networks; and (b) a nonprofit's ties to elites, Faulk et al. (2016) explicitly link the concept of status to a nonprofit's structural position in the grant market, though previous work (Baum et al. 2005, Lin et al. 2009, Podolny 1993 and Jensen 2003) has linked structural position to status in other markets. A key limitation of Faulk, Lecy and McGinnis' approach to network-based status is their positioning of status as a function of nonprofits' relations with other nonprofits, specifically those ties formed when nonprofits share one or more benefactors. This is problematic as it effectively removes foundations from the network which they actively build, denying their agency as strategic decision-makers.

For the purposes of this work, such a nonprofit–nonprofit network does not help to elucidate how foundations utilise information based on structural position to make their decisions as, crucially, the logic for network-based status as a heuristic to judge quality is from the perspective of foundations. This necessitate a wholly different approach to detailing the operation of status, and thus the competitiveness of SMOs, as they seek financial support. What is required is a rethinking of the grant market itself. As the notion of interaction between two distinct organisational populations best captures the allocation of grants to SMOs, to "bring foundations back in" the mutualistic structure within which patronage takes place must be maintained.[48]

[48] Following Diani (2015; 2013), I view the empirical aspects of social movements as constitutive of an organisational field that is fundamentally relational in nature and fruitfully analysed as a social network. Specifically, social movement fields are understood to consist of a population of SMOs that are united in their issue interests and tied by relations indicative of domination, cooperation, information exchange and mutual awareness (see also Diani and Pilati 2013 and Minkoff and McCarthy 2005). The most complete notion of field includes both the focal actors of interest and those other entities they routinely engage, here limited to private foundations — though other actors, such as individual activists and government entities, are sure to play a role. In the context of external resource derivation, the logic governing interaction between a field of SMOs and a population of foundations — a field in its own right — is understood to be mutualistic.

II.3. Hypotheses on status dynamics

Given a mutualistic network, how is status expected to operate? Two previously unexplored dynamics are immediately apparent: (a) the inter-mode interaction of degree distributions; and (b) interlocked investment. Substantively, the first dynamic concerns how a foundation's structural position within the grant market, i.e., the breadth of its funding portfolio, mediates its decision to invest in a SMO relative to that SMO's status. Here a foundation's structural position is understood to be an indicator of its status to the extent that it reflects dominance of a grant market as a key provider of capital. Past research has documented the operation of "status-based homophily" whereby status is positively correlated in organisational partnerships (Chung et al. 2000, Lin et al. 2009 and Podolny 1994). In the present scenario, such a tendency may be attributed to a type of two-way legitimisation that sees the reinforcement of prestige when high-status foundations cooperate with high-status SMOs (Faulk et al. 2016). Ultimately, this results in bolstered competitive advantage for both a high-status foundation and a high-status SMO such that the SMO continues to enjoy an increased likelihood of success in the grant market and the foundation benefits from reinforced perceptions of legitimacy in action by stakeholders. This leads me to expect that:

Hypothesis 1**:** There will be a tendency for those foundations *i* that support many SMOs *k* to invest in SMOs *j* that possess a number of other foundation patrons *h.*

One can expect the opposite tendency when foundations of any stature have the opportunity to make an investment. I attribute this to the status leakage that results from deference to a low-prestige organisation (Podolny 2010). Investment in poorly funded, low-status SMOs that may be at risk of failure may damage a foundation's credibility as a social investor by suggesting the squandering of scarce and lucrative grant dollars. Thus I expect that:

Hypothesis 2a: There will be a tendency against foundations investing in SMOs that have zero patrons.

Hypothesis 2b: There will be a tendency against foundations investing in SMOs that have near zero (i.e. 1) patrons.

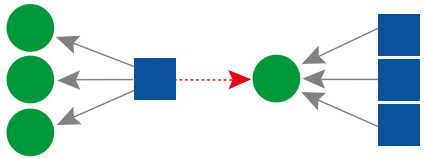
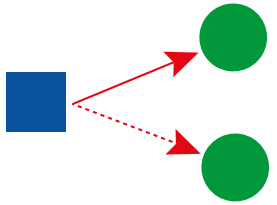
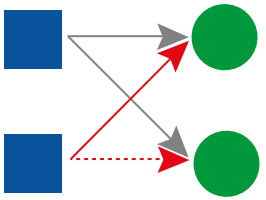
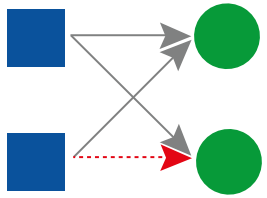
The second dynamic concerns the immediate, local-level effects of interlocked investment. In a dynamic bipartite scenario, this takes the form of peer referral (Koskinen and Edling 2012) whereby two foundations' joint-investment in one SMO leads to future joint-investment in a second SMO. While I have focused exclusively on those factors that contribute to varying levels of competitiveness amongst SMOs, foundations are also understood to be in competition for nonprofit services. Nonetheless, there is no a priori reason to assume that foundations in direct competition for SMO services cannot learn from one another. As Trapido (2007) demonstrates, familiarity and knowledge-based trust tend to be *higher* amongst competitors. The offloading of assessments of SMO quality to another foundation with whom there is direct confirmation of relative investor competency, i.e., equivalency in behaviour, presents a route to managing uncertainty. Specifically, foundations that are structurally equivalent in the grant market belong to a similar status group within which they may monitor and mimic the behaviour of one another. This leads me to expect that:

Hypothesis 3: There will be a tendency for foundations *i* to invest in those SMOs *j* when *j* also receives funding by those foundations *h* with whom *i* shares one or more third-party ties in the form of joint-investment in SMOs *k*.

Hypothesis 1 is tested with a network configuration for *Out-Indegree Assortativity*. Positive estimates for this configuration indicates assortative mixing whereby high-status foundations tend to be patrons of high-status SMOs over time. Hypothesis 2a and Hypothesis 2b are tested with the sibling configurations *In-Isolates* and *In-Near-Isolates*. Positive

estimates for these configurations indicate a tendency for foundations *i* to invest in those SMOs *j* that have zero or near-zero (i.e. 1) patrons *while also continuing* to support those SMOs *k* to whom *i* is the only patron or one of two patrons over time, respectively. Hypothesis 3 is tested with the *4-Cycle* configuration, the bipartite analogue to the transitive triplet which reflects clustering (Robins and Alexander 2004). Positive estimates for this configuration indicate a tendency for a focal foundation *i*, interlocked with another foundation *h* via joint investment in SMO *k* in year *t*, to close a second interlock by investing in a second SMO *j* in year t^{+1} that received a grant from *h* in year *t*. Table 1 provides each network configuration, its statistic and the associated hypothesis.

Table 1: Hypothesised Bipartite Effects

Hypothesis	Effect	Description	Statistic	Network Configuration
Hl	Out-in Degree Assortativity	Tests for the propensity of egos that are highly active funders to make investments in SMOs with many patrons	$\sum_j x_{ij} x_{i+}^{1/2} x_{+j}^{1/2}$	
H2a	In-isolates	Test for egos propensity to invest in SMOs that have zero patrons (dashed) alongside a propensity to continue to invest in those SMOs that would otherwise have zero lines of financial support (black; solid)	$\sum_j I\{x_{+j} \geq 1\}$	
H2b	In-near-isolates	Test for egos' propensity to invest in SMOs that have one patron (dashed) alongside a propensity to continue to invest in those SMOs that would otherwise have just one line of financial support	$\sum_j I\{x_{+j} \geq 2\}$	
H3	4 Cycles	Test for egos' propensity to invest in those SMOs who are funded by egos' joint investment partner	$\sum_{j,k,h} x_{ij} x_{ik} x_{hj} x_{hk}$	

i+ denotes the outdegree of *i* and +*j* denotes the indegree of *j*.
Foundations (ego) are represented by squares. SMOs (alter) are represented by circles.
Red dashed lines are proposed tie changes during network evolution.
Grey solid lines represent the state of the local network within which ego is embedded and responds to when deciding to establish a financial tie.

III THE CASE, DATA AND METHOD

III.1 Resource mobilisation and the denial of global warming: the case of the climate change countermovement

Despite increasing consensus in the scientific community over the reality and importance of Anthropogenic Climate Change (ACC), there exist a number of cleavages in opinion within the United States. Scholars have sought a number of explanations for the high degree of scepticism amongst the American public, exploring the effects of demographic factors (Dietz et al. 2007 and McCright 2010), knowledge (O'Connor et al. 1999), political affiliation (McCright and Dunlap 2011), and the weather itself (Hamilton and Keim 2009). Work in this area seeking institutional explanations has argued that large-scale efforts to deny and distort climate science and the public's understanding of it represent a full-fledged countermovement – a social movement with goals aimed at preserving the established order and traditional values relative to the change advocated by the movement it opposes (see Lo 1982). The Climate Change Countermovement (CCCM; Brulle 2013) began in 1989 in the wake of the formation of the Intergovernmental Panel on Climate Change (Antonio and Brulle 2011) and is largely an extension of the conservative movement of the American right (see Himmelstein 1992for a review). The CCCM is characterised by: (a) the intermingling of corporate and conservative interests; (b) an aim to position ACC as a scientific non-problem through challenges to its reality and legitimacy; and (c) opposition to government regulation (e.g. policies on carbon emissions) in efforts to stave the effects of climate change (McCright and Dunlap 2000; see Dunlap and McCright 2011 for a thorough overview).

Of the CCCM's many political actors, scholars focused on its history, goals and tactics have highlighted its core in the form of highly professionalised and conservative trade associations, advocacy groups and think tanks. Data for this research concerns the SMOs of the CCCM, largely advocacy organisations, and is a subset of the dataset used by Brulle

(2013) in a comprehensive survey of the financiers of the CCCM. The professionalised nature of the SMOs of the CCCM and their history of reliance on wealthy conservative elite (Dunlap and McCright 2011) place many of the above assumptions about cooperative and competitive dynamics between foundations and nonprofits on solid ground. And despite the association of these SMOs with a countermovement, I see no reason to assume that their survival goals, and the subsequent need to strategically pursue financial resources, systematically differ from professional SMOs of the more progressive movements typically addressed in the sociological literature (e.g. civil rights, feminist and peace movements).

However, the atypically close financial relationship between private foundations and the SMOs of the CCCM warrant caution (see especially Section 3.4.2 on Astroturf groups) and limit the generalizability of the funding dynamics observed here. *Thus an important scope condition for hypotheses is that they only applicable to the derivation of external resources by professional SMOs with close links to their population of benefactors.* Less professionalised and/or more radical entities favouring amorphous structure and the avoidance of "mainstream" behaviour are understood to be subject to different constraints.

