THE ENACTMENT OF PLURAL LEADERSHIP IN A HEALTH AND SOCIAL CARE NETWORK: THE INFLUENCE OF INSTITUTIONAL CONTEXT

Abstract

In this article we employ developments in social network analysis (SNA), specifically the *p** model, to examine the enactment of plural leadership within, and across, hierarchical levels and organizational boundaries (Denis et al., 2012). Drawing on an empirical study of an inter-professional, inter-organizational network that delivers health and social care, we address two research gaps: (i) the effect of power relations, derived from professional hierarchy, upon spread of plural leadership; and (ii) the effect of formal leadership, derived from managerial accountability, in channeling the spread of plural leadership for coherent strategic effect. We show that, in a routine situation, the network is characterized by generalized leadership exchanges. In this situation, professional hierarchy and managerial accountability are not visible, nor is channeling of plural leadership by the formal leader. In a non-routine situation, when a disruptive event occurs, the network is characterized by restricted exchange. In this situation, professional hierarchy and managerial accountability are evident, and a formal leader channels plural leadership.

Keywords: Plural Leadership; Social Network Analysis; Public Services; Professions; Accountability**.**

THE ENACTMENT OF PLURAL LEADERSHIP IN A HEALTH AND SOCIAL CARE NETWORK: THE INFLUENCE OF INSTITUTIONAL CONTEXT

Scholars' increasing interest in "leadership in the plural" is a response to the critique of more individualistic, heroic notions of leadership associated with transformational organizational change (Fletcher, 2004; Uhl-Bein, 2006). Plural leadership (henceforth PL) focuses, "on the need to distribute tasks and responsibilities of leadership up, down, and across the hierarchy … [articulates] leadership as a social process that occurs in and through human interactions … [and focuses upon] the more mutual, less hierarchical leadership practices and skills needed to engage collaborative, collective learning" (Fletcher, 2004: 650).

In studying PL, Denis et al (2012: 211-12) suggest "future research might pay more attention to social network perspectives … [and] to the role of power", and identify four distinct streams of scholarship examining PL. Our study is located within the third stream, which refers to work that has examined how leadership may be handed over between people from one hierarchical level over time as well as across intra-organizational and inter-organizational boundaries (Buchanan et al., 2007; Chreim et al., 2010; Currie et al., 2009; Huxham & Vangen, 2000; Martin et al., 2008). This is the stream most closely associated with inter-organizational collaboration in professionalized, public services contexts. Within this stream of research, Denis et al. (2012: 253) call for "greater attention [to] the role of power in understanding how leadership works and what this means when it is spread over organizations and across their boundaries." Alongside this, within their review of empirical studies within this stream of PL research, Denis et al. (2012) highlight that it is not clear how professional hierarchy and formal managerial accountability shape patterns of power to channel (or not) the spread of PL for strategic effect. Our empirical study of inter-organizational collaboration through a network in a professionalized, public services context addresses this research gap. Aligned with Provan and Kenis (2008), we take a broader focus upon inter-organizational networks as a group or collective dynamic, rather than individualistic or agency perspective, what Powell et al. (2005, 1133) referred to as, “illuminating the structure of collective action”.

Drawing on a case of a health and social care network children’s safeguarding board, we studied two episodes of PL at time points 2007 and 2010, which exemplify a routine situation and non-routine situation (following a disruptive event as detailed below), and employed social network analysis (SNA) to examine PL (see: Balkundi & Kilduff, 2006; Carson et al., 2007; Contractor et al., 2012; Mehra et al., 2006a & 2006b; Sparrowe & Liden, 1997; Uzzi, 1996 & 1997). Employing SNA enables us to focus on specifically how leadership is enacted by each actor in a network, and with whom. In doing so we are able to examine the patterns of leadership interactions in a formalized manner, and account for the institutional context in which actors are located (Balkundi & Kilduff, 2006; Brass, 2001; Carson et al., 2007; Contractor et al. 2012; Mehra et al., 2006a & 2006b) using *p** models (Pattison & Wasserman, 1999; Robins et al., 2007; Wasserman & Pattison, 1996).

In between the two time points in which we studied PL, the health and social care network (children’s safeguarding board) was struck by an unanticipated “disruptive event”. Specifically, three teenage girls died from anorexia within a short period of time (Fall 2008), which dramatically shifted the network from a routine to a non-routine situation. The disruptive event rendered visible the spread of PL across two very different network contexts, and created a unique window through which we were able to examine episodes of PL across routine and non-routine situations.

PLURAL LEADERSHIP

Our interest lies in understanding the spread of leadership, or, “how leadership may be handed over between people from one hierarchical level to another over time, as well as across intra-organizational and inter-organizational boundaries” (Denis et al., 2012: 213). In considering this, Huxham and Vangen (2000) suggest inter-professional and inter-organizational collaboration in pluralistic settings may be characterized by strategic inertia, because leadership is fragmented. Although leadership activities clearly affect the outcomes of the collaboration, those leading are frequently thwarted by structural dilemmas and difficulties, so the outcomes are not what they intended. Whilst rich in empirical detail, Huxham and Vangen (2000) did not provide a theorization of the spread of leadership, which takes account of power relations (Denis et al., 2012).

Buchanan et al. (2007) also appear to ignore power, reflected in the assertion that the spread of leadership for strategic change in pluralistic settings is characterized by “nobody in charge”. They argue that formal channelling of PL is not necessary, and might even be harmful. In contrast, Chreim et al. (2010) argue for formal channelling of leadership in pluralized settings, to have a coherent effect upon strategic change. Crosby and Bryson (2010) are supportive of the stance taken by Chreim et al. (2010) towards co-ordination of pluralized leadership. In the face of these competing views, studies need to consider how important formalization of leadership roles and structures might be to the whole concept of PL (Denis et al., 2012).

Meanwhile, Gronn (2002) outlines an idealistic model of distributed leadership, a concept that represents the historical forerunner to interest in spread of leadership within pluralistic settings (Denis et al., 2012). Whilst derived from the single organizational unit of the school, the model exhibits little concern for structures of professional organization or managerial accountability. In later work, cognizant of structures of professional organization and managerial accountability, Gronn (2009; 2011) calls, first, for clarification of the role and influence of any formal leader, as leadership is spread. Second, he calls for more attention to the interplay of both macro and micro-level factors, with some concern for temporary and enduring leadership features. Yet, even in later work, Gronn remains wedded to the idea that distributed leadership has a concerted effect, and downplays power and contestation as leadership is spread (Denis et al., 2012). In contrast, Spillane et al. (2004), argue that leadership does not have to be concerted, but can be contested amongst stakeholders, so its' effect fragments, rather than channels pluralization. It is not that PL "disappears", indeed Denis et al. (2012) suggest PL is always present in inter-organizational, professionalized, public services settings. Rather, the spread of PL might be more widespread or less widespread and more channelled. Drawing the extant literature together, examining the spread of PL, Denis et al. (2012) highlight that power is rarely mentioned, and suggest that scholars need to attend to how power channels PL.

Addressing Denis et al's. (2012) call, we examine how leadership spreads in a pluralistic setting. We analyze how more formal leadership channels PL for a coherent strategic effect. We now outline the application of SNA to the study of PL, which enables us to examine the spread of leadership taking account of power relations.

APPLYING SOCIAL NETWORK THEORY TO PLURAL LEADERSHIP

Denis et al. (2012) suggest that future research on PL should draw upon insights provided by SNA. PL should be viewed as a specific type of social network, in much the same vein as advice and friendship networks (Contractor et al., 2012), and therefore, open to the same network analytic methods. Indeed, a precedent for the use of SNA in studying PL can be seen in a small, yet growing, number of empirical studies (Carson et al., 2007; Dansereau, 1995; Davis & Greve, 1997; Graen & Uhl-Bien, 1995; Mayo et al., 2003).

