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STRINGS OF TRAITORS: SOCIAL NETWORKS
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DEPARTMENT OF POLITICAL SCIENCE

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Abstract

How do social networks shape the development and trajectory of militant organizations and revolutionary parties engaged in the process of establishing political order through violence? I argue that the topology of social networks becomes key to understanding how the complex web of interpersonal relationships shapes identities, interests, and collective action in the context of conflict, revolution, and state formation. Using a dataset of Khmer Rouge personnel from Democratic Kampuchea's Southwest Zone, I examine mechanisms of network formation and contagion, maintaining that network structure matters a great deal to the success or failure of militant organizations as they transition into governing roles. I contend that networks are the result of mechanisms of attraction based on shared attributes, also referred to as homophily, and self-organization that relate to network topology itself. As a consequence, these mechanisms influence the formation of networks on which informal institutions are built, violence spreads, and organizational resilience emerges. Thus, the articles presented in this dissertation are guided by three respective questions that relate back to this broader puzzle. First, what leads to the emergence of informal institutions? Second, why are some individuals purged while others survive during times of revolution? Third, why are some organizations resilient while others are not?

The first article provides a detailed description of the social networks present in the Southwest Zone. In this chapter, I present a map of the topological features of the network to analyze the social structures that existed beneath the formal institutional structures of the Khmer Rouge. The second article turns to the emergence of informal institutions, such as patron-client relations, using a relational approach that relies on social network analysis to explain how endogenous dependencies influence the formation of networks within revolutionary

organizations. Using an exponential random graph model, I examine the entangled nature of homophily and different self-organizing processes driven by network topology to better understand the complex nature of network formation that lies beneath informal institutions.

The third article focuses on the consequences of individual network position during violent political purges, such as those that tore through the ranks of the Khmer Rouge, resulting in the arrest and execution of nearly 63% of the personnel in the Southwest Zone. With the help of a network autocorrelation model, I examine the influence of network position and exposure to violence on an individual's likelihood of becoming a victim of a purge. Finally, in the fourth article, I investigate the sources of organizational resilience in the Khmer Rouge with a longitudinal network that the stability of relations in the Southwest Zone during forty-eight months of communist rule. After conducting a series of checks to confirm that the network is indeed robust across time, I then use a temporal exponential random graph model to examine how the mechanisms of embeddedness and cohesion each contribute to the development of resilient networks within the organization, demonstrating the stability of ties over time.

Together, the articles presented in this dissertation represent a significant advance in our understanding of the internal dynamics of militant organizations and revolutionary parties and how social structure influences their ability to successfully build states. In providing a rare look inside the Khmer Rouge, these articles examine the social networks within a militant organization in detail. Moving beyond a longstanding recognition that networks play an important function for organizations engaged in insurgency, terrorism, crime, and state building, this study offers the first known mapping of interpersonal relationships among personnel inside a militant organization turned revolutionary party. Going even further, the articles in this dissertation also extend the analysis of social networks to include tests of hypothesis related to

network formation and contagion in order to draw causal inferences related to organizational fragility and resilience. The resulting picture reveals that would-be state builders often face numerous paradoxes that emerge out of the contradiction found between social structure and formal institutional goals, which, in turn, influence organizational performance.

Chapter 1: Introduction

Ban would not have been considered a monster. Neither would most of the men and women who joined the Khmer Rouge. They were ordinary people whose lives could be described as time spent with family, hard work, and hope that someday they might end up better off than where they started. Ban was born in Takeo province in Cambodia's southwest region to a family of farmers as the second oldest of ten siblings. He grew up to earn a primary education and became a teacher at a secondary school. In July 1970, seeking comradery and a better country, Ban joined a clandestine organization that promised to bring dramatic change to Cambodia through a communist revolution. A year later he became an official member of the youth league, having been introduced by his friends. Shortly thereafter, Ban became a full-rights member of the Communist Party of Kampuchea, also known as the Khmer Rouge, something he claimed pride in achieving. Ban soon found himself working at Office S-71, which provided logistical support to the top-level Party offices, including those of the powerful Standing Committee of the Central Committee led by Pol Pot. It was while working there that Ban met his wife, Yort, who had also joined the revolution. Ban's siblings soon followed their older brother into the Khmer Rouge (Biographic Database 2019).