III.2 Data collection

Here I subset the dataset appearing in Brulle (2013). The full dataset consists of 5223 grants given to 98 SMOs by 138 foundations from 2003 to 2010 (see Appendix IV.D for data collection and coding details). The present analysis uses the 3261 grants given by 136 of the foundations to 66 of the SMOs from 2003 to 2007. Use of a reduced dataset was done for multiple reasons. As the logic governing the funding of organisations that are donation-dependent is likely to differ for those that are supported via alternative revenue streams generated from fees and services (see Galaskiewicz et al. 2006), I only focus on U.S. tax-exempt organisations (501(c) entities) in the nonprofit (501(c)3) and social welfare (501(c)4)

categories. I exclude the 21 organisations that had 501(c)6 or 501(c)12 status, largely trade associations, for a total of 77 SMOs.

Of these 77 11 were born after 2007, which is where I truncate the study period for this work in light of shifts in both the funding logic of the conservative movement and the political opportunity structure. The year 2008 saw a marked increase in the amount of funding flowing through untraceable sources and coalesced with the rise in "donor-directed" foundations, namely Donors Trust and Donors Capital (see Brulle 2013). Donor-directed foundations receive money from individuals and nonprofits and then go on to give grants broadly in line with the preferences of the original contributors. This process conceals both the intent and identity of original contributors as there is no legal requirement for transparency, ultimately enabling anonymous giving. The year 2008 also saw a major economic upheaval in the form of the global financial crisis that is likely to have shaped domestic funding dynamics through a negative impact on discretionary funds. Furthermore, after a period of relative stability from 2002 to 2005 public awareness of climate change began to increase in 2006, peaking in 2007 before falling continuously until 2010 when it landed at pre-2007 levels (see Brulle et al. 2012). Finally 2003–2007 sits within the presidency of George W. Bush, whose administration represented the institutionalisation of the conservative movement within which the CCCM is rooted (McCright and Dunlap 2010).

Collectively, these restrictions resulted in data for 66 SMOs which the present analysis is based on. Of these 66, 60 have a secondary focus on climate change, whereas just six have a primary focus on climate change. This makeup of organisational interests yields a population of SMOs that is loosely mobilised around anthropogenic climate change. Note that ratios of giving (average of reported total contributions to average reported total revenues of the 66 SMOs) from 2003 to 2007 range from 87 to 92 percent, indicating that this population of SMOs is highly donation-dependent.

Figure 1 depicts the bipartite graph capturing aggregate flows of capital from the 136 foundations to the 66 SMOs across the five-year study period. Table 2 and Table 3provide summary statistics for the patronage networks, their change over time and counts for organisational births. Appendices IV.B and IV.C of the online supplement enumerate all 66 SMOs and 136 foundations.

Figure 1 | Bipartite Graph of Foundation-SMO Mutualism for Financial Patronage: *Aggregated* financial patronage of 66 SMOs by 136 private foundations between 2003 and 2007, inclusive. Resources (money) flow from the lower level (foundations) to the higher (SMOs). The width of each resource flow is scaled to reflect the raw dollar amount given by a foundation to a SMO during this period. Rectangles representative of actors in each class are scaled to reflect the amount of resources they give (receive) to (from) the other organisational population. Rectangles representative of actors are ordered from the largest giver (receiver) from left to right. Across all five years, the top four givers of grant dollars are; (a) The Scaife Affiliated Foundations [$25 Mil.]; (b) Donors Trust/Donors Capital Fund [$23 Mil.]; (c) The Lynde and Harry Bradley Foundation [$18 Mil.]; and (e) The Koch Affiliated Foundations [$17 Mil.]. The top four receivers of grant dollars are: (i) The Heritage Foundation [$46 Mil.]; (j) The American Enterprise Institute for Public Policy Research [$45 Mil.]; (k) The Hoover Institution on War, Revolution and Peace [$28 Mil.]; and (l) The Manhattan Institute for Policy Research [$21 Mil.].

Finally, in 2014 additional data was collected to construct financial efficiency measures (Section 3.4.2) using information obtained from the IRS form 990. As noted earlier, there are a number of issues with IRS data related to the accuracy of reporting and outright accounting malfeasance (c.f., Gordon et al. 1999 and Krishnan et al. 2006), despite its general consistency with data obtained directly from organisations (Froelich and Knoepfle 1996). Tinkelman and Mankaney (2007) suggest that researchers restrict their samples to organisations that report realistic administrative or fundraising expenses (greater than $1000). While the removal of data is fairly simple in atomistic frameworks and the variable-centred statistical analyses which typically accompany, the network approach used here gives rise to a number of issues related to the interdependence of entities and the biasing of network boundaries. The valid identification of boundaries is a key component of rigorous statistical

network analysis (see Shalizi and Rinaldo 2013). As the removal of actors is not an option, I treat unrealistic values for administrative and fundraising expenses as missing while retaining the organisational actor and its relational data.

Table 2: Descriptive Statistics — Networks

	Wave 1	*Wave 2*	*Wave 3*	*Wave 4*	*Wave 5*
Number of Ties	493	488	524	516	507
Density	0.06	0.05	0.06	0.06	0.06
Average Outdegree	3.63	3.59	3.85	3.79	3.73
SMOs To Be Born	3	1	1	0	0
Foundations To Be Born	13	9	5	2	0

Table 3: Summary of Network Change

Period	*0 → 0*	*0 → 1*	*1 → 0*	*1 → 1*	*Jaccard Index*	*Missing Ties*	*SMO Births*	*SMO Deaths*	*Foundation Births*	*Foundation Deaths*
1 → 2	8333	150	155	338	0.53	0	2	0	4	0
2 → 3	8313	173	137	351	0.53	2	0	0	4	0
3 → 4	8295	155	165	359	0.53	2	1	0	3	0
4 → 5	8318	142	151	365	0.56	0	0	0	2	0

Jaccard Index: Measure of overlap between sets.
Higher values indicate less change between waves.
Values should be greater than 0.3, reflecting a process of steady change.

0 → 0: Number dyads that remained empty from wave t to t +1
0 → 1: Ties created from wave t to t +1
1 → 0: Ties terminated from wave t to t +1
1 → 1: Ties maintained from wave t to t +1

III.3 Stochastic actor-oriented models: assumptions and estimation

I test my four hypotheses using Stochastic-Actor Oriented Models (SAOMs) which enable statistical inference about network evolution on the basis of a series of observed networks. SAOMs represent a methodological improvement over the time series and cross-sectional regression typically featured in studies of foundation patronage (Jenkins and Eckert 1986 and Tinkelman and Mankaney 2007) and are better able to capture the dynamism of status deference in grant markets. These models are defined in terms of an actor's (ego) choices in establishing his/her/its *outgoing* ties to some alter, easily suiting my argument that models of patronage deal directly with foundation-investor decision-making. The key assumptions of SAOMs are as follows: (a) network evolution happens in continuous time via one tie change at a time (micro-steps); (b) network evolution is the result of a Markov process – for a given point in time, the current state of the network probabilistically determines its further evolution, disallowing effects from earlier periods; (c) only one actor (probabilistically determined) may change just one tie at a time, disallowing coordination; (d) actors are purposeful, controlling their outgoing ties; (e) tie changes are reactionary in response to one another sequentially (path dependence), ego's structural position and ego's and potential alters' attributes; and, finally, (f) actors make decisions based on the limited information available in their immediate network (varies by configuration; see Table 1).

The SIENA algorithm (Ripley et al. 2015) used to estimate SAOMs simulates changes between each observed network via the probabilistic and sequential micro-steps. During simulation, actors respond to shifting states of the network in that the probability of making a micro-step at a given moment depends on the (unobserved) state of the network at that same moment. Each additional micro-step changes the state of the network thus making the context within which actors are embedded ever changing (Zeggelink 1994). Using method of moments, the estimation procedure conditions on the first observed network (i.e.,

the first "wave") to model the change between successive time points (see Snijders 1996 and Snijders 2001).

During this process, the average frequency in which actors get the opportunity to change their ties is determined by the rate function (λ), where actions include creating a new tie, terminating a tie or abstaining. For simplicity, I assume λ is homogenous across the foundation population. Furthermore, actors are allowed to join and leave the network during simulations. This is used to handle organisational births and deaths. When an organisation does not exist, dyads including the organisation are indicated as being structurally impossible. This is respected in the simulations. Here, population density is largely fixed as no SMOs die during the four periods and few are born.

The evaluation function (1) determines the probabilities of various tie changes in the network. Similar to generalised linear models, the evaluation function is assumed to be a linear combination of various effects. $f_i(\beta, x)$ is the value of the evaluation function for actor i given the network state x. $s_{ki}(x)$ are the posited effects of interest associated with the network, actor attributes, or dyadic covariates. β_k are the estimated parameters which weight the effects, taking the form of log-odds ratios.

$$f_i(\beta, x) = \sum_{k=1}^{n} \beta_k \, s_{ki}(x) \qquad (1)$$

Estimates of zero indicate that the effect plays no role in network dynamics, positive estimates indicate a tendency for ego to create ties which move the network into a state where there is a higher occurrence of the effect, whereas the converse for negative β_k. Here the evaluation function is understood to represent the attractiveness of moving from network x^0 to x^1 for a given actor. From this perspective, estimates reflect the dynamic tendencies of

actors who have the opportunity to move from x^0 to x^1 by changing a single tie. Significance is determined with Wald-type tests using *t*-ratios equivalent to the absolute value of the ratio of the moment estimate β_k to its standard error. *t*-ratios greater than two indicate that β_k is significantly different from zero at the 95% confidence level.

When working with three or more waves of data, it is advisable to assess the degree to which β_k varies over time. Here I use an unrestricted SAOM which allows for time heterogeneity in all effects (see Lospinoso et al. 2011 for a technical treatment). Briefly, the evaluation function now takes take the form:

$$f_i(\beta, x) = \sum_{k=1}^{n} (\beta_k + \delta_k^{(a)}) s_{ki}(x) \qquad (2)$$

Where $\delta_k^{(a)}$ represents the time-dummy interacted effect parameter for effect k in period $a \in A$ where the number of periods of change in A is equal to the number of waves minus one. By convention $\delta_k^{(1)} = 0 \ \forall \ k \in K$ such that the first period represents the base period.

Significance of $\delta_k^{(a)}$ in periods after the first is determined using the score-type tests of Schweinberger (2012), consisting of tests for joint-significance across all periods, effects and individual estimates of $\delta_k^{(a)}$, period-wise significance, effects-wise significance and individual significance $\delta_k^{(a)}$ for each effect in each period. There are two issues for consideration. Currently there is no formal strategy for incorporating the large amount of information from the various tests. Additionally, time heterogeneity of one parameter may be related to that of another (especially degree-based effects). Here my strategy consisted of iteratively including individual estimates $\delta_k^{(a)}$ found to be significant, giving special attention to degree-based effects, until the period-wise, effects-wise and joint-significance tests for

time heterogeneity were failed. *p*-values for the joint-significance test are given in for each model with results.