SNA is particularly well suited to studying PL, as it renders visible patterns of leadership interactions within a network, and allows for the possibility that there can be multiple leaders (Brass & Krackhardt, 1999; Contractor et al., 2012). In addition, SNA has the potential to describe, in fine-grained detail, the structure of PL (Mayo et al., 2003; Mehra et al., 2006a). Finally, it is also possible to examine the patterns of PL among individuals at several levels including, the dyadic, extra-dyadic and whole network perspectives (Balkundi & Kilduff, 2005; Mehra et al., 2006a & 2006b; Sparrowe & Liden, 1997; Uzzi, 1996 & 1997).

Scholars of SNA have argued that to describe the structure of PL, aggregate indicators, such as density and centralization, are important (Bartol & Zhang, 2007; Carson et al., 2007; Mayo et al., 2003; Mehra et al., 2006a & 2006b). Density highlights the concentration of interaction, and centralization shows the spread of PL. Centralization is suitable for capturing whether PL is concentrated in one (high centralization), or spread across a number of individuals (low centralization) (Contractor et al., 2012). Where leadership is extensively pluralized, then a low centralization score is exhibited, where PL is more channelled, then a high centralization score is exhibited. Thus, if a network is characterized by density and low centralization, we suggest that PL is widely spread. Both measures have been used in a number of important studies on PL (e.g. Carson et al., 2007; Mayo et al., 2003; Mehra et al., 2006a).

In addition to aggregate network level indicators, and to facilitate understanding of the dynamics of PL, SNA scholars have examined dyadic and extra-dyadic relationships. We view PL as a collective phenomenon rooted in social exchange behavior (Hiller et al., 2006; Homans, 1958; Seers et al., 2003; Sparrowe & Liden, 1997; Standford, 2008), with important parallels between social exchange theory and network approaches to leadership research (Sparrowe & Liden, 1997). Social exchange theory and network analysis both conceptualize social structure as a configuration of social relations and positions (Cook & Whitmeyer, 1992).

In terms of dyadic relations developing in a social context (Emerson, 1976), social exchange theory assumes bi-directional interactions in that something has to be given and something returned (Blau, 1964; Emerson, 1976), which are represented in SNA by interdependence and reciprocity (Molm, 1994 & 2001). Dyadic relations are described as direct (or restricted) exchange, where two actors give benefits to one another in a relation of direct reciprocity: actor *A* gives to actor *B*, and actor *B* to actor *A*. In terms of leadership research, social exchange theory highlights that the quality of social interactions of actors within their networks is increased by sharing in leadership responsibilities, with a focus on the direct (or restricted) exchange of resources, including advice and support (Burt 1992; Hiller et al., 2006; Setton et al., 1996; Sparrowe & Liden, 1997). Examples include Alvarez and Svejenova's (2005) study of dyads and triads with executives, and Heenan and Bennis's (1999) analysis of effective leadership pairs.

Although dyadic relations are important, scholars of leadership have long argued the need to move beyond rigid dyadic contrivances (Sparrowe & Liden 1997; Uzzi, 1996 & 1997). Extra-dyadic relations are of particular interest to scholars of PL as interdependence between actors is unlikely to be limited to dyadic interactions (Balkundi & Kilduff, 2006). In SNA terms, these extra-dyadic structures represent generalized exchange (Ekeh, 1974; Jones et al., 1997; Takahashi, 2000), which occurs when members of the network interact beyond the need for immediate reciprocity (Gillmore, 1987). Generalized exchange is based on the idea of indirect reciprocity. For example, actor *A* may provide information to actor *B*, actor *B* to actor *C*, and possibly actor *C* back to actor *A* (Bearman, 1997). In building and maintaining ties, therefore, actors in a network may be influenced by their own pattern of contribution, and by the contribution of others in the network (Lazega & Pattison 1999).

The concept of generalized exchange, as applied to leadership, reflects actors' altruistic interest in others (Seers, 1989). Scholars have argued that this collective system of indirect or generalized exchange, which inherently involves more than two people, generates stronger bonds of solidarity than pairwise, restricted exchange (Molm, 2001). Linked to generalized exchange, Sparrowe and Liden (1997) highlight that Krackhardt's (1992) development of simmelian ties is pertinent to PL research because it provides a structural explanation of how ties (normally triadic) are important in fostering inclusion and cohesiveness. For a simmelian tie to exist, there must be three (a triad) or more of reciprocal strong ties in a group. Krackhardt's (1992) research focused on triads and, by extension, larger social network structures. He contended that simmelian ties facilitate collective behavior by reducing individuality and individual power, and constrain individual activity through the obligation of collective behavior. Similarly, Offstein et al. (2006) suggest that triads are formed and exist to fulfil collaborative motives in leadership networks. Drawing on the concept of simmelian ties, Offstein et al. (2006) describe how triadic interactions differ from dyadic interactions, due to the more complex interactive dynamics that accompany the introduction of an additional person to the relational exchange.

Based on the above, we suggest that SNA is particularly useful for examining the enactment of PL at the network, dyadic and extra-dyadic levels. At the network level, the general network properties that reflect the enactment of PL are density and (low) centralization. At the level of the dyad, PL may be enacted through more reciprocal patterns of social exchange. Reciprocal patterns of exchange, however, characterize a form of PL that is relatively restricted, being based on reciprocation between individual dyads of actors. In essence, this suggests PL is being enacted in a less widespread or channelled way. Finally, at the extra-dyadic level, more generalized forms of exchange (e.g. triadic exchange) characterizes a form of PL where there is indirect exchange among multiple actors in the network. We suggest that generalized exchange represents an important indicator of whether leadership is able to move beyond rigid dyadic control mechanisms, to an organic structure more capable of dealing with a complex environment (Gronn, 2002). In essence, more generalized forms of exchange are indicative of a more widespread form of PL. It is important to note, however, that a network may exhibit both restricted exchange and generalized exchange as they are distinct network properties and are driven by different factors. Restricted exchange is based on direct reciprocity between two actors and is calculative in nature. In contrast, generalized exchange is based on indirect reciprocity across three or more actors and is not calculative in nature, reflecting collective rather than individualized behavior (Takahashi, 2000).

In addition to explaining the form of PL enacted (i.e. more restricted or more generalized exchange), SNA can also be employed to help examine the influence of exogenous context on the enactment of PL. Context is particularly important where it impacts on the importance of different individual-level attributes that shape the enactment of PL (Balkundi & Kilduff, 2006). Social exchange theory suggests that actors may directly exchange with other actors based on their status (Blau, 1964). Actors are sensitive to status recognition and this gives them an incentive to share their expertise or judgment with others (Gould, 2002). Leadership networks may be shaped by such status games. Actors may exhibit a pecking order that closely follows the hierarchical structure of the organization and therefore they may be highly centralized (Lazega & van Duijn, 1997). In addition, actors may use similarities with others for certain solidarity between exchange partners. Of particular relevance are potential similarities and differences between actors, and their potential influence on leadership behavior, which can be explained using the concept of homophily.

Homophily (i.e. similarity) is a well-established concept in SNA studies (McPherson et al., 2001), which explains why certain actors (with similar attributes) are attracted to others and, thus, why network relationships form in terms of leadership (Monge & Contractor, 2003; Powell et al., 2005). Leaders' homophilic preferences mean that individuals prefer to interact and work closely with those like themselves (see: McPherson et al. [2001] for a review of this perspective). Homophily has been argued to facilitate communication (Rogers & Bhowmik, 1970) and increase coordination (Cole & Teboul, 2004). Research shows that actors use similarities to mitigate the potentially negative effects of power relations for intra-organizational action (Lazega & van Duijn, 1997). Finally, homophily, in terms of shared affiliations and spatial propinquity, matter in terms of their exogenous effects on network tie formation (e.g., McPherson et al., 2001). We employ the concept of homophily as a means of exploring the influence of context on the enactment of PL.