Ban's experience as a member of the Khmer Rouge was far from atypical. Throughout Cambodia in the years leading up to the communist takeover in April 1975, thousands of men and women joined the Khmer Rouge. Like Ban, their journeys reflect a simple truth about conflict and revolution, namely that no one participates alone. Rather, the stories of individuals from hundreds of villages all point to the enduring interconnected nature of politics. The frequency with which members of the Khmer Rouge referred to relationships as the defining feature of the organization suggest that networks played a prominent role in its ability to govern.

This raises an important question. Given the relational nature of the revolutionary experience, how do social networks shape the development and trajectory of militant organizations and revolutionary parties engaged in the process of establishing political order through violence? In particular, the articles presented in this dissertation are guided by three respective questions that relate back to this broader question. First, what leads to the emergence of informal institutions? Second, why are some individuals purged while others survive during times of revolution? Third, why are some organizations resilient while others are not? In short, I contend that the answer to each of these questions lies in the networks that form the invisible backbone of militant organizations and revolutionary parties.

1.1. Existing Research

Previous approaches to the study of civil war, revolution, political violence, and state formation have each highlighted the importance of interpersonal networks as key factors related to success or failure in the effort to establish political order. For example, existing theories of political violence have pointed to the role of prewar social relations in facilitating mobilization and the spread of violence, emphasizing the instrumental nature of killing (Hinton 2005; Fujii 2009; Kopstein and Wittenberg 2011; Su 2011; Braun 2016; Finkel 2017). Similarly, research on militant organizations has noted the importance of interpersonal networks as a significant factor in the creation of group longevity and survival (Wickham-Crowley 1992; Petersen 2001; Wood 2003; Sinno 2008; Mampilly 2011; Christia 2012; Parkinson 2013; Staniland 2014; Parkinson and Zaks 2018). The literature on state formation has shown that attempts to establish political order frequently lead to gaps in formal institutional structures that are filled via informal means (Tsai 2006; Helmke and Levitsky 2006; Tsai 2007). As a consequence of notable shortcomings in institutional capacity, militant organizations and revolutionary parties rely on social networks

to compliment or substitute for formal structures (Urban 1989; Willerton 1992; Easter 2000; Hillman 2014).

Although much of the existing literature points to the importance of networks to the process of fighting, survival, victory, and establishing order, there have been few attempts to take up the challenge of examining the underlying networks within militant organizations or revolutionary parties in detail. Moreover, the current frontier of research on militant organizations and revolutionary parties has benefited from both a micro-level turn in studying conflict and an organizational turn in examining the groups themselves (Kalyvas 2006; Parkinson and Zaks 2018). Beginning with the groundbreaking work of Kalyvas (2006), the study of conflict has benefited from a micro-level turn that focuses on individuals. This ambitious research agenda has resulted in a number of important advancements in our knowledge of mobilization for collective action (Lichbach 1994; Goodwin 2001; Petersen 2001; Wood 2003; Balcells 2017), the formation of groups (Grossman 1991; Staniland 2014), the instrumental use of violence (Kalyvas 2006; Fujii 2009), inter and intra-group competition (Fjelde and Nilsson 2012; Staniland 2012), and internal dynamics of militant organizations and revolutionary parties (Wickham-Crowley 1992; Petersen 2001; Wood 2003; Weinstein 2007; Humphreys and Weinstein 2008; Sinno 2008; Mampilly 2011; Christia 2012; Parkinson 2013; Staniland 2014; Parkinson and Zaks 2018).