III.4 Control variables

III.4.1 Structural controls

As degree distributions are understood to drive many of the status dynamics in mutualistic networks, I include a number of degree-related controls:

Indegree popularity (linear and square root): Following previous work predicting a monotonic relationship between grant market centrality and the receipt of grants, I include an effect for the sum of the square root of the indegrees (i.e., number of grants received in year *t*) of all those SMOs whom a foundation is tied to.[49] Positive values for this effect indicate cumulative advantage whereby large indegrees reinforce themselves over time leading to high levels of dispersion in the indegree distribution (Snijders et al. 2010). This effect represents the global status hierarchy of SMOs based on their number of patrons. Here I use the square root of the indegrees as it is more realistic to assume that higher indegrees represent an increase in the competitiveness of SMOs as grantees, but that the impact of competitiveness decreases at high values, i.e., a falling marginal effect. Inclusion of the linear effect helps to fit the lower tail of the indegree distribution. Relative to the square root

[49] Organisational research has a long history of operationalizing status as power centrality/eigenvector centrality (Faulk, Lecy and McGinnis 2012; Lin, Yang and Arya 2009; Poldony et al. 1996). At the time of writing, there is no option to estimate SAOMs for bipartite networks with a two-mode measure of power/eigenvector centrality. Use of indegree centrality represents a limitation of this work as it is tantamount to measuring the status of a SMO in a way that does not reflect variation in the status of its financial patrons. While indegree centrality is an unrefined measure of status relative to power/eigenvector centrality, there are benefits to employing the former given the actor-oriented nature of the models used here. Raw popularity requires a much less tenuous information assumption on the part of ego. Specifically, indegree centrality only assumes some focal foundation is aware of the patrons of a potential grantee. On the other hand, power/eigenvector centrality assumes that the focal foundation: (a) knows what foundations serve as the patrons of a potential grantee; and (b) is also privy to the composition of the funding portfolios of each of the patrons of a potential grantee.

version, the linear effect has no substantive interpretation and the net effect of indegree popularity is yielded by summation of the linear and square root variants.

Outdegree activity (linear and square root): I also include effects for the sum and the square root of foundation's outdegrees, which reflect the number of grants given in year *t*. Positive values for these effects indicate that foundations in the network who are more active funders will be extra inclined to invest in SMOs over time. I refer to this as cumulative activity. Similar to indegree popularity, these effects capture the global status hierarchy of foundations based on the breadth of their funding portfolios.

1/(outdegree + c)(outdegree + 1 + c): This function controls for non-linearity in the outdegree distribution. The internal parameter *c* controls the concavity of the function, with higher values approximating a linear shape. Here $c = 1$ due to the sharp decline in the number of actors with outdegrees greater than two. In the models presented here $\beta_{k1/(outdegree+c)(outdegree+1+c)}$ is fixed as estimation suggests it should be included in the model but that its precise value is not well approximated. As Ripley et al. (2015) describe, this is indicated by a large estimated value of β_k, a large standard error and a lack of convergence of the algorithm. In these cases, it does not matter how large β_k is just that it is included in the model. Here, $\beta_{k1/(outdegree+1)(outdegree+1+1)}$ is fixed arbitrarily at 22.

Outdegree truncation up to one: This effect captures the tendency for actors to be isolates with respect to their outgoing ties (i.e., outdegree truncation at one). Note that for this effect negative values of β_k represent a tendency for the occurrence of isolates whereas positive values represent a tendency *against* being an isolate, i.e., having an outdegree equal to one.

Outdegree truncation up to two: This effect controls for the modal outdegrees across the entire study period. Across the five years, the majority of foundations had an outdegree of two or less.

III.4.2 Monadic controls

Informed-donor model: The informed-donor portion of the SAOM consists of a slightly modified version of Frumkin and Kim's (2001) specification in their model of the effect of nonprofit financial efficiency on the receipt of grant dollars. Their specification maintains parsimony while still possessing good explanatory power compared to other models of efficiency and patronage (see Tinkelman and Mankaney 2007). The modified specification used here consists of: (a) the administrative cost ratio (the share of total expenses going to management expenses); (b) logged programme expenses; (c) logged fundraising expenses; (d) organisational size as logged total revenue; (e) staff pay ratio (the share of total expenses going to salaries and wages); and (f) organisational age (logged years of nonprofit status).[50] Each of the money-based covariates are lagged by one year to deal with simultaneity bias.

Primary focus: Variable reflecting whether or not a SMO has a primary focus on climate change (six SMOs) or a secondary focus on climate change (60).
Organisational type: Categorical variable for whether the SMO is an advocacy group (28 SMOs), think tank (37), or media organisation (one).

Share of grant dollars: The percentage of total grant dollars in t^{-1} taken home by a SMO. This is to control for market domination.

Average percentage of contributions controlled by foundations: Astroturf groups – entities created to lobby and campaign on behalf of sponsors who wish to remain anonymous – are an active organisational component of the CCCM. Arguably, these groups are the result of heavy intermingling between the CCCM and commercial interests, representing a key difference between this countermovement and peer progressive movements. To the extent that these groups are the domain of only one or a very small number of private foundations,

[50] See Appendix IV.E for the rationale behind this modification.

not accounting for their disproportionate financial backing by "host" foundations would bias analyses. To correct for this, I first calculate the percentage of a SMO's total contributions provided by the foundation population in the year prior. This percentage is then divided by a SMO's total number of patrons in that same year producing a measure of the average share of contributions controlled by its patrons. Large values of this measure indicate concentration of contributions around a small numbers of foundations.

Age of foundation: As Singh and Lumsden (1990) note, organisational age may be a surrogate for multiple correlated constructs such as aptitude at survival and institutional support. While composing an admittedly thin characterisation of foundations' attributes, I include a variable for the logged number of years since the foundation was founded. This is used as an omnibus proxy to control for foundations' reputation, size and the amount of resources at their disposal.

III.4.3 Dyadic controls

Foundation-SMO state match: While earlier studies in the literature on organisational ecology emphasised geographic invariance with regard to the strength of ties between organisations in the same population, this assumption has largely been relaxed through attempts to highlight sub-systems based in regions, states and cities (see Freeman and Audia 2006 on geographic space). As this work suggests that organisational populations are agglomerations of more localised communities, I include a binary dyadic indicator for whether or not any foundation – SMO couple were located in the same state in the year prior.

IV MISSING DATA

SAOMs allow for missing data at both the network and actor level. It is treated as non-informative. One can expect no problems with estimation at levels of missingness as

high as around 20 percent, though at these levels a non-informative assumption may be unreasonable. To minimise the impact of missingness on results, calculation of target statistics during the simulations only uses non-missing data, however, simulations are carried out as if data were complete using imputation. Missing data for the covariates are replaced with the mean of the variable for the observation period in which it is missing. Missingness of network ties is handled with the last-observation-carried-forward method; if there is no earlier value for the tie then a zero is imputed.

Three monadic covariates (Fundraising Expenses, Share of Grant Dollars, and Average Percentage of Foundation Control of Contributions) have levels of missingness over 20 percent. For share of grant dollars and average percentage control of contributions 23.86 percent missingness is intentional due to design constraints. These two variables are computed using the patronage network in each year. In order to directly address issues around simultaneity, money-based covariates are lagged. However, this lagged structure results in missing values for variables created using grant data for the first wave (2003) as Brulle's (2013) dataset does not cover 2002. High levels of missingness for fundraising expenses are the result of employing Tinkelman and Mankaney's (2007) cut-off of $1000. Without this cut-off, only 15.2 percent of observations for fundraising expenses are missing.
Some evidence of misreporting emerged upon review of the data. A grant from Donors Trust/Donors Capital Fund to The Free Enterprise Education Institute was found to comprise over 100 percent of the latter's total contributions in 2005. Additionally, a grant from the Koch Affiliated Foundations to The Americans for Prosperity Foundation was also found to comprise over 100 percent of the latter's total contributions in 2005. A search of the IRS form 990 PF for the foundations confirms that grants were given in 2005 despite what was reported on the 990s of the SMOs. Here I treat these two grants as missing. This is the only missing

data at the network level (less than 1 percent). Descriptive statistics for covariates appear in Table 4.

Table 4: Descriptive Statistics — Continuous Monadic Covariates (Global)

Variable	*Mean*	*Min*	*Max*	*Percent Missing (Global) ^*	*Avg. Percent Missingness**
Administrative Cost Ratio	0.14	0.00	1.00	15.53	0.06
Fundraising Expenses (Log) §	11.88	7.10	15.50	25.76	0.10
Program Expenses (Log)	13.32	0.00	17.20	11.36	0.04
Total Revenue (Log)	13.84	6.90	17.80	11.36	0.04
Staff Pay Ratio	0.33	0.00	0.90	11.36	0.04
Years of Non-Profit Status (Log)	2.83	0.00	4.10	7.95	0.03
Share of Grant Dollars †	0.02	0.00	0.20	23.86	0.09
Avg. Percent Contributions Control †	0.06	0.00	1.00	23.86	0.09
Foundation Age (Log)	3.02	0.00	4.60	3.31	0.01

^ Missing percentages do not reflect missing data for organisations when they do not exist.

** For SMOs there are 264 possible observations across the four periods (66 observations/per period) minus 5 (the number of impossible observations for those SMOs yet to be born). For foundations, there are 544 observations across the four periods minus 29 (the number of impossible observations for those foundations yet to be born). Here, Average Percentage of Missingness = Percent Missing (Global) ÷ Total Number of Possible Observations*

† High percentage of missingness is by design due to the lagged structure of the data (i.e., data is missing for all 66 SMOs for the first period). This variable is created using total contributions and grant data. Grant data for 2002 was not available in Brulle's (2013) original data.

§ High level of missingness is the result of employing Tinkelman and Mankaney's (2007) cut-off of $1000. Without this cut-off only 13.26 percent of observations for fundraising expenses are missing.

Administrative Cost Ratio = Management Expenses ÷ Total Expenses
Staff Pay Ratio = (Annual Compensation to Directors & Officers + Other Salaries & Wages) ÷ Total Expenses

V RESULTS

My analysis consists of two stages. The first is a series of SAOMs: (a) an attributes-only model reflective of "informed donor" explanations of foundation patronage; (b) a structure-only model used to detail the endogenous dynamics of the mutualistic system; and (c) a social selection model whereby structure and attributes are modelled jointly. Given strong tendencies for popularity and activity effects, the second stage consists of graphical exploration of their joint contribution to the evaluation function in order to decompose status dynamics.