MODELLING THE EFFECT OF CONTEXT ON LEADERSHIP NETWORK STRUCTURE

In this section, we model the effect of context on leadership influence network structure in terms of restricted and generalized exchange. We represent context in terms of professional hierarchy and managerial accountability, and network structure through patterns of restricted and generalized exchange. Both restricted and generalized exchange reflect different, but not competing patterns of network interaction, and may co-exist in a network as the presence of one does not preclude the other (Takahashi, 2000; Robins et al., 2007).

We begin by outlining a context in which professional hierarchy and managerial accountability are weak, as exemplified by a professional bureaucracy archetype form (Mintzberg, 1979), in which collegiality frames PL (Greenwood & Hinings, 1993). The collegial organization consists of professional peers, without regard for specific position, who are interdependent and jointly perform non-routine tasks. Within a collegial organization, the most expert and/or senior professional is positioned as “first amongst equals” and expected to enact a custodial role for his or her peers (Ackroyd et al., 1989; Kirkpatrick, 1999). In this situation, there is considerable ambiguity regarding how much the expert, senior professional exerts influence over his or her professional colleagues (Denis et al., 2001). Leadership in a collegial organization represents a collaborative process that entails significant devolution of power to professional peers (Freidson, 1994; Hugman, 1994; Lazega, 2001). At the same time, the collegial organization will be co-ordinated by an administrative cadre of staff that take on a “diplomat” role to facilitate professional practice (Ackroyd et al., 1989), yet without any significant leadership influence upon strategic change.

Should the ideal collegial organization underpin the network, then we might expect leadership is widely spread across professionals, but in a way channelled towards maintaining existing professional practice, rather than strategic change. Under such conditions, exogenous context (as represented by professional hierarchy and managerial accountability – as we outline below) will have a weak effect on leadership influence, leading to a network structure that is characterized by generalized exchange. Hence:

Hypothesis 1: Where exogenous context (as represented by professional hierarchy and managerial accountability) has a weak effect on leadership influence, the network structure will be characterized by generalized exchange.

The collegiate ideal, as outlined above, is likely to be difficult to enact in a context in which relationships are framed by power differentials. In a health and social care context, there are two dimensions of macro-level structure that are significant: professional organization and government policy (Lounsbury & Glynn, 2001). Professional organization manifests itself in terms of the system of professional groups, and government policy in terms of the mandated managerial accountability of actors. We now examine how both dimensions may shape the enactment of PL.

Power differentials deriving from a system of professions is based on the horizontal and vertical distribution of knowledge and jurisdiction (Abbott, 1988), and manifests itself in a professional logic of hierarchy, which is essentially paternalistic and authoritarian (Bate, 2000). Professional hierarchy may stymie leadership being spread beyond the powerful professional group, due to significant power disparities regarding who can lay claim to knowledge and jurisdiction over expert matters. Furthermore, power differentials may arise between members of the college, and/or between different colleges. Specifically, within health and social care organizations, power is traditionally concentrated with specialist hospital doctors (Fitzgerald & Ferlie, 2006), and others have struggled to assert themselves in influencing doctors; e.g. nurses (Currie et al., 2010) and managers (Ackroyd, 1996; Ferlie et al., 1996). Where different health and social care organizations come together in networks, the distribution of power is less clear, particularly between doctors and social workers (Currie et al., 2010). Meanwhile, professionals from agencies outside health and social care, such as police, youth workers, and voluntary sector workers may find they exert relatively little leadership influence in networks (Huxham & Vangen, 1996).

Where exogenous context, in relation to professional hierarchy, exerts a strong influence on actors' leadership interactions, the pluralization of leadership across professional boundaries, and particularly across more and less powerful professional boundaries, may prove challenging. We anticipate that under such conditions we will see a homophilic tendency of actors to orientate towards their own professional groups, leading to patterns of leadership interaction exhibiting a more restricted form of exchange. Hence:

Hypothesis 2: Where professional hierarchy has a strong effect on leadership influence the network structure will be characterized by restricted exchange.

Power differentials derived from government policy, in the form of more managerial modes of organizing health and social care, have disrupted traditional professional organization, with senior professionals positioned as formally accountable under new managerial arrangements for networks (Ferlie et al., 2003). The effect of accountability regimes on leadership within English health and social care organizations is exemplified by the way those at the apex of the management hierarchy ("formal leaders") have been castigated for failures in the delivery of health and social care. Recent examples within English health and social care include the sacking of health and social care leaders, such as the Director of Children's Services, Haringey Local Safeguarding Children's Board, following the death of "Baby P" (Laming, 2009), and the CEO at Mid-Staffordshire Hospital following patient deaths attributed due to poor quality service (Francis, 2013). The context of such threatening accountability has a potential "chilling effect" upon service improvement, since any formal leader, based upon their managerial accountability, may become rather defensive (Morris & Moore, 2000). Those located in formal leadership positions, with managerial accountability, may prove unwilling to spread leadership to others, and others unwilling to take up leadership positions (Currie et al., 2009; Heifetz, 2004).

Where exogenous context in relation to managerial accountability exerts a significant influence on actors' leadership interactions, the pluralization of leadership across managerially accountable and non-managerially accountable actors may prove challenging. We anticipate that under such conditions, we will see a homophilic tendency of actors in managerially accountable positions to orientate towards similar others, leading to patterns of leadership interaction exhibiting a more restricted form of exchange. Hence:

Hypothesis 3: Where managerial accountability has a strong effect on leadership influence the network structure will be characterized by restricted exchange.

In summary, we suggest that when exogenous context, in terms of professional hierarchy and managerial accountability, are not influential, actors are more likely to enact PL through patterns of generalized exchange. In contrast, when exogenous context, in terms of professional hierarchy and managerial accountability, are influential, actors are more likely to enact PL through patterns of restricted exchange.

METHOD AND DATA

Our study focuses upon City Local Safeguarding Public Service Network (CLSPSN). CLSPSN, as an organizational entity, represents a mandated public services network, comprised of several legally autonomous organizations that work together to achieve not only their own goals, but also a collective goal. Unlike non-mandated networks, which develop opportunistically, goal-directed public service networks are set up with a specific purpose, either by those who participate in the network or through mandate, and evolve largely through conscious efforts to build co-ordination and encourage informal interaction (Agranoff & McGuire, 2003; Imperial, 2005; Kilduff & Tsai, 2003; Lemieux-Charles et al., 2005; Provan & Kenis, 2008; Provan & Milward 1995; Provan et al., 2004).

The CLSPSN brings together a multitude of different professionals and organizations (i.e. health, social care, education, careers and youth work, police and voluntary organizations, as well other local level agencies) deemed responsible for strategically overseeing the front-line handling of child abuse and related deaths (DES, 2006; DES, 2007). The actors meet regularly at overview meetings, but also work together and interact outside the formal network meetings. CLSPSN is situated within the children's services department of the local level of government (in England, a host local authority), which is ultimately accountable for safeguarding failures. Around half of safeguarding networks are formally led by a managerially accountable independent chair, with the other half led by a managerially accountable senior manager from the host local authority, commonly the Director Children's Services (France et al., 2009). At the same time, the children's services department alone does not hold all the resource for service delivery or control, nor do they manage key staff delivering services, so they cannot alone, ensure high quality delivery of services.