Secondly, the study of militant organizations and revolutionary parties has been enriched by an organizational turn that focuses on the organizations themselves as important units of analysis (Wood 2003; Sinno 2008; Mampilly 2011; Christia 2012; Parkinson 2013; Staniland 2014; Parkinson and Zaks 2018). This literature has approached the investigation of militant organizations and revolutionary parties through an organizational sociological framework that

defines organizations as a system of roles and relations (Parkinson and Zaks 2018). In response to these trends, this dissertation represents an opportunity to further expand this research boundary to include an examination of the social networks that exist within militant organizations and revolutionary parties using empirical examples.

1.2. A Network Approach to Understanding Revolutionary Organizations

In order to extend the analysis beyond existing explanations of the micro-politics of militant organizations in post-conflict and revolutionary settings, I turn to a different perspective that is rooted in the interdisciplinary study of social networks. A network can be defined as a collection of relationships, identified using graph theory and data visualization to draw the nodes and edges with individuals representing each node and the edges the connections between them (Kadushin 2012). A network approach is based on the fundamental assumption that relationships matter. As a phenomenon of interest to social scientists, politics is particularly well suited for study from a network perspective given its inherently relational nature. Political actors and actions cannot be properly considered in isolation apart from the social context defined by relationships in which they exist (Emirbayer 1997).

Four additional assumptions follow the conclusion that relationships are key to understanding revolutionary organizations from a network perspective. First, while traditional approaches assume the independence of observations, a network perspective assumes the opposite. Actors and actions are considered in terms of their interaction with one another in the context of interdependent networks (Wasserman and Faust 1994). Second, relationships, or ties, between actors function as conduits through which various phenomena move across a network (Wasserman and Faust 1994). Interpersonal relationships create natural pathways for information, resources, and other phenomena, such as violence, to move through a network. A

third and closely related assumption holds that networks have both a constraining and enabling effect on actors (Wellman 1988). Relationships present opportunities and obstacles for actors. In the context of networks, individual positions are not equally advantaged in access to information and resources with some actors enjoying immense privilege and others suffering from poverty. Fourth, patterns of relationships among actors represent social networks (Wasserman and Faust 1994). Knoke (1990) observes that the study of politics is essentially the study of roles occupied by actors and the ties between them.

1.3. The Central Argument

In this dissertation, I critically examine mechanisms of network formation and spreading, arguing that network structure matters a great deal to the development and trajectory of militant organizations as they transition into governing roles. Specifically, organizations face the challenge of balancing security and efficiency, and how they solve this dilemma is reflected in their underlying social networks. Individual attributes such as gender, ethnicity, occupational background, official positions, or length of time in an organization offer a partial explanation for the behavior and performance of militant organizations and revolutionary parties. Given the fact that individuals do not exist in isolation but are embedded in a broader social context, the topology of these networks becomes key to understanding how the complex web of interpersonal relationships shapes identities, interests, and collective action. In response, I contend that networks are the result of mechanisms of attraction based on shared attributes, also referred to as homophily, and self-organization that relate to the network topology itself. As a consequence, these mechanisms influence the formation of networks on which informal institutions are built, violence spreads, and organizational resilience emerges.

Moreover, this dissertation offers several contributions to comparative politics and international relations through the adoption of a relational perspective informed by network analysis. First, the articles presented in this dissertation provide new insight into the development of informal institutions that play a critical role in regime consolidation. This study attempts to enrich the existing literature by examining an empirical network to provide a formal test for a relational explanation of the emergence of these unofficial and sometimes invisible ways of accomplishing objectives that often exert significant influence on the development and trajectory of militant organizations and revolutionary parties. Second, this dissertation adds to our understanding of the micro-level processes that affect the spread of political violence. By examining political violence as a relational phenomenon, I highlight the way interpersonal relationships offer both costs and benefits during times of high-risk activity. Rather than focusing on individual motivation, a network approach casts political violence in a relational light to reveal the interdependent nature of violent acts. Third, the articles also offer a new approach to consider the long-recognized importance of interpersonal networks to the performance of militant organizations and revolutionary parties, particularly in the context of state formation. Using detailed archival data, I am able to map out the social networks, presenting a never-before-seen look at the social structure behind one of history's most notorious organizations, the Khmer Rouge. Together, these insights add to our knowledge of the internal dynamics of militant organizations and revolutionary parties with a new level of detail that promises to better our understanding of the processes of conflict, civil war, and revolution.