Effects for density represent the likelihood that a foundation will invest in a random SMO and might be thought of as an intercept term. However, substantive interpretation is best avoided as human socio-economic networks tend to be sparse. This almost always leads to large negative estimates for density.

Moreover, some readers may baulk at the size of these models given the sample size (n = 202 organisations). It may be useful to think about the size of the dyadic observation pool, though observations may not always be independent depending on the network configuration in question. The 136 × 66 adjacency matrix representing capital flows from foundations to SMOs contains 8976 dyadic observations. Across five years, and after accounting for the two missing ties, there are 44,878 dyadic observations from which to base the inferences for structure on.

Finally, it is important to note that the networks of patronage are built from successful bids for grants. While this does not violate the key assumption of SAOMs – that actors control their outgoing ties – it does require that structural effects be understood as conditional on some focal SMO having submitted a grant application to one or more foundations (varies by configuration) in order for some focal foundation to have the opportunity to decide whether or not to invest.

V.1 Summary of models

Model estimates appear in Table 5. This first model presents the impact of various organisational attributes on the likelihood of a SMO winning foundation-investors. All continuous monadic covariates are centred at their global means. Results for this model indicate that foundations have roughly four opportunities to invest in a SMO per period. There is a net tendency for foundation giving to be confined within states and for think tanks to receive grants over advocacy and media-type SMOs. Those SMOs with a primary focus on climate change are less likely to receive funding compared to SMOs with a secondary focus on climate change. Of the measures composing the informed donor model, only total revenue has an effect on the likelihood of a SMO's receipt of a grant. Consistent with past research, SMOs with above average revenues, an indicator of size, are more likely to receive grants. Additionally, investments are very likely to go to those SMOs who command the share of grant dollars in the year prior. Finally, older foundations are more likely to give grants.

Table 5: Stochastic Actor-Oriented Models of Financial Patronage (2003–2007)

		Attributes Model		*Structure Model*		*Social Selection Model*	
		Rate (λ)	*s.e.*	*λ*	*s.e.*	*λ*	*s.e.*
Period I	*Rate (2003–2004)*	*3.89*	0.30	*4.46*	0.34	*4.68*	0.37
Period II	*Rate (2004–2005)*	*3.85*	0.28	*4.62*	0.35	*4.78*	0.34
Period III	*Rate (2005–2006)*	*4.02*	0.28	*4.58*	0.35	*4.72*	0.36
Period IV	*Rate (2006–2007)*	*3.54*	0.26	*4.15*	0.32	*4.35*	0.34
Key Structural Dependencies		*β (Log*	*s.e.*	*β*	*s.e.*	*β*	*s.e.*
	Outdegree (Density)	**-2.31**	**0.07**	**-6.36**	**0.69**	**-6.09**	**0.66**
	$\delta_{\text{Period 2}}$	0.18	0.16	**-0.37**	**0.17**	**-0.58**	**0.23**
	$\delta_{\text{Period 3}}$	0.04	0.11	-0.05	0.17	-0.14	0.21
	$\delta_{\text{Period 4}}$	-0.10	0.11	**-0.59**	**0.17**	**-0.68**	**0.22**
Hypothesis 1	Out-in Degree^(1/2) Assortativity	–	–	**-0.55**	**0.08**	**-0.40**	**0.07**
Hypothesis 2a	In-Isolates	–	–	**-1.22**	**0.28**	**-0.91**	**0.29**
Hypothesis 2b	In-near-Isolates	–	–	**-0.67**	**0.32**	-0.29	0.31
	$\delta_{\text{Period 4}}$	–	–	**-1.73**	**0.86**	**-1.76**	**0.82**
Hypothesis 3	4 Cycles	–	–	**0.05**	**0.01**	**0.04**	**0.01**
	$\delta_{\text{Period 2}}$	–	–	0.00	0.00	**-0.01**	**0.00**
	$\delta_{\text{Period 3}}$	–	–	**0.01**	**0.00**	**0.01**	**0.00**
	$\delta_{\text{Period 4}}$	–	–	0.00	0.00	0.00	0.00
Structural Controls							
	Outdegree Activity (*sqrt*)	–	–	**1.91**	**0.32**	**1.45**	**0.28**
	$\delta_{\text{Period 2}}$	–	–	**0.20**	**0.06**	**0.25**	**0.07**
	$\delta_{\text{Period 3}}$	–	–	-0.04	0.07	-0.01	0.07
	$\delta_{\text{Period 4}}$	–	–	**0.21**	**0.07**	**0.19**	**0.08**
	Outdegree Activity (*Linear*)	–	–	**-0.04**	**0.02**	-0.02	0.02
	Indegree Popularity (*sqrt*)	–	–	**1.70**	**0.23**	**1.49**	**0.21**
	Indegree Popularity (*Linear*)	–	–	**-0.06**	**0.02**	**-0.08**	**0.02**
	Outdegree Truncation (At most 1; Isolates)	–	–	**2.77**	**0.41**	**3.08**	**0.43**
	Outdegree Truncation (At most 2)	–	–	**1.85**	**0.34**	**1.87**	**0.34**
	1/(outdegree+1)(outdegree+1+1)	–	–	*22.00*	FIXED	*22.00*	FIXED

Dyadic Covariates							
	State Match (t^{-1})	**0.96**	**0.10**	–	–	**1.17**	**0.10**
	$\delta_{\text{Period 2}}$	**-0.51**	**0.24**	–	–	-0.40	0.22
Monadic Covariates							
	Primary Focus Climate Change	**-1.03**	**0.24**	–	–	-0.51	0.31
	$\delta_{\text{Period 4}}$	0.77	0.47	–	–	**1.49**	**0.60**
	Type: Media (Ref. Advocacy)	0.28	0.18	–	–	0.16	0.19
	Type: Think Tank (Ref. Advocacy)	**0.30**	**0.07**	–	–	**0.26**	**0.09**
	Administrative Cost Ratio (t^{-1})	-0.26	0.44	–	–	**1.33**	**0.49**
	$\delta_{\text{Period 2}}$	**-2.09**	**0.91**	–	–	**-3.43**	**1.00**
	Programme Expenses (Log; t^{-1})	0.07	0.09	–	–	0.02	0.08
	Fundraising Expenses (Log; t^{-1})	-0.06	0.04	–	–	**-0.11**	**0.04**
	Total Revenue (Log; t^{-1})	**0.31**	**0.10**	–	–	**0.27**	**0.11**
	Staff Pay Ratio (t^{-1})	0.17	0.21	–	–	-0.45	0.25
	Years of Non-Profit Status (Log)	-0.02	0.07	–	–	**-0.17**	**0.08**
	$\delta_{\text{Period 2}}$	**-0.42**	**0.16**	–	–	-0.22	0.19
	$\delta_{\text{Period 3}}$	**-0.36**	**0.16**	–	–	-0.30	0.19
	$\delta_{\text{Period 4}}$	**-0.51**	**0.17**	–	–	-0.32	0.21
	Share of Grant Dollars (t^{-1})	**3.73**	**0.90**	–	–	**4.72**	**1.13**
	Avg. Percent Contributions Control (t^{-1})	0.42	0.49	–	–	-0.02	0.72
	Age of Foundation (Log)	**0.16**	**0.04**	–	–	0.05	0.03
	$\delta_{\text{Period 2}}$	**0.56**	**0.13**	–	–	**0.32**	**0.10**
	$\delta_{\text{Period 3}}$	0.10	0.11	–	–	-0.03	0.09
	$\delta_{\text{Period 4}}$	**0.38**	**0.12**	–	–	0.17	0.10
Joint Test For Time Heterogeneity (p-value)		0.95		0.88		0.99	

Significance determined by Wald-type test of t-ratios which equal abs(β/s.e.$_\beta$)
***BOLD** estimates are significantly different from zero with t-ratio > 2 approx. $p < 0.05$; Note that for rate parameters tests of this type do not apply*
Estimation Settings (All Models): Number of Sub-phases in Phase 2 = 6, Phase 3 Iterations = 4000
The overall maximum convergence ratio for all models is <0.25. All t-ratios for convergence are < 0.1 in absolute value. See Ripley et al. (2015) for details.

The structure model indicates a small but significant positive tendency for four cycles, providing some evidence for the operation of a peer-referral mechanism (H3). There also exists a net tendency for foundations to invest in popular grantees because of their popularity. However, there is tendency against very active foundations investing in those SMOs with very many patrons (H1). Additionally, there is a tendency against foundations investing in SMOs with zero (H2a) or near-zero patrons (H2b). Inversely, this also represents a tendency for foundations to divest in SMOs when they serve as the sole provider or one of two providers of funding, respectively. Furthermore, results indicate a net propensity for very active foundations to give grants precisely because of their activity. Lastly, there is a tendency against foundations not investing in any SMOs over time alongside a tendency for foundations to tend to fund no more than two SMOs over time. Foundations again have roughly four opportunities to create financial ties.

For the social selection model, structural results are largely the same with slight fluctuations in magnitude. The key difference with regard to structure is the loss of significance for the in-near-isolates effect (H2b). In the presence of structure, one now observes a tendency for SMOs who spend above average amounts on administrative expenses to receive investments, thought this effect becomes strongly negative during the 2004–2005 period. Furthermore, SMOs that spend above average amounts on fundraising and who are older are now found to be less likely to receive funding. Lastly, age no longer impacts the propensity of foundations to invest.

Regarding the heterogeneity of estimates, significant estimates of $\delta_k^{(a)}$ are added to β_k to yield the net effect for a given period. The only variable that warrants further discussion in this regard is Administrative Cost Ratio in the social selection model. Significant estimates of δ for all other variables do not result in the sign of the net effect changing and there is no *a priori* expectation for fluctuation in strength. See Appendix IV.F for a discussion of the sign

of the estimate for Administrative Cost Ratio in addition to a discussion of other attribute effects that disagree with findings in the public administration literature.

As information criteria such as AIC and BIC have not been developed for SAOMs, I assess the fit of each of the three candidate models with respect to auxiliary statistics. These statistics are used to judge the plausibility of the networks generated from each of the three models. Specifically, plausibility is determined by comparing the distribution of values of an auxiliary statistic calculated using simulated networks to the value of that same statistic calculated using the observed networks. Importantly, auxiliary statistics are not explicitly fit by a particular effect in the model, but are still features of the network that should be faithfully represented (see Lospinoso 2012; also Snijders and Steglich 2013).