We conducted our study between 2007 and 2010, capturing network data at the two time points. In both cases we obtained responses from all 23 members of the network, the details of which are presented in table 1. Between 2007 and 2010, and of particular significance to our study, a disruptive organizational event occurred in 2008 (between the two periods of our SNA data collection), which rendered our interest in the enactment of PL, and the influence of professional hierarchy and managerial accountability there upon, very visible. Within the area covered by CLSPSN, over a three month period in late 2008, three teenage girls died from anorexia, all following at least two referrals by a primary care doctor to the acute hospital. The girls should have come into contact with mental health services, but the provider organization in the CLSPSN area was unaware of their problem, neither through direct referral, nor through the high incidence of cases being brought to CLSPSN attention. In short, this represented a safeguarding failure, one which the pluralization of leadership through the CLSPSN might have been expected to mitigate.

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Measures and data

Many network studies are based on a single network and some are based on plausible model assumptions or model based inferences (Sterba, 2009). Model based design[1] is appropriate where the whole network has been observed, and the main features of the data set can be represented by a set of parameters. Employing a model based design and a single case, it is possible to say something about social processes and mechanisms more generally (see: Frank, 2009), as the corresponding standard errors provide an indication of how different these estimates might be if the study was repeated. However, in order to make inferences, researchers must be concerned for any potential endogeneity issues arising from their constructs and variables (Antonakis et al., 2010; Li, 2013). In particular, we explain our justification of our network boundary specifications and data collection methods, which are important when estimating the underlying network processes (Li, 2013). Since our analysis focuses on the network processes within a particular public service setting, we condition on their composition. Our network boundary is determined by the fact that the network is recognized and defined by the members. However, our actor attributes are delimited by our theoretical interest.

We collected socio-metric (in terms of PL influence), organizational and demographic information by means of a questionnaire administered face to face to the members of the CLSPSN network. The data collection was used to identify PL influence patterns at two time points in early 2007 and early 2010. Demographic information included, age, gender, tenure,

[1] Model-based inference acknowledges that empirical random sampling would not always be feasible, particularly for observational studies in the social sciences. But statistical modelling should play a central role in data analysis; in that, model building and modification should mediate between real-world problems and statistical testing with the data at hand. A model-based design allow different kinds of inference (descriptive vs. analytic) to different kinds of populations (finite vs. infinite). The framework allows both kinds of inference to both kinds of populations, given a random sample.

organizational affiliation, and managerial accountability. The response rate was 100 per cent. We outline the measurement of our constructs below.

***Leadership influence measure*:** Our dependent variable is the perception of leadership influence. Our definition of a leader is someone who is perceived as such by others, which is reflected though a set of formal and informal ties (Balkundi & Kilduff, 2006; Mehra et al., 2006a & 2006b; Zohar & Tenne-Gazit, 2008). The measure is similar to that used in other studies to capture respondents' personal and explicit theories of leadership (Mehra et al., 2006a) and is consistent with classic socio-metrical work on leadership (Calder, 1977). A leadership relationship is said to exist when one member perceives another as exerting leadership influence across multiple individuals. Research on leadership suggests that perception is good for assessing leadership influence, in that the observation of others' leadership influence strongly matches the perceiver's leadership prototype (see: Brass & Burkhardt, 1993).[2] Also, Carson et al. (2007) argued leadership can be conceptualized in relation to either strength of influence or source of influence. They also stated that the focus upon multiple sources of influence refers to widespread influence within the network, rather than formal positions or traits. Thus the leadership influence network provides the basis for capturing PL as a relational phenomenon.

We collected information for each dyad asking in the survey whether, "*i* believes *j* has leadership influence", using the roster method within the survey (Carrington et al., 2005).[3] A roster-based approach invites a respondent to specify, classify, or characterize their relationship with each member of a pre-set group of actors. Respondents were provided with

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[2] See also Salk and Brannen (2000) who collected data in this way to assess perceived leadership influence.
[3] See also Wasserman and Faust (1994) for a discussion of survey instruments for SNA.

a list containing the names of the other members of the safeguarding network arranged in alphabetical order. The list was generated through exploratory interviews with two key members of the safeguarding board. Respondents were asked to indicate who was perceived as a leader with each of them.[4] The leadership network was represented by a binary adjacency matrix recording the presence or absence of perceived leadership relations for each possible pairs of individuals in the sample.

Context and control measures**:** We derived several constructs to represent context. We consider them as actor attributes; i.e. they are individual-level measures on the nodes of the network, and they reflect social selection,[5] which is important for exploring the influence of context on the formation of network ties (Robins et al., 2001). We derived two constructs to model an actor's context, which were their professional status and whether or not they had a formal position of managerial accountability in the network. Based on our hypotheses above, we suggest that actors in a public services network are likely to have some awareness of these institutional influences and may use their implicit understanding of these patterns to inform their perceptions of leadership influence.

Professional hierarchy is measured employing a binary variable, distinguishing between high status professions (1 if a doctor or social worker) and low status professions (0 if other profession). We classified the status of actors, drawing on the sociology of professions literature that indicates that doctors and social workers enjoy high status relative to nurses and others (Nancarrow & Borthwick, 2005). These are the important professions in safeguarding public service networks and we earlier suggested that professional status also

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[4] Respondents were also asked to rate the strength of the relationship as valued data collected, but *p** models can only be conducted with binary data.

[5] Social selection assumes that while attributes are fixed and that ties may vary (Robins et al., 2007).

matters regarding whether an actor is perceived as exerting leadership influence (Currie et al., 2012).

Managerial accountability is measured employing a binary variable indicating whether the actors have a formal managerial role on the safeguarding board (Yes = 1) or not (No = 0). Researchers have highlighted the importance of managerially accountable roles in public service networks (Denis et al., 2001; Ferlie et al., 1996; Harrison et al., 1992). We take the view that if an actor has a managerial role, then more actors will perceive them as exerting leadership influence.

Both professional status and managerial accountability reflect our notion of institutional influences and are examined within the models as homophily effects. From our discussion above of institutional influences upon PL, namely professional organization and government regulation, we argue that similarity of members of a public service network in terms of professional status or accountability are important when examining relationships associated with PL, and will influence the way in which PL is enacted in the network.

The control variables we employed were gender and tenure with the current and past safeguarding networks. Prior research has shown that gender influences the structure of social networks in organizations (Brass, 1985; Ibarra, 1992). In addition, we expect tenure to influence an individual's embeddedness in networks (Lazega & Pattison, 1999; Van de Bunt et al., 1999), and may shape actors' perceptions of leadership influence (e.g. Blau, 1964). Each of our control variables is modelled as actor relation effects, in that homophily is expected, which reflects the propensity for a tie to form between actors who share the same characteristics.

The *p Model**

Whilst SNA of leadership has tended towards description in the past, and the various network structural properties rarely stand up to the scrutiny of parametric significance tests (Frank, 2009), recent developments in statistical SNA have led to the possibility of models that can be used to address a variety of questions about structure in social networks (Robins et al., 2007). These models provide explanations as to why ties might be present in a network, how ties might come to form particular patterns of network configurations (e.g., reciprocated ties), and how ties might be associated with actor attributes (Robins et al., 2009). In this paper we employ a recent development in SNA, the *p** model (Wasserman & Pattison, 1996) for analyzing binary socio-metric data. The modelling class is little known in leadership research (Contractor et al 2013), so we provide some expositive detail here.