Following Koskinen and Edling (2012), I assess the fit of the models using SMO indegrees, foundation outdegrees, SMO-SMO geodesics and foundation–foundation geodesics. The results of the goodness-of-fit assessment indicate that the social selection model best summarises those processes leading to the emergence of the patronage system. This assessment is based on 4000 simulated networks (1000 for each period). For the social selection model, fit is excellent and the model outperforms both the attribute and structure-only variants. Appendix IV.A provides graphs for the distribution of auxiliary statistics for observed and simulated networks and additional information on goodness-of-fit assessment.

Finally, the size of these models demands a comment on the multicollinearity of parameter estimates. The largest correlation coefficient for estimates in: (a) the attributes model is −0.86 (total revenue, programme expenses); (b) the structure model is −0.95 (out-in degree assortativity, 4 cycles); and (c) the social selection model is −0.94 (out-in degree assortativity, 4 cycles). Within the SAOM framework, correlation coefficients between two estimates may approach ±1. This is especially so for network effects, which are often highly correlated. Correlations that approach ±1 are not cause for concern in and of themselves.

Caution is warranted only if standard errors are large. Furthermore, if standard errors and parameter estimates are stable across multiple runs of the estimation algorithm, correlations above 0.9 are acceptable, particularly for estimates that are significantly different from zero. With regard to the models presented here, there were no major fluctuations in estimates or their standard errors across successive runs of the estimation algorithm. See Ripley et al. (2015, pg. 66–67; 73–74) for further details.

$$\beta_{inPopSqrt} \sum_j x_{ij} \sqrt{x_{+j}} + \beta_{inPop} \sum_j x_{ij} x_{+j} + \beta_{outActSqrt} x^{1.5} + \beta_{outInAssort} \sum_j x_{ij} x_{i+}^{1/2} x_{+j}^{1/2} \quad (3)$$

V.2 Decomposition of the popularity effect

In their tabular form these results do not reveal how status dynamics operate across the foundation population, particularly in light of the negative out-indegree assortativity estimate. To further explore the effects of status on foundations' propensity to invest, I use the estimates from the social selection model to decompose the SMO choice process into three different scenarios. These scenarios are based on foundations' levels of funding activity and are designed to assess how their structural position mediates their propensity to invest. Using the distribution of observed outdegrees (range 0–34) from 2003 to 2007, I construct profiles for peripheral, median and major activity foundation-investors. Respectively, these profiles represent the bottom 25th percentile (outdegree = 0), the 50th percentile (outdegree = 2), and the top 5th percentile (outdegree = 15) of the global outdegree distribution. The global average outdegree is 3.7.

Equation 3 gives the joint contribution to the evaluation function using the square root and linear popularity effects, the square root outdegree activity effect, and the out-indegree

assortativity effect where $i+$ indicates the outdegree of i and $_+j$ indicates the indegree of j. Figure 2 presents the shape of the joint contribution in the form of (3) for each investor profile ($i_+ = 0$, $i_+ = 2$ or $i_+ = 15$). Diamonds are the values of the joint contribution for a SMO with an average number of patrons ($_+j = 8$) excluding the potentially incoming tie from the foundation represented by each profile. Circles indicate the maximised value of the joint contribution for the range of observed indegrees (0–42) from 2003 to 2007. Each profile is accompanied by rug plots representing the distribution of observed indegrees across the study period, where the position of each tick is dodged to aid visual assessment. Note that direct calculation of the probabilities for various tie changes is not pursued as the intricate interdependencies between the structural effects could lead to unrealistic scenarios.

Figure 2 | Foundation-investor Profiles: Graphs depict the joint contribution (log odds ratio) to ego's evaluation function using the popularity effects, the outdegree activity effect and the out-indegree assortativity effect across the range of observed indegrees from 2003 to 2007. Diamonds indicate the value of the joint contribution for the global average indegree (7.6, rounded to 8). Circles indicate the maximised value of the joint contribution for a given indegree. Rug plots depict the distribution of indegrees. Each panel represents one of three foundation-investor profiles: Peripheral (Bottom 25th percentile; Outdegree = 0; *A*), Median (50th percentile; Outdegree = 2; *B*); and Major (Top 5th percentile; Outdegree = 15; *C*). Global average outdegree = 3.7.

In interpreting these graphs, it may be useful to recall that when a foundation in class *A* has an opportunity to change a tie relative to its set of choice options (SMOs in class *P*), where options include *P* changes and one non-change, a foundation is understood to make tie changes in such a way that the value of its evaluation function is maximised given the constraints of its local network. In this sense, the evaluation function represents actors' short-term objectives given both preference and structural constraint. Given the opportunity to act, which action an actor chooses follows the logic of discrete choice models (Snijders et al. 2010; see McFadden 1973 and Maddala 1983).

For peripheral foundation-investors the joint contribution has a range of 0.01–6.3, falling to virtually zero should a potential grantee have no other patrons and peaking should

the potential grantee have very many patrons (maximised at $_{+}j = 42$). In contrast, the joint contribution for median foundation-investors has a range of 4.1–6.8 and is maximised at $_{+}j = 33$. While the curves for median and peripheral investors differ in their range of values, both indicate a strong preference for investments in very popular SMOs.

For major activity investors there is a stark difference when compared to the first two profiles. The shape of the joint contribution for this group of foundations drops steadily across the range of observed indegrees from 84 to 80. Interestingly, the joint contribution for major activity foundations is maximised at $_{+}j = 0$. Collectively these graphs serve as provocative evidence for the avoidance of assortative mixing between high-status SMOs and high-status foundations. Those foundations at the extremes of the outdegree distribution very clearly prefer to invest in SMOs at the opposite end of the indegree distribution.

VI DISCUSSION

Through the present analysis I have attempted to craft one answer to a simple question: what explains the allocation of capital to professional SMOs by private foundations? The simplicity of this question betrays the complexity of the attendant processes at work. Here I have argued for reconsideration of the grant market as a mutualistic network, introducing a powerful and flexible analytical framework for theorising and empirically testing the intricate interplay between SMOs' status and strategic positioning, foundations' attempts to overcome information asymmetries as they make their decisions to invest, and the mediating effects of foundations' prestige relative to that of a potential grantee. This has resulted in a much more nuanced picture of external resource derivation than that which is currently found in the sociological and organisational literature on SMOs and, more broadly, nonprofits. Results indicate that the structural positions of both foundations and SMOs operate in tandem to produce multiple network dynamics, unique to bipartite graphs and

beyond snapshots of point centrality, that powerfully shape foundations' propensity to invest. Methodologically, results suggest that SAOMs are a plausible alternative to measures of population density and aggregate foundation giving in variable-centred modelling frameworks (e.g., OLS regression or time series) when scholars seek to detail the dynamics of competition and cooperation which govern external resource derivation.

This work makes an important and provocative substantive contribution at the intersection of the sociology of status and work on professional SMOs/nonprofits with regard to understanding how differing levels of prestige impacts the receipt of resources. In line with Kovács and Sharkey's (2014) recent call for a perceptual view of status, my findings indicate that the effects of SMOs' grant-market prestige manifests in different ways across various segments of the population of foundation-investors. Counterintuitively, results indicate a dynamic tendency for degree disassortativity, an inverse relationship between cumulative advantage and cumulative activity, such that high-status foundations prefer to invest in SMOs with few patrons – an indicator of lower status in this framework. The converse is true for peripheral foundation-investors and high-status SMOs.

This is surprising as one would assume status to be positively correlated in organisational partnerships. What then explains this tendency against status-based assortativity? Extant scholarship on elite patronage and social control would suggest that the avoidance of high-status SMOs by major grantors be attributed to a perception of high-status grantees as ill equipped to address a foundation's individual interests amongst a number of others. However, there have been mixed conclusions about patronage and social control alongside a growing acknowledgement of the similarities between foundations and those that they fund (Cress and Snow 1996). Following Phillips and Zuckerman (2001), I suggest that a second, more plausible, conclusion rests with status and behavioural constraint. Specifically, the security that comes from being a high-status provider of capital may erode major

foundations' concerns about prevailing notions of what is and is not a legitimate investment (see Sauder et al. 2012 for a review of status-based constraints on organisational behaviour). This, alongside possessing extensive capital, enables major foundations to take risks, "gambling" with their investments by serving as patrons for low-status SMOs.

Such gambling may be attributed to a preference for innovation, or being in the vanguard, with regard to addressing social issues on the part of foundations. Grantors of a philanthropic orientation, such as those studied here, are characterised by their permanent and independent revenue streams which afford considerable freedom in expressing preferences via the allocation of funds. This freedom allows philanthropic foundations to occupy an entrepreneurial role through which they bring attention to new ideas, service models and organisations.[51] Moreover, philanthropic foundations have been shown to be acutely aware of the shifting docket of social problems, leading to the strategic modification of interests in response to changes in the policy environment (see Mosley and Galaskiewicz 2010).

Given tendencies for social entrepreneurship and adaptation to the socio-political environment, a preference for innovation on the part of major grantors may foster the perception that those SMOs who benefit from an extensive support base are inert due to the risk of patron alienation that comes with organisational change. While having a multitude of revenue streams allows SMOs to weather unexpected financial shocks, such a large number of patrons may "lock in" their immediate goals. This effectively limits organisational transformation in response to shifts in the importance of social problems, leaving well-funded SMOs out of sync with the more fluid interests of entrepreneurial foundations-investors.

[51] This is in contrast to foundations with a charitable orientation who serve the public by attempting to alleviate suffering via support of programmes that the government cannot or will not provide. Though charitable and philanthropic orientations are contrasted, they are not mutually exclusive. As Mosley and Galaskiewicz (2010) demonstrate, foundations may take actions that represent both of these behavioural logics. Nevertheless, this mixing is more apparent amongst progressive and centrist foundations compared to their conservative counterparts.

Further still, high-activity funders may be extra prone to compassion fatigue around certain issues. By investing in peripheral, poorly funded SMOs with an incentive to strategically position themselves relative to the wider organisational population, major-foundations capitalise on an opportunity to best their competitors in the search for novel solutions to some social problem. Arguably, this opportunity is even more pronounced given the preoccupation of peripheral grantors with high-status SMOs. Again drawing on the work of Phillips and Zuckerman (2001), the security of being high-status affords grantors an additional strategy to source innovative solutions for what they perceive as socio-economic ills.

Notwithstanding, there is a limit to how peripheral a SMO may be for it still be competitive despite the maximisation of the joint-contribution of status to major-foundations' evaluation function occurring at an indegree of 0. The large effect for the in-isolates configuration indicates that there is a penalty for exclusive resource dependence. Specifically, foundations tend to divest from SMOs when they serve as the only patron whilst tending to not make investments in SMOs with zero patrons. Together, these dynamics suggest that there is some avoidance of investment in those SMOs most in need within this particular population of grantors.