The stream of research employing *p** models began with Frank and Strauss (1986), which has subsequently been elaborated and extended in a series of papers exploring how best to identify specific models for certain forms of network data (Handcock et al., 2004; Pattison & Robins, 2002; Pattison & Wasserman, 1999; Robins et al., 1999; Snijders et al., 2006; Wasserman & Pattison, 1996). The breakthrough in stochastic social networks came with the proposal of the notion of dependency between network ties (Frank & Strauss, 1986), which is the foundation of *p** models. In this way, ties can organize themselves into patterns or configurations, where the presence of one tie may affect the presence of others. Without some form of dependence among ties, it is impossible to argue for tendencies for certain patterns of ties to form (Wasserman & Pattison, 1996).

Frank and Strauss (1986) proposed a Markov dependence assumption and the adoption of Markov random graph model (MRGM) (Pattison & Wasserman, 1999; Robins et al., 1999; Snijders et al., 2006; Wasserman & Pattison, 1996). The Markov dependence assumption infers that two tie-variables are dependent if they share a node. The Markov dependence basis for any MRGM is that any relational ties involving the same actors (say *i* and *j*) can be defined in which a possible tie from *i* to *j* is assumed conditionally dependent only on other possible ties involving *i* and/or *j*. These can take the form of edges (a tie between two nodes, either directed or undirected), stars (represented by incoming ties to or outgoing ties from a central node) and triangles (ties connecting three nodes). The *p** model, and any proposed assumptions about potential conditional dependencies among network tie variables, can be inferred from the Hammersley-Clifford theorem (Besag, 1974).

The Hammersley–Clifford theorem gives the necessary and sufficient conditions under which a positive probability distribution can be represented as a MRGM. It informs us that any MRGM can be completely characterized by the numbers of edges, stars and triangles; i.e. the sub-graphs of the MRGM (Pattison & Wasserman, 1999; Robins et al., 1999; Snijders et al., 2006; Wasserman & Pattison, 1996). By incorporating a number of configurations (edges, stars and triangles) simultaneously, a MRGM can test the evidence as to which processes contribute to the formation of a network structure (Monge & Contractor, 2003).

The network configurations are consequential patterns that represent underlying social processes. These are endogenous effects, in that the network patterns arise exclusively from the internal processes of the system of network ties. Endogenous network configurations are of central importance in the statistical modelling of social networks (Robins et al., 2007; Rank et al., 2010), however, the idea that potential dependence in tie formation leads to endogeneity may complicate both estimation and intuition. Nonetheless, this dependence is not a weakness of *p** models, but is an inherent feature of relational data, and we model it explicitly rather than treating it as a nuisance parameter.

In terms of our analysis, it is a theoretical and empirical task to delineate the various forms of dependence that are to be examined in the network. The researcher chooses a model to use by selecting which network patterns or configurations are important. The model specification, in social network terms, reflects the theoretical interest of the researcher. Thus, the chosen *p** model enables us to include a series of different network parameters as endogenous effects, that provide important insights into the enactment of PL in the network – see Figure 1. For our study, the general PL properties of a network are represented by density (edge) and centralization (k-in-star) parameters. Density or edge configuration is a baseline propensity for tie formation and corresponds to the amount of leadership interaction in a network, in terms of the proportion of direct ties in a network relative to the total number possible. Centralization (k-in-star) network configurations are equivalent to modelling the in-degree distribution (Snjiders et al., 2006). High positive values of these parameters indicate network centralization. For instance, a significant large positive parameter would indicate that in-degrees are centralized on a few key actors. A small or even negative parameter on the other hand would suggest a relatively equal spread (de-centralization) of influence across actors (Robins et al., 2009).

--- INSERT FIGURE 1 ABOUT HERE ---

In analyzing the effect of context of network structure, we focus on both restricted and generalized exchange, both of which may co-exist in any *p** model. By including a number of configurations simultaneously into a p* model, we can test the evidence as to which processes contribute to the formation of the network structure (Monge & Contractor, 2003; Robins et al., 2007). Dyadic effects through the reciprocity parameter represent restricted exchange. Reciprocity is defined at the level of the dyad, and refers to the tendency of actors to reciprocate leadership influence with similar others.

Generalized forms of exchange are represented by the transitivity and cycle parameters, which we operationalize at the level of the triad. Cycle effect denotes the tendency for a relationship to be in the form of generalized reciprocity (i.e. if there is a tie from *i* to *j*, and also from *j* to *h*, there is also a tie from *h* to *i*). Transitivity denotes that if actor *i* perceives actor *j* as a leader, and actor *j* perceives actor *h* as a leader, then actor *i* will also perceive actor *h* as a leader. Transitive and cycle effects have interesting differences in regard to local hierarchies in the network. The inclusion of these parameters is a strength of *p** models because there is a paucity of network models that incorporate these effects (Newman, 2003). We include these configurations because the theories of generalized exchange and simmelian ties that provide the motivation for our empirical analysis, predict that collective or distributed conduct will emerge as a direct consequence of the presence of extra-dyadic configurations (Sparrowe & Liden, 1997).

In addition, we wish to take into account the distinct processes whereby actor attributes may affect network tie formation. In *p** models actor attributes are treated as exogenous or explanatory variables that affect the presence of ties. Thus, we are able to include parameters to examine the influence of exogenous context[6], which will help us explain patterns of interaction in the network. We do so through analyzing actor attribute effects, while controlling for the endogenous effects in our network. Our actor-specific variables enter in the model as a homophily effects; i.e. network ties are predicted to be more or less likely between individuals who are similar in both professional and managerial hierarchy. Homophily is indicated by a positive parameter value for these effects.

[6] The distinction between endogenous and exogenous effects for explaining the presence of ties is important. We need to account for endogenous effects for the formation of ties in order to make the right inferences about the actor attribute effects (i.e., assumptions about the effects of context).

Model specification

As stated in the previous section, the choice of network configuration to include in our model is a theoretical statement about which combinations of parameters are important in describing the formation of ties in our observed network. To link our hypotheses to the appropriate statistical models, we consider each potential network tie between the actors as a random variable. So that, for each pair of individuals *i* and *j* we define a random variable Yij so that Yij = 1 if a given relation exists between *i* and *j*, and Yij = 0 otherwise. As relations of leadership influence give rise to directed ties, Yij may be different (in general) from Yji. The observed value is specified as y_{ij} for all *I* and *j,* with y the matrix of observed ties. We now link our structure directly to the *p** class of statistical models.

Following Wasserman and Pattison (1996), *p** models can be viewed in a standard form in which the response variable is the log-odds of the probability that a relational tie is present. Together with an assumption of homogeneity (i.e. parameters do not depend on the identities of the nodes in the configurations to which they correspond), *p** establishes a model for the interacting system of tie variables in terms of parameters that refer to the presence or absence of certain configuration, or relational forms in the network.

The general form of the model is determined by assumptions about the dependencies among these variables. Following Pattison and Wasserman (1999) for *p** the basic model has the following form:

$$P(Y = y) = \kappa^{-1}\ \exp\left(\sum_A \lambda_A Z_A(y)\right) \tag{1}$$

Where:

(i) Y is the *n* x *n* array of network tie variables, with realizations y;

(ii) $Z_A(y)$ is the network statistic of for all configurations A (hypothesized to affect the probability of this network forming) in the model (configurations might include edges, stars, transitive triads and so on);

(iii) λ_A is the corresponding parameter estimate (equal to one if a particular configuration is observed or zero otherwise); and

(iv) the value κ is the normalizing constant, included to ensure that (1) is a proper probability distribution

The summation in the model is taken over all network effects included in the given model. Equation (1) describes a probability distribution of graphs on *n* nodes. The probability of observing any particular graph y is dependent both on the statistics $Z_A(y)$ and on the corresponding parameter λ_A for all effects in the model. It should be noted that, because the model has an exponential term in the right hand side, it has been also referred to as exponential random graph models (ERGM) (Snjiders et al., 2006).

There are various ways we can extend $p*$ as a probability model for the structure of network ties with actor attributes as exogenous predictors. Here, we assume a vector X of binary attribute variables with $x_i = 1$ if actor *i* has the attribute, and $x_i = 0$ otherwise. The vector y is still then the set of observations on Y. We consider attribute effects as indicative of exogenous processes that operate alongside endogenous network formation mechanisms.[7] In doing so, we can investigate similarity or homophily in our network in that ties tend to develop between actors with the same attributes. Consequently, our interest is in the probability of the graph y given the observations of attributes x, $\Pr(\mathrm{Y} = \mathrm{y} \mid \mathrm{X} = \mathrm{x})$. A

[7] For our study the theoretical hypothesis is about homophily, and as such we are assume the inference about the association between ties and attributes (and not causality) is sufficient.

simple dependence assumption between the attribute and network variables is that the attribute of *i* influences possible ties that involve *i* (i.e. Xij), referred to as a *Markov attribute* assumption (see: Robins et al., 2007). The model with exogenous predictors has the general form:

$$P(Y = y|\, X = x) = \kappa^{-1} \ \exp\left(\sum_A \ \lambda_A\, Z_A\,(y) + \lambda_A\, Z_A(y, x)\right) \tag{2}$$

Where X is an *n* x *m* array of individual attribute variables with realizations x and where λ_A and Z_A are parameters and statistics for endogenous network effects. $Z_A(y, x)$ is a network statistic that can be computed for a particular network realization y that may also depend on the vector x of attributes. Attributes, in the form of actor-attribute covariates may enter the model as homophily effects. In our model, we investigate homophily for a interaction effect and also in relation to reciprocated ties (or mutual activity) (see Figure 1).

In summary, the model in equation (2) can be used to examine the specific effects of actor attributes on network ties in a way that controls for endogenous network processes.

Model estimation

Statistical methods have only become available recently for general exponential random graph models (ERGM or *p**) (see: Robins et al., 2007). The estimation of the parameters is not straightforward. Given our proposed model (set of *z* statistics), one would like to identify the λ_A vector maximizing model likelihood. However, the normalizing constant *k* in Equations (1) and (2) is impossible to calculate for all but the smallest networks, preventing direct evaluation of the likelihood function. Approximations using logistic regression have been used (Besag, 1974; Frank & Strauss, 1986; Wasserman & Pattison, 1996). Although pseudolikelihood techniques have been shown to be useful in estimating the *p** model parameters (Pattison & Wasserman, 1999), due to dependencies in the data, Monte Carlo Markov Chain Maximum Likelihood Estimation (MCMCMLE) methods are preferred wherever possible (Wasserman & Robins, 2005; Snijders et al., 2006).

Empirically, it is possible to estimate the parameter values that are most likely to have generated the observed graph, and it can be shown that the observed graph is central in the distribution of graphs determined by these estimates. We define the distribution as centred on the observed values, when the values of the statistics from the distribution are the same as those observed on average. Thus, fitting a model is finding the parameter values that give maximal support to the data (i.e., centering the distribution is equivalent to finding the maximum likelihood estimate of the parameters). This is difficult to do analytically, so we have to rely on simulation (Hunter & Handcock, 2006). MCMCMLE methods generate a sample from the space of possible networks to estimate the λ_A vector (Robins et al., 2007). A sample of such realizations provides a means for examining model fit. These methods have been now developed to obtain estimates of parameters and standard errors for exponential random graph models (see: Hunter & Handcock, 2006; Snijders, 2002). We used the package *PNet* (Wang et al., 2006),[8] which implements MCMCMLE to fit a model to the observed network by obtaining convergent estimates.[9]

Because the estimation techniques are only approximate, assessment of the important structural characteristics and model fit are based on heuristics that compare the observed values with the fitted values. We use the goodness-of-fit assessment methods described

[8] Other statistical software packages are available. SIENA (Snijders, et al., 2005) uses the same algorithm as PNet for ML estimation, and Statnet (Handcock, et al., 2004) uses a different algorithm.

[9] The process converges, in principle, on a set of parameter estimates with the property that the distribution simulated from the estimates has average values of the statistics that are very close to the observed values (see Robins, et al., 2007).

in Hunter et al. (2008). Here, we use the same MCMC algorithm and estimated model coefficients to simulate new networks. We then compare these simulated networks to the observed data on various structural properties to reveal which models represent our data well.

For interpretation, statistically significant parameter estimates indicate a structural effect that cannot be explained by a random set of ties, or by other effects in the model. For each estimate a convergence t-ratio was obtained. The convergence t-ratio for each parameter estimate in a well-fitting model should be less than or close to 0.1 (Robins et al., 2007). Goodness of fit (GOF) statistics can also be reported in order to explore how similar the graphs that the model produces compared to the observed graph. An adequate fit is generally accepted if the parameter estimates and standard errors are within the bounds of a reasonable model, and the t-ratio for all the configurations in the model are less than 0.1. A good model fit requires all the parameters and configurations that were estimated and specified in the final model have t-ratios below 0.1, and the parameters used to check the goodness of fit of the model have t-ratios below 2.0 (Robins et al., 2007).

EMPIRICAL FINDINGS

In the results we present below, we examine the structure of leadership interactions in the network across both episodes of PL, before and after the disruptive organizational event. Comparing the two time points, we show the enactment of two different configurations: generalized and restricted exchange. Using the *p** model we can obtain insight about the mechanisms that drive the structure of the network (Robins et al., 2007). Specifically, we focused on the role of professional and managerial hierarchy, which drove important changes in the enactment of PL in the network as we discuss below.

Because *p** models are based on dyadic observation systems, the number of (non-independent) observations is N*(N-1), where N is the number of nodes in the network (in our study N=23). Thus, the number of observations is 506. In Table 2, we report descriptive network statistics that provide a general sense of PL formed by the different types of relations among the network members. The networks have relatively high standard deviations for in-degree centralization, which can be seen in the high degree centralization statistic for in-degrees. The centralization statistic are scaled to percentages with 0 per cent indicating that no actor in the network plays a more central role than any other actor and 100 per cent indicating that all ties are through only one star actor. In our 2007 network, which we characterize as operating in a routine situation, we find that the centralization score is low indicating (following Mehra et al., 2006b) PL is more spread, but less channelled. This compares quite sharply with the leadership influence network in 2010, which appears less spread, and the higher centralization score indicates that relatively few leaders are recipients of incoming ties, thus suggesting that a more channelled form of PL is enacted (Mehra et al., 2006b).

--- INSERT TABLE 2 ABOUT HERE ---

We now present the *p** models, including both exogenous and endogenous network effects. The degree of association between our exogenous (actor attribute) variables is presented in Table 3, which indicate no strong associations between the variables. We begin by reporting the results of the estimates of fitting a *p** model to PL, with only the endogenous network effects, within the network for the two time points separately (Table 4 Panel 1). Second, we introduce our exogenous context and control variables to clarify the structure of the leadership networks and likely nature of the effects of our contextual covariates for the two time points separately (Table 4 Panel 2). In doing so we are able to assess the impact of context on PL in the health and social care network. An effect is regarded as statistically significant if its estimated value is greater (in absolute value) than two times its standard error. All parameters in the models presented in Table 4 indicated good convergence of the MCMCMLE algorithm (Robins et al., 2007). We note that the goodness of fit of all the models was excellent, with the convergence statistics for all modelled effects less than 0.1, and the set of non-modelled effects that were examined for fit less than 2.0.