VI.1 Limitations and conclusion

With all work there are limitations. The SAOMs presented here are fundamentally analyses of resource derivation by actors within a single movement, though I eschew any conclusions specific to the CCCM. Additionally, I have not given treatment to one of the most visible components of ecological analyses of organisational populations – birth and death. These two limitations are linked in that they are artefacts of my use of an organisational population wherein both density and the competitive logic are stable in order to make an explicit move away from the effects of resource derivation to focus on its

antecedents. This ultimately required a well-defined population of SMOs and a smaller period or study, and thus less variation in the number of births and deaths. Larger fluctuations in the composition of organisational populations are likely to be observed across longer time periods. More work must be done on: (a) the sensitivity of the network dynamics detailed here to changes in the sizes of the population of SMOs and foundations; and (b) the degree to which these dynamics differ across diverse populations of SMOs associated with heterogeneous social movements. Notwithstanding, it is worth stating that these dynamics resonate quite strongly with previous work on status and information asymmetry in markets and are likely not artefacts of the use of the CCCM as a case study.

It should also be said that by focusing exclusively on money I have taken a very narrow view of an SMO's resource space. As Cress and Snow (1996) make clear, there are a number of other resources in addition to financial patronage that combine in different ways to ensure organisational viability. By focusing only on capital, this work misses these combinations and thus the various differentiation strategies SMOs pursue in a multi-resource space. Though this limitation is mitigated somewhat by the fact that the SMOs studied here are professionalised nonprofits that are highly donation dependent, future work should pursue co-evolving mutualisms and other resource related networks in order to untangle how combinations of resources constrain derivation. Relatedly, the patronage networks I have constructed are based on successful bids for grants, providing no information on the dynamics of the failed solicitation of patrons. A focus on grant applications would shift the locus of action in these models from foundations to SMOs, providing needed insight into foraging patterns.

An additional limitation is the qualitative assessment of patronage through a focus on whether or not a grant was given as opposed to how much money was given to a SMO by some foundation. This is largely a methodological limitation. Currently, SAOMs may be fit

to ordered networks in the style of Russian Dolls, where the values of ties are binned using a small number of integer values (e.g. 1–3) with each value constituting its own unique network. However, this variation is still very much in the development phase, leading me to adopt the qualitative strategy. Thus work must be done on how the network dynamics discussed here play out across various levels of support.

And, finally, I have given a thin treatment to the multi-layered nature of organisational populations by only using matched geographic location. Future research should look to multiplexity in further detailing the dynamics of financial patronage as concurrent ties amongst SMOs, amongst foundations, and between foundations and SMOs are likely to play an important role in resource derivation.

Nonetheless, these trade-offs are justified for a first attempt at precisely detailing competition for foundation patronage amongst professional SMOs through the lens of a mutualistic network. Overall, my analysis indicates that dynamic, status-based tendencies play a non-trivial role in determining the competitiveness of SMOs by governing foundations' propensity to invest. Although I used patronage as an empirical context, I strongly suspect other resource-related movement relationships are amenable to exploration as mutualistic networks using dynamic bipartite graphs. For example, consider competition between SMOs for coverage in various media outlets. Here, there are multiple attendant concerns on the part of both organisational decision-makers leading them to act strategically in the face of finite resources, even whilst both stand to benefit from collaboration. Furthermore, I expect mutualistic models of patronage in the vein presented here, along with requisite assumptions around status and the SAOM methodology, to fruitfully map onto competition for patrons amongst nonprofits in more traditional sectors such as the arts, education and development.

APPENDIX IV.A
Goodness of Fit

Figures A1 and A2 depict distributions of auxiliary statistics used to assess the fit of each model. The solid red lines indicate observed values. The box plots represent the distribution of 4000 simulated values for each observed value of the statistic. The dashed blue lines are the 95% confidence interval for the distribution of simulated statistics. *p*-values are given for a test of Mahalanobis distance. These values, along with visual inspection, indicate how well a model recreates the observed features of the network. *p*-values very close to or greater than 0.5 indicate that the model-based distribution is not significantly different from the observed. For example, looking at the distributions depicted in Figure A1, fit for the social selection model is quite good ($p = 0.33$ for the SMO indegree distribution and $p = 0.05$ for the foundation outdegree distribution) whereas for the attributes model fit is unacceptable (p = approximately 0 for both the indegree and outdegree distributions). Save dramatic changes in simulated values (e.g., see Figure A2 for a comparison of the geodesic distribution generated by the attributes models versus those generated by the social selection model), relative assessment of fit is crude. Nonetheless, a SAOM's reproduction of observed values is a powerful way of judging the plausibility of a particular specification.

Note that geodesic distance is calculated using the weighted projections of the mutualistic network, i.e., matrices retain the number of SMOs two foundations both invest in or the number of patrons two SMOs share. Distance is rounded to the nearest whole integer where a unit of distance refers to one step with the average tie weight in the network (see Opsahl, n.d. and Opsahl, Agneessens and Skvoretz 2010 for details on this calculation).

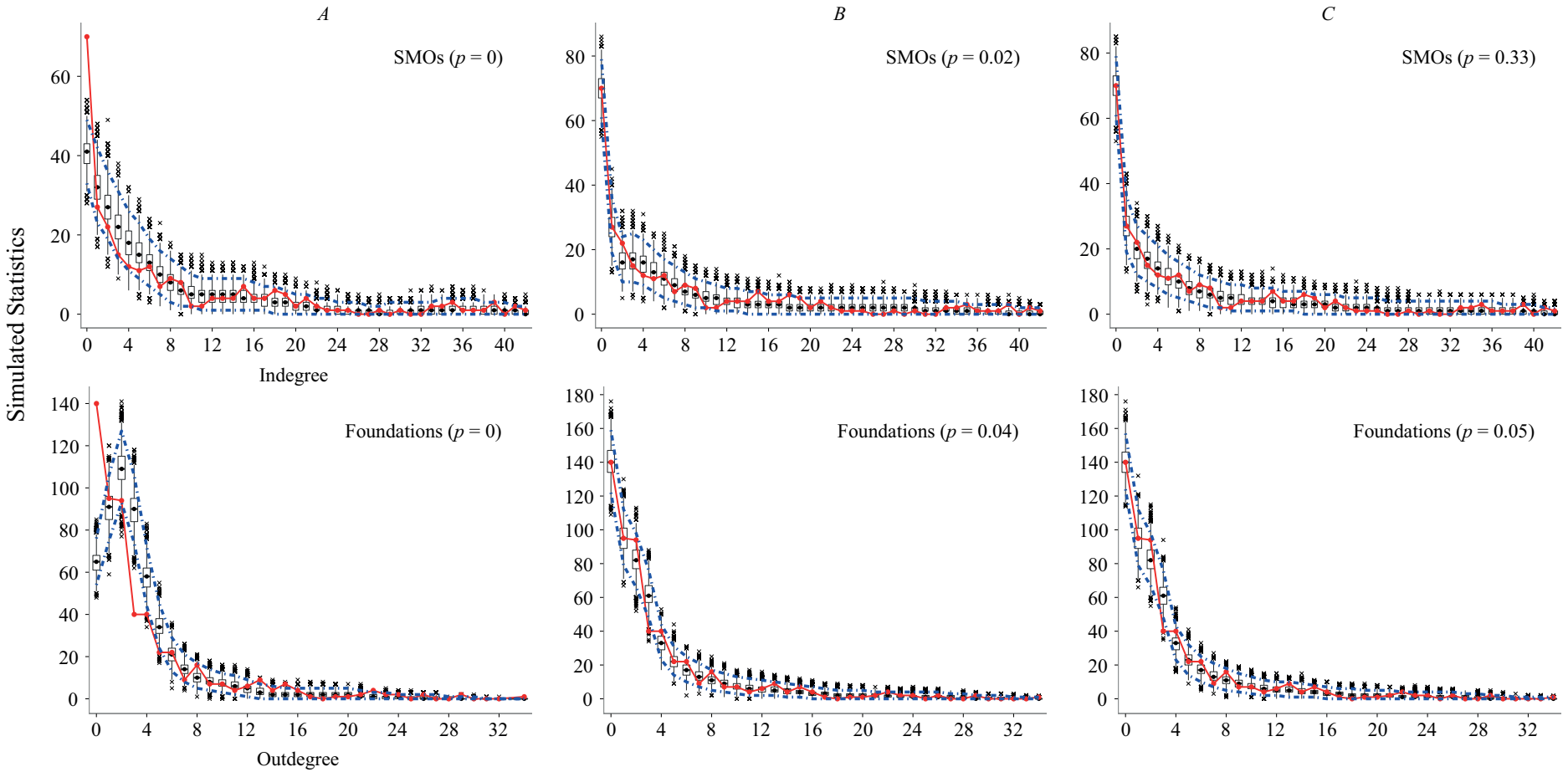


Figure A1 | Goodness-of-Fit for In and Outdegree Distributions: Distribution of auxiliary fit statistics for the attribute (*A*), structure (*B*) and social selection (*C*) models. Distribution of observed values given by solid red line. Dashed blue lines represent the 95% confidence interval for simulated statistics for each observed value. Distributions are joined across all waves. For example, across all waves, 70 SMOs had an indegree of 0. *p*-values (inset) are given for a test of Mahalanobis distance.

Figure A2 | Goodness-of-Fit for Within-class Geodesic Distributions: Distribution of auxiliary fit statistics for the attribute (*A*), structure (*B*) and social selection (*C*) models. Distribution of observed values given by solid red line. Dashed blue lines represent the 95% confidence interval for simulated statistics for each observed value. Distributions are joined across all waves. For example, across all waves, roughly 3500 dyads in the unimodal SMO-SMO network were connected by 1 step of the average weight of the network (i.e., the average number of shared foundation patrons). *p*-values (*x*-axis label) are given for a test of Mahalanobis distance.

APPENDIX IV.B

Social Movement Organisations

1. 60 Plus
2. Advancement of Sound Science Center
3. Alliance to Save Energy
4. American Coal Foundation
5. American Conservative Union Foundation
6. American Council for Capital Formation Center for Policy Research
7. American Enterprise Institute for Public Policy Research
8. American Friends of the Institute of Economic Affairs
9. American Legislative Exchange Council
10. American Policy Center
11. Americans for Prosperity Foundation
12. Annapolis Center for Science-Based Public Policy
13. Atlas Economic Research Foundation
14. Capital Research Center
15. Cascade Policy Institute
16. Cato Institute
17. Center for the Defense of Free Enterprise
18. Center for the Study of Carbon Dioxide and Global Change/Co2 Science
19. Collegians for a Constructive Tomorrow-Upper Midwest
20. Committee for a Constructive Tomorrow
21. Competitive Enterprise Institute
22. Congress of Racial Equality
23. Consumer Alert
24. Environmental Literacy Council
25. Free Enterprise Education Institute
26. Free Enterprise Foundation
27. Free Enterprise Fund
28. Free Enterprise Institute
29. Freedomworks
30. Freedomworks Foundation
31. Frontiers of Freedom Institute
32. George C. Marshall Institute
33. Heartland Institute
34. Heritage Foundation
35. Hoover Institution On War, Revolution and Peace
36. Hudson Institute
37. Independence Institute
38. Independent Institute
39. Independent Women's Forum
40. Institute for Energy Research
41. Institute for the Study of Earth and Man
42. James Madison Institute for Public Policy Studies
43. John Locke Foundation
44. Landmark Legal Foundation
45. Mackinac Center for Public Policy
46. Manhattan Institute for Policy Research
47. Media Research Center
48. Mercatus Center
49. Mountain States Legal Foundation
50. National Center for Policy Analysis
51. National Center for Public Policy Research
52. National Taxpayers Union
53. National Taxpayers Union Foundation
54. Oklahoma Council of Public Affairs
55. Oregon Institute of Science and Medicine
56. Pacific Research Institute for Public Policy
57. Reason Foundation
58. Responsible Resources
59. Science and Environmental Policy Project
60. Southeastern Legal Foundation
61. Sovereignty International
62. State Policy Network
63. Texas Public Policy Foundation
64. Thomas Jefferson Institute for Public Policy
65. Ts August/The Second of August
66. Washington Policy Center

APPENDIX IV.C

Private Foundations

1. Aequus Institute
2. Alfred C. Munger Foundation
3. American Petroleum Institute
4. Annenberg Foundation
5. Assurant Health Foundation
6. Barbara and Barre Seid Foundation
7. Barney Family Foundation
8. Bialkin Family Foundation
9. Bill & Melinda Gates Foundation
10. Brady Education Foundation
11. Carnegie Corporation of New York
12. Charles and Ann Johnson Foundation
13. Charles F. De Ganahl Family Foundation
14. Chase Foundation of Virginia
15. Claws Foundation
16. Communities Foundation of Texas
17. Coors Affiliated Foundations
18. Covenant Foundation
19. Daniels Fund
20. David J. & Mary L. G. Theroux Foundation
21. Dean & Barbara White Family Foundation
22. Dodge Jones Foundation
23. Donors Trust/Donors Capital Fund
24. Dorothy D. And Joseph A. Moller Foundation
25. Douglas & Maria Devos Foundation
26. Dunn's Foundation for the Advancement of Right Thinking
27. E. A. Morris Charitable Foundation
28. Earhart Foundation
29. Ed Foundation
30. Ed Uihlein Family Foundation
31. Eli Lilly and Company Foundation
32. Ewing Marion Kauffman Foundation
33. Exxonmobil Foundation
34. F. M. Kirby Foundation
35. Galashiels Fund, Ltd.
36. General Motors Foundation
37. Gilder Foundation
38. Gordon V. & Helen C. Smith Foundation
39. Greater Kansas City Community Foundation
40. H. Smith Richardson Charitable Trust
41. Hatton W. Sumners Foundation for the Study and Teaching of Self-Government
42. Henry R. Kravis Foundation
43. Herrick Foundation
44. Hilton Family Foundation
45. Hirsch Family Foundation
46. Howard Charitable Foundation
47. Iowa West Foundation
48. J. P. Humphreys Foundation
49. Jaquelin Hume Foundation
50. John Dawson Foundation
51. John S. And James L. Knight Foundation
52. John Templeton Foundation
53. John William Pope Foundation
54. K. C. Ames Foundation
55. Koch Affiliated Foundations
56. Koret Foundation
57. Lakeside Foundation
58. Lillian S. Wells Foundation
59. Lilly Endowment Inc.
60. Lovett & Ruth Peters Foundation
61. Lumina Foundation for Education
62. M. J. Murdock Charitable Trust
63. Malott Family Foundation
64. Mercer Family Foundation
65. Modzelewski Charitable Trust
66. Pacificorp Foundation
67. Pierre F. And Enid Goodrich Foundation
68. Richard & Barbara Gaby Foundation
69. Robert & Ardis James Foundation
70. Rose-Marie and Jack R. Anderson Foundation
71. S.D. Bechtel, Jr. Foundation
72. Scaife Affiliated Foundations
73. Searle Freedom Trust
74. Sid W. Richardson Foundation
75. Smith Richardson Foundation
76. Stephen Bechtel Fund
77. Susquehanna Foundation
78. Sweetfeet Foundation
79. Taube Family Foundation
80. The Abstraction Fund
81. The Achelis-Bodman Foundations
82. The Alice M. & Thomas J. Tisch Foundation
83. The Ambrose Monell Foundation
84. The Andrew Cader Foundation
85. The Anschutz Foundation
86. The Armstrong Foundation
87. The Bristol-Myers Squibb Foundation
88. The Capital Group Companies Charitable Foundation
89. The Carson Family Charitable Trust
90. The Challenge Foundation
91. The Chisholm Foundation
92. The Chrysler Foundation
93. The Community Foundation Serving Richmond & Central Virginia
94. The E. L. Craig Foundation
95. The Gordon and Mary Cain Foundation
96. The Grover Hermann Foundation
97. The Harry and Jeanette Weinberg Foundation
98. The Hofmann Family Foundation
99. The J. M. Kaplan Fund
100. The Jean I. & Charles H. Brunie Foundation
101. The Jeld-Wen Foundation
102. The JM Foundation
103. The John D. And Catherine T. MacArthur Foundation
104. The Kern Family Foundation
105. The Kovner Foundation
106. The Lynde and Harry Bradley Foundation
107. The Marcus Foundation
108. The Meadwestvaco Foundation
109. The Paul Singer Family Foundation
110. The Pew Charitable Trusts
111. The Richard and Helen Devos Foundation

112. The Richard Seth Staley Educational Foundation
113. The Robert Wood Johnson Foundation
114. The Roberts Foundation
115. The Rodney Fund
116. The Roe Foundation
117. The Samuel Roberts Noble Foundation
118. The San Francisco Foundation
119. The Starr Foundation
120. The T. Boone Pickens Foundation
121. The Thomas and Stacey Siebel Foundation
122. The TWS Foundation
123. The Ups Foundation
124. The Weismann Foundation
125. The William and Flora Hewlett Foundation
126. The William and Inez Mabie Family Foundation
127. The William H. Donner Foundation
128. The Woods Charitable Foundation
129. Timken Foundation of Canton
130. Tully and Elise Friedman Fund
131. Vanguard Charitable Endowment Program
132. Walton Family Foundation
133. Wellpoint Foundation
134. William E. Simon Foundation
135. William Howard Flowers, Jr. Foundation
136. William K. Bowes, Jr. Foundation

APPENDIX IV.D
Further Details on Data Collection and Coding

Data collection for the full dataset in Brulle (2013) was as follows. Candidate CCCM SMOs were determined by enumerating any organisations that: (a) sent a speaker to or sponsored any of the eight conferences by the Heartland Institute's International Conferences on Climate Change between 2008 and 2012; (b) are members of the Global Climate Change Coalition, the Alliance for Climate Strategies, or the Cooler Heads Coalition; or (c) were addressed in accounts of CCCM activity by Oreskes and Conway (2010), Greenpeace (2010), The Union of Concerned Scientists (2007) and Covington (1997). This resulted in a list of 538 candidate SMOs of the CCCM.

These 538 organisations were coded as having climate change as a primary focus, a substantive, but secondary, concern, a peripheral concern, or no concern at all. For example, the Science and Environmental Policy Project was coded as having a primary focus on climate change whereas the Cato Institute was coded as having a secondary focus on climate change due to its participation in a number of different policy arenas. Coding was based on a review of candidate SMOs' activism, summaries of their activities by Greenpeace and the Centre for Media and Democracy's SourceWatch, a review of its mission and objectives, the nature of its arguments about climate change (e.g., "climate change is a hoax" versus "addressing climate change is expensive" versus "there are more important problems than climate change"), and its advocated actions to address climate change which includes "no action". The test of intercoder reliability yielded a Krippendorf's Alpha coefficient of 0.87 for the two independent coders. Of the 538 candidate SMOs 123 had either a primary or secondary focus on climate change. This constitutes the core population of SMOs in the CCCM. Of these, IRS data was available for 98 SMOs between 2003 and 2010. These 98 SMOs were used in Brulle's original analysis.

Upon my examining of the full dataset used in Brulle (2013), small data entry errors were found leading to discrepancy between the original number of organisations listed in Brulle (2013; 140 foundations, 91 SMOs). Subsequent discussions with Brulle confirm that the numbers used here are correct. To assess the robustness of this sample to alternative efforts to enumerate the core SMOs of the CCCM, Brulle (2013) compared the 123 SMOs to the listings of CCCM SMOs presented in two previous studies (McCright and Dunlap 2000; Jacques et al. 2008), finding that more than 90 percent of the organisations analysed in previous work were included in the set of 123 SMOs.

Selection of private foundations was considerably more straightforward. The Foundation Centre's grants database (http://www.foundationcenter.org/) in addition to the IRS 990 PF was used to identify all grants given to the 98 SMOs from 2003 to 2010. This resulted in 9,094 grants from 1170 private foundations totalling approximately $620 million. All grants were included regardless of purpose. To retain those grantors that are active contributors to the CCCM, only foundations that gave $500,000 or more to the 98 SMOs over the 2003–2010 period or $200,000 in any one year were retained. This resulted in a population of 145 private foundations. This was reduced to 138 foundations as those entities under the same directorship were consolidated in order to not bias the picture of their activity in the network. Consolidations include a combination of the activity of: (a) the Castle Rock and Coors foundations; the Sarah Scaife, Carthage, and Allegheny foundations; (c) the Charles Koch, David Koch, and Claude Lambe Foundations; (d) Donors Trust and Donors Capital; and (e) the Achelis and Bodman foundations. Finally, one grantor (The Foundation to Promote Open Society) was removed as it was born after 2007 and a second (The Atlantic Philanthropies) was removed as its business operations are based outside of America. This resulted in a population of 136 private foundations.

APPENDIX IV.E
Rationale Behind the Modification of Frumkin and Kim's Original Model Specification

Originally, the Frumkin and Kim (2001) model consists of: (a) the administrative cost ratio (the share of total expenses going to management expenses); (b) logged programme expenses; (c) logged fundraising expenses; (d) organisational size as logged total revenue; and (e) logged government grants and contracts. In an attempt to clarify the relationships between 12 commonly used independent variables in models of foundation investment, Trussel and Parsons (2007) conduct a factor analysis and find that these variables load on four distinct organisational constructs — efficiency, stability, information provision and reputation. In their analysis, both age, size (as total assets) and government contracts loaded on the reputation construct when using their entire sample and not distinguishing by sector. Of these, size loaded the highest on reputation. In light of these results, I exclude a measure of government contracts, and instead use organisational age (logged years of nonprofit status). Use of age is further supported by its theoretical import in studies of organisational populations.