--- INSERT TABLES 3 & 4 ABOUT HERE ---

Starting with our main effects representing general PL in 2007 (see Table 4 Panel 1), the density effects and 2-in-star effects are significant. The negative estimate for density indicates that ties occur comparatively infrequently unless they are part of other network configurations. We have significant and positive effects for our centralization parameter (2-star configuration), indicating that networks are centralized, and leadership influence tends to be clustered around a subset of individuals. The finding supports our view that PL in health and social care networks tend to be more channelled. While the results suggest that the leadership influence network in 2007 is more pluralized, with a significant density and (small) centralization parameter, the reciprocity parameter is not significant, indicating that there is no tendency towards mutual ties and therefore no alignment. What can be clearly seen is that the structure of the leadership influence network in 2007 is explained by the significant parameter estimates for generalized exchange effects (transitivity and cycle parameters). These parameters imply that the leadership influence network at this time is strongly suggestive of structural patterns that reflect generalized exchange interactions (which we find significant). Thus, some triadic effects are evident, however, we find a positive parameter for transitivity and a negative estimate for our cycle parameter, which suggests that leadership influence does have a hierarchical tendency. Overall, the network structure is a collection of generalized interactions.

To explain how context may influence the enactment of PL, we included actor attributes relating to professional hierarchy and management accountability, and also gender and tenure as controls, into our model (see Table 4 Panel 2). Adding in our contextual variables does not drastically alter the core estimates, and leaves entirely unaltered our assumptions about the endogenous network mechanisms for PL. We find that both professional status and managerial accountability are insignificant. Hence, our analysis suggests that the enactment of PL will be more likely to be characterized by generalized exchange when professional and managerial accountability have a weak effect on leadership influence, which supports H1. The only significant actor attribute variable was the control for tenure, which is unsurprising as symmetrical relations between longstanding members are often found in collegial forms of networks (Lazega & Pattison, 1999).

By early 2010, our descriptive SNA suggests that the network functions in a very different manner to early 2007 (see Table 2). First, fewer actors enjoy high scores for in-degree centrality. Second, density and centralization is indicative of a network distributed around a few key members, referred to as distributed-coordinated by Mehra et al. (2006a; 2006b) (see Table 4 Panel 1). In order to account for the change in the enactment of PL, it is necessary to detail the effects of the disruptive organizational event.

The CLSPSN faced its biggest challenge to date, when three teenage girls died from anorexia, with a subsequent internal inquiry highlighting a problem with leadership across health and social care agencies representing a key contributor to the safeguarding failure. The internal inquiry highlighted that the different healthcare agencies (the acute hospital provider, primary care service providers, the mental healthcare provider, and the local authority) failed to provide an integrated service that might have prevented these deaths. Following this inquiry, the independent chair attempted to move CLSPSN towards a managerialized form, with clear lines of accountability aligned with professional expertise.

From the analysis of the network in 2010 (see Table 4 Panel 1), we find significant density and 2-in-star parameters, which suggests that there is some pluralization of leadership influence. In addition, we do find evidence of reciprocity, indicating restricted exchange, but no evidence of generalized exchange. The network parameters indicate that in 2010, leadership influence was concentrated within a subset of individuals who form mutual ties. In essence, PL was being enacted in a more channelled way than 2007.

When we add in our contextual and control variables (Table 4 Panel 2), we find our parameters for professional status and managerial accountability are significant. First, we found significant interaction and reciprocity effects for professional status, reflecting a tendency for homophily among high status professions. To elaborate further, conditional on the other effects included in the full model, the odds of observing leadership influence ties between actors with high status managers of are almost twice (exp[0.5261]=1.7) the odds of observing a tie between actors of low professional status. Similarly, the conditional odds of observing leadership influence ties between actors with managerial roles are almost three times (exp[0.9666]=2.6) the odds of observing a tie between actors with no managerial role. Note: The conditional odds are constructed analogously to the odds ratios of a logistic regression, although the analysis reported here is dyadic; i.e., the odds are applied to the presence or absence of a network tie. First, the results support H2: the enactment of PL will be more likely to be characterized by restricted exchange when professional hierarchy has a strong effect on leadership influence (controlling for all other effects). Second, we similarly found significant interaction and reciprocity homophily effects for managerial accountability. The results support H3: the enactment of PL will be more likely to be characterized by restricted exchange when managerial accountability has a strong effect on leadership influence.

DISCUSSION AND CONCLUSION

Our aim in this paper is to address the paucity of research that examines how institutional context shapes the enactment of PL, to provide insight into the effect of power relations, derived from professional hierarchy, and the importance of formal leadership, derived from managerial accountability. In addressing this research gap, we have established a foundation for the use of social network theory and method, and specifically the use of the *p** model, to advance our understanding of how exogenous context may shape the enactment of PL (see: Balkundi & Kilduff, 2006; Carson et al., 2007; Mehra et al., 2006a & 2006b; Sparrowe & Liden, 1997; Uzzi, 1996 & 1997).

Our analysis suggests that in 2007, under routine circumstances, the leadership influence in the network was characterized by generalized exchange. During this period, neither professional hierarchy nor managerial accountability, were found to influence patterns of leadership interaction. Following the disruptive event, and now in a non-routine situation, the independent chair (formal leader with managerial accountability) employed professional hierarchy and managerial accountability (not her own accountability, but that of constituent members of the network for their own organizational outcomes) to channel the spread of PL for strategic effect (Mehra et al., 2006a). Following the chair's actions, leadership interaction in the network in 2010 was significantly different to 2007, being based on restricted, rather than generalized, exchange, as shaped by professional hierarchy and managerial accountability. Under these conditions, we see the influence of the independent network chair in channelling the enactment of PL in the network.

We suggest that our work makes three main contributions to the literature on PL. First, our paper is the first to demonstrate that we can formally model the enactment of PL in a network, and the effect of institutional context there upon, using social network theory and method (see: Balkundi & Kilduff, 2006; Carson et al., 2007; Contractor et al., 2012; Mehra et al., 2006a, 2006b; Sparrowe & Liden, 1997; Uzzi, 1996, 1997). Second, we show how institutional context channels enactment of PL. In doing so, we suggest that formal leaders have agency as to how institutional influences may channel the enactment and spread of PL, and so need to be attuned to how they are best able to do so in order to achieve their desired goals (see Contractor et al., 2012). Third, our work suggests leadership configurations fuse different degrees of more individualized, formal tendencies and those that are pluralized (Bolden et al., 2008, 2009; Gosling et al., 2009; Gronn, 2009). Indeed Bolden et al. (2008) presents an accurate description of leadership practice in professionalized, public services settings, including both individualized, formal leadership and PL working in tandem. They note that pressures for top-down influence in times of change exist in dynamic tension with traditional values associated with professional collegiality. Our conceptual analysis highlights that some sources of influence carry more weight than others, and are anchored in different sets of resources; i.e. managerial accountability upwards as the senior lead, or concentration of power resultant from professional hierarchy.

Regarding further research, we recognize limits to our study, notably the empirical context was a particular form of mandated network and set in one country (England). Consequently, we encourage further research in different public services contexts, particularly outside

England, where the effect of centralized performance management regimes may be less pronounced, as was revealed in the Canadian health and social care system by Denis et al. (2001). Second, although the majority of research into PL has focused on public services organizations, the appeal of PL is equally as strong in the private sector (e.g. Nonaka & Toyama, 2002; Teece, 2007). Further research should detail how institutional context shapes the enactment of PL in the private sector, particularly in the face of exogenous shocks to organizations.

Our approach is novel in that we specify and estimate ERGMs for social networks that allow us to account explicitly for a variety of endogenous dependencies that are known to characterize relationships around PL within organizational networks. ERGMs support the estimation of parameters associated with variables of theoretical interest, while at the same time providing an accurate characterization of the network structure in which leadership relations are embedded. There are, however, limitations associated with our study, which we comment on below, and in doing so suggest directions that future research might pursue to deal with the issues.