Finally, while professional SMOs are understood to be more attractive to foundation-investors compared to their grassroots counterparts, varying degrees of professionalism may impact foundation decision-making. Following Hwang and Powell (2009) and Staggenborg (1988), I include the ratio of staff pay to total expenses as a measure of professionalism.

APPENDIX IV.F
A Note on the Behaviour of Estimates in the Informed-Donor Portion of the Social Selection Model

That SMOs who have higher administrative cost ratios are more likely to receive funding is counter to the efficiency arguments found in work in public administration. Tinkelman and Mankaney (2007) caution against serious interpretation of positive relationships between giving and administrative cost ratios as the degree to which a sample of organisations is restricted based on the anticipated information needs of decision-makers and the degree to which those organisations in the sample are large and less donation-dependent may preclude expected negative association. Interestingly, results here indicate that the estimate changes sign over time. During the 2004–2005 period the estimate for administrative cost ratio becomes large and negative and returns to its positive form for the 2005–2006 and 2006–2007 periods. Given the political nature of these organisations and the prominent role of think tanks, a plausible explanation for fluctuation in the estimates for administrative cost ratios lies with foundations' responsiveness to the broader political environment.

The period of 2004 to 2005 was an election year. It is possible that conservative foundations responded to the environmental pressure of a potential regime change from that of George W. Bush by diverting funds away from those SMOs who spend "too much" money maintaining their individual organisations towards those that may be better equipped to maintain conservative goals by being more outwardly focused.

As for the negative effect of age, while seniority can serve as a proxy for organisational quality, Tinkelman (1999) suggests that in models where quality is controlled for in some other way (status in the present models), the favouring of younger nonprofits by foundations may indicate a preference for organisations that are perceived as dealing with more topical causes.

CHAPTER V

Some Concluding Thoughts On Networks, Strategy and Social Movement Fields

Social movements are fundamentally relational in nature; phenomena most realistically viewed as constellations of adherents directly and indirectly tied by relationships that form the basis of both cooperation and competition. Here I have dismissed any metaphoric utility derived from use of the word "network" to describe social movements. In contrast to much extant research in social movement studies, I have instead placed network structure at the centre of my theorising and analysis of the strategic decision-making of SMOs. In this thesis I have argued, and empirically demonstrated, that network structure affords SMOs a route to accessing information that may be used to manage uncertainty when there are questions as to the most appropriate course of strategic action. I have built this argument upon two simple observations: (a) populations of SMOs are constitutive of social movement fields wherein these diverse organisations cooperate, compete and learn from one another through surveillance, comparison and mimicry; and (b) SMOs are embedded in rich webs of relations with peers — both online and offline — that enable and constrain their behaviour by governing access to informational resources. This led me to recast SMOs' strategic actions as types of relationship formation in inter-organisational networks of peer-SMOs.

The strengths of my approach are substantial. From the perspective of sociology, it yields better treatment of SMOs' agency as strategic decision-makers through a shift in

analytical focus to those micro-level network locales (also, "local neighbourhoods", "network sub-graphs" or "network motifs") within which SMOs are embedded. By extension, my approach has the appealing property of making clear the effect of SMOs *on each other* — a key aspect of the institutional perspective on which this work is built. Critically, this effect is manifest in network structure and the ways in which it guides action (i.e., tie formation) *vis-á-vis* a need to manage uncertainty.

The engine behind both the theoretical and analytical innovation of this thesis rests with my focus on comparatively overlooked network scenarios — namely, multiplex and bipartite networks. While students of networks will continue to make both substantive and methodological advances through the analysis of unimodal simplex networks, great insight into both inter-organisational dynamics and the ways in which network structure shapes behaviour stand to be had by focusing on multiple types of relationships and multiple types of actors. The motivation behind my decision to focus on multiplex and bipartite networks is simply that such scenarios are more realistic representations of social structure and thus are better positioned to capture the richness of its dynamics.

Despite influential and classic work by Bearman and Everett (1993) and Gould (1991), scholars of social movements have been slow to explore these more intricate network scenarios. This has coincided with a failure to take an explicitly "bottom up" approach to theorise and model how the micro-level dynamics of networks might govern the behaviour of SMOs. Though the expansive scholarship of Mario Diani (Diani 1992; 2003; 2015; Diani and Baldassarri 2007; Diani and Kousis 2014) is a notable exception to this trend, more work is needed. With this thesis, I have attempted to contribute to this scholarly conversation.

Specifically, I have presented three case studies of strategic action: (a) a longitudinal study of tactical implementation in the Palestinian National Movement; (b) a longitudinal study of financial patronage in the US Climate Change Countermovement; and (c) a cross-

sectional study of online coalition formation amongst organisational members of the Hardest Hit Coalition, a UK-based anti-austerity issue campaign. Across these three diverse cases, network structure plays an important role in shaping the strategic behaviour of SMOs in ways that extant scholarship in social movement studies has missed. Most important here is the diverse ways that strategic action is rooted in micro-level dynamics and, in the cases in Chapter II and Chapter IV, the inability of these dynamics to be explained by monadic variables of traditional interest to sociologists.

Across this work, triangles and four-cycles have stood out as especially important settings wherein theorised informational dynamics proved to be especially salient. In some respect, a conclusion based on the signalling inherent to these network motifs is not new. Indeed, scholars in sociology and social psychology working on friendship (Block, 2015; Standfeld and Pentland 2015) and scholars in organisational studies and management science working on questions of alliances and partner selection (Gulati and Gargiulo 1999; Koskinen and Edling 2012; Rivera, Soderstrom and Uzzi 2010; Uzzi 1996) have long been interested in how informational dynamics in dyads, triads and four-cycles might aid decision-making. However, here I make a novel contribution to this line of work as it relates to social movement fields by showing that signalling plays out in interesting, sometimes counterintuitive ways, especially with regard to question of organisational competition. And, in doing so, I have responded directly to Diani's (2012) call to combine theories and approaches from sociology, organisational studies and network science in studying social movements.

Methodologically, I have made exclusive use of statistical models of social networks given their utility in tackling questions related to the emergence of social systems. Throughout this thesis I have maintained that a core strength of these models is their realistic handling of the constraints/benefits of social actors' structural positions with respect to their

behaviour. Results, especially those from stochastic actor-oriented models (Chapters II and IV), strongly support this assertion. The key conclusion of this thesis with respect to methodology is clear — social movement scholars must go beyond simple descriptions of network structure to model interaction between movement adherents as a complex system using inferential frameworks. By committing this thesis to the application of statistical models for social networks and elevating structural path-dependency to an explanatory role — as opposed to relegating it to a nuisance feature — I have avoided an under-socialised view of organisational decision-making. Ultimately, this allowed me to move beyond the key weakness of variable-centred (i.e. atomistic) statistical frameworks (e.g., OLS or logistic regression) — namely, their failure to account for SMOs interdependence and thus their poor representation of the institutional dynamics which so heavily govern their behaviour.

In reflecting upon the results of these case studies, my broader thoughts with respect to the state of the sociology of social movements and what a statistical networks approach might offer the field moving forward are hopeful with respect to potential theoretical developments. Celebrated efforts to demonstrate the power of structural analysis for understanding social movement dynamics and, more broadly, collective action (Diani and McAdam 2003) indicate that the network perspective has gained a respected position. Furthermore, the "cultural turn" amongst analysts of social movements (see Larson 2013 for a review) suggest that network motifs stand to gain popularity as sites for theorising action mechanisms, strategic or otherwise, with respect to institutional processes in social movement fields.

However, my excitement about the future of the sociology of social movements with respect to statistical models of networks is more muted. At present, these models have yet to gain any real traction in social movement studies, perhaps due to the sometimes sharp contrasts in methodological perspectives. As Jasper (2004) states in regard to using rational choice frameworks to understand the trade-offs movement adherents make, "I do not think

we can possibly model strategic choices with mathematical equations." (p. 6). Though it would be foolish to generalise broadly and conclude that this sentiment is pervasive amongst scholars of social movements, especially those within the resource mobilisation tradition, amongst those working at the intersection of culture and networks, sympathy for the quantitative analysis of networks of social movement adherents is not universal (Diani and McAdam 2003: vii).[52]

As with all methodologies, critical reflection on strengths and weaknesses is required to produce the very best science. However, blanket rejections of "math" as a means of studying social movement dynamics — both within and outside of networks — strikes me as terribly naïve and a good way to cripple further substantive insight. As I have demonstrated above, one may tackle questions of strategic choice with respect to agency and cultural (i.e. institutional) factors with advanced quantitative methodologies.

My advocacy for the increased used of statistical models of networks is not at the expense of the importance of alternative modes of investigating the organisational dynamics of social change. Here, I only attempt to highlight the utility of the most-recent developments in social network analysis for studying social movement fields. As McAdam (2003) rightly points out, knowledge about network structure and those mechanisms of interest to the analyst yielded by both qualitative and quantitative modes of inquiry provides the most promising way forward. Though it would be grossly inaccurate to describe this as a mixed-methods thesis, my discussion about the entrepreneurial nature of private foundations in Chapter IV does demonstrate how qualitative insight can illuminate statistically observed regularities in networks.

[52] In contrast to Jasper (2004), consider, for example, Oliver and Myers (2002) who pen a spirited piece demonstrating the utility of formal mathematical models for untangling social movement dynamics in *Mobilization: An International Quarterly* — the top sub-field journal for social movement studies.

Where next might the statistical analysis of social movement fields as networks go? Throughout this thesis, I have suggested some promising avenues such as the co-evolution of multiple bipartite networks and longitudinal analyses of multiplex networks. However, one very exciting area for future research that I have yet to discuss is multilevel networks (see Lazega and Snijders 2015). As their name suggests, these structures consist of two sets of actors (i.e., the levels), where relationships may form between actor sets (i.e., a meso-level bipartite network) and within one or both actor sets. Such structures represent the natural extension of the analyses presented in Chapter II and Chapter IV. In the case of the latter, the meso-level network of private foundations who invest in SMOs would remain the same. However, the multilevel version of this network would see ties between SMOs in the form of direct interaction (e.g. information exchange) or formal collaboration. Here, the idea would be to explore how sharing a financial patron shapes the interaction between SMOs. The interesting questions here being how do private foundations *build* social movement fields by facilitating inter-SMO relations (Bartley, 2007) and to what degree do private grant dollars facilitates or disrupt institutional dynamics?

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