First, the most obvious limitation concerns relate to data with respect to the size of our sample, attrition of personnel in the network, and the cross-sectional nature of our research design. We cannot rule out the possibility that our analysis was derived because of changing hierarchical relations, and personnel turnover. Such a possibility is exacerbated due to the cross-sectional nature of our research design. The main difficulty would be by setting the problem up for longitudinal analysis the model would not entirely be a *p**. Models have yet to be elaborated to permit longitudinal analysis (Robins et al., 2007). We also recognize that network size is a critical factor influencing inter-organizational relationships, whilst there was limited attrition of network personnel, nevertheless this may have influenced change over the two episodes of PL we examined.

The second limitation concerns the transferability of our findings. We selected the case of a children's safeguarding network because it exemplifies the inter-organizational collaboration required to address the "wicked issues", which pervade public services globally (Rittel & Webber, 1973). In addition, English public services have been described as a "fast mover" in terms of governance reforms, which may provide important lessons for public services in other countries (Martin et al., 2009). We accept, however, that context may matter, and so it is important for scholars to replicate ERGM modelling of PL across different geographic and sectoral contexts to assess the generalizability of our findings. Nevertheless, we suggest that irrespective of the generalizability of our findings, our study does hold important insights into the utility of the ERGM approach for leadership studies and in particular PL. We think future studies interested in examining PL may take our analysis derived through the ERGM approach as a reliable point of departure.

A third limitation concerns network delineation. We argue that formal leadership influence is a particular important example of a social network, however, individuals may be linked through more informal forms of leadership influence. We suggest that future research should address the effects of multiple leadership network ties (i.e. formal and informal), which may be achieved using recent developments in network models for multiplex relations (see: Lazega & Pattison, 1997; Rank et al., 2010).

Finally, we note that notwithstanding the limitations outlined above, our study contributes to research into network structures and relational dependencies more generally. The social networks include examples such as those within formal organizations, including health and social care, and around issues other than PL, such as knowledge mobilization (e.g. Currie & White, 2012).

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FIGURE 1
Configurations and parameters for the *p models**

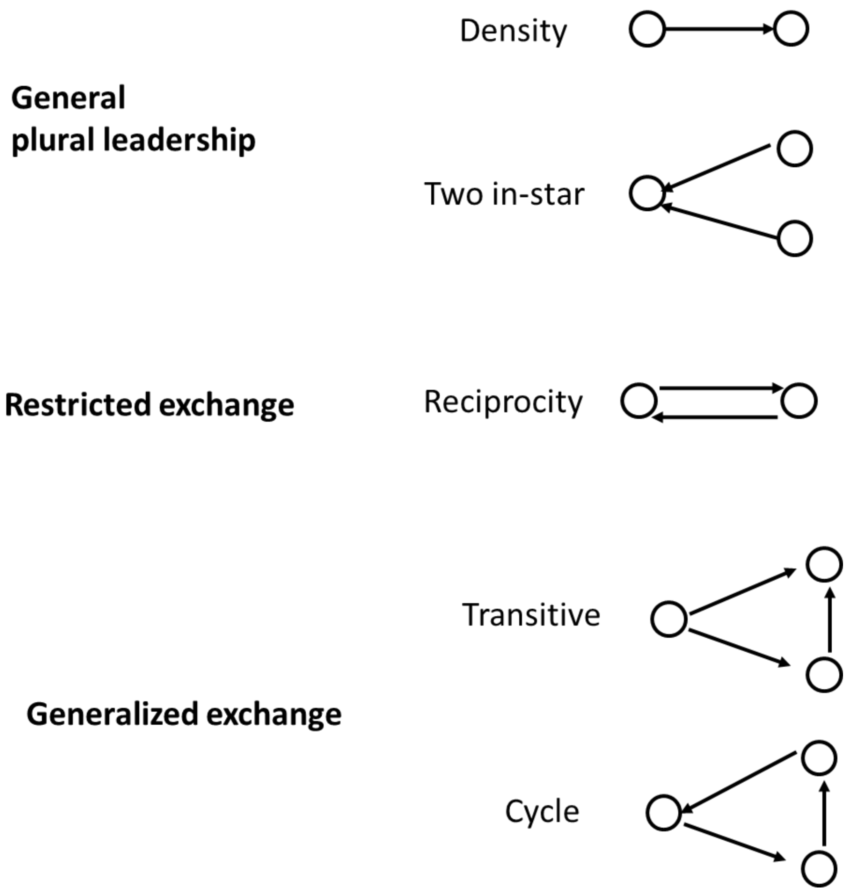

TABLE 1
Network membership 2007 and 2010

TABLE 2
Descriptive network statistics

Network statistic	**Definition**	**2007**	**2010**
Density	Proportion of actual connections over the maximum number of connections	0.2115	0.1621
Average in-degree (Standard Deviation)	Average number of edges incident with nodes	4.652 (4.788)	3.565 (5.531)
In-degree centralization	Network concentration or distribution	44.42%	73.347%

TABLE 3
QAP correlations of Actor covariates

	Mean degree (St.D.)	Status	Management	Tenure	Gender	Influence 2008
Status	3.6 (3.6)	1.000				
Management	3.7 (3.0)	0.009	1.000			
Tenure	3.9 (4.9)	0.008	0.049	1.000		
Gender	2.5 (3.2)	-0.090	-0.128	0.090	1.000	
Influence 2007		-0.022	0.008	0.019	0.074	1.000
Influence 2010		0.138*	0.087	0.188**	-0.106	0.020

Significance levels: * p<0.1 **; p<0.05

TABLE 4
Estimation Result for Influence network in 2007 & 2010

DL attributes	Parameters	Panel 1		Panel 2	
		Estimates 2007	Estimates 2010	Estimates 2007	Estimates 2010
General DL	Density	-2.5363 (0.1556)*	-3.2093 (0.1793)*	-2.5788 (0.1638)*	-3.1378 (0.2736)*
	2-in-star	0.2043 (0.0221)*	0.2656 (0.0157)*	0.1027 (0.0478)*	0.2939 (0.0531)*
Restricted exchange	Reciprocity	0.1151 (0.5152)	0.8267 (0.4085)*	0.0518 (0.5308)	1.1756 (0.5010)*
Generalized exchange	Transitivity	0.0600 (0.0243)*	-0.0244 (0.1166)	0.1483 (0.0244)*	-0.0359 (0.0523)
	Cycle	-0.2091 (0.1034)*	-0.04601 (0.0488)	-0.1695 (0.0144)*	0.0508 (0.2002)
Context	Status interaction			-0.0100 (0.5014)	0.3164 (0.0915)*
	Status reciprocity			-0.1783 (0.1369)	0.5261 (0.1555)*
	Manager interaction			1.3601 (1.0806)	0.3835 (0.1766)*
	Manager reciprocity			-1.8845 (1.6478)	0.9666 (0.0174)*
Controls	Tenure interaction			0.3392 (0.0603)*	0.3173 (0.1212)*
	Tenure reciprocity			1.9218 (1.0060)	-2.1627 (1.3851)
	Gender interaction			-0.0079 (0.3038)	0.4675 (0.4868)
	Gender reciprocity			0.3122 (0.3578)	0.7411 (0.8787)

Notes:
*Following convention, a parameter is deemed significant if its parameter estimate equals at least twice its standard error (Robins et al., 2007).
Standard errors are given in parentheses.
t-ratio = ([observation - sample mean]/standard error). The convergence t-ratios for all modelled effects were less than 0.1, suggesting that the models show a good fit to the data.
Controls were included in the models as covariate effects, none were significant with corresponding t-ratios all <0.1.