1.4. Case selection

The articles submitted in the chapters that follow focus on Cambodia's Southwest Zone, which was one of six major administrative zones created by the Khmer Rouge. The choice to

focus on the Southwest Zone as an ideal case is, in part, motivated by the central role that the zone's personnel played in the Khmer Rouge regime as well as the zone's prominent reliance on patron-client networks (Hinton 2005; Mertha 2014). Following the fall of Phnom Penh in April 1975, the Khmer Rouge divided the country into six administrative units each headed by a powerful zone secretary who was responsible for day-to-day operations. The Southwest Zone consisted of regions 13, 33, 35, and 25, and was home to the 703rd Division of the military (Nhean 2010). The Southwest Zone also benefited from access to the coast, fertile soil, and plenty of water, making it an ideal location for rice production and a stronghold of Khmer Rouge activity early in the struggle against the government and throughout the Democratic Kampuchea era (Kiernan 2002; Ea 2004; Hinton 2005).

The Southwest Zone was led by Zone Secretary Mok, sometimes referred to as Chhit Chhoeun or Grandfather Mok. Also known as Brother No. 5 and "the Butcher," Mok was one of the top military commanders in the Khmer Rouge and a ruthless zone secretary who is remembered for successfully installing his relatives and friends in an extensive patron-client network throughout the zone (Hinton 2005; Mertha 2014). Mok, however, was not alone in seeking to build patron-client networks within the Southwest Zone. Historically, patron-client networks represented an organizing feature of political life in Cambodia, creating an informal system that reinforced authority and helped maintain an effective command structure by demanding loyalty in exchange for protection (Hinton 2005). Patron-client networks provided clients with security and access to resources while patrons received loyalty and support from their base (Hinton 2005; Nhean 2010). The power dynamics, however, were far from equal. Patrons often enjoyed positions of power that made clients dependent on them for security and resources and imposed heavy costs on individuals who attempted to switch patrons (Hinton

2005; Hicken 2011). Under this system, patron-client networks resembled "lines" or "strings" that joined individuals together in a complex web of relationships inside the regime (Chandler 1999; Hinton 2005).

Under Mok's leadership, the Southwest Zone also became well-known for its harsh but effective administration, earning recognition from the Party Center as an exemplary role model for other zones to follow (Kiernan 2002; Ea 2004; Nhean 2010). Given its favor with the Party Center, the Southwest Zone provided an important source of military manpower in the effort to consolidate power. Cadres under Mok's leadership were used repeatedly to forcefully remove and replace personnel in other zones as the Central Committee moved to eliminate potential rivals and build alternative patron-client networks within the party (Kiernan 2002; Ea 2004; Hinton 2005; Mertha 2014). For these reasons, the Southwest Zone under the Khmer Rouge represents an ideal case with which to study the social networks within an armed revolutionary organization in an effort to better understand how interpersonal relationships influence the development and trajectory of organizations engaged in state building.

1.5. Methods

The analysis presented in the empirical chapters relies on the use of social network analysis. Network analysis offers a solution to the problem of interdependence of observations found in relational data. Standard statistical models operate on the assumption of independent and identically distributed (i.i.d) random variables. This i.i.d. assumption, however, implies that observations can be equally replaced with any randomly selected sample and that such an exchange would not impact the inferences drawn from the data. Stated differently, traditional statistical models often operate under the assumption that observations have no influence on each other (Cranmer, Desmarais, and Menninga 2012). The inherently relational nature of social

network data, however, explicitly violate this assumption due to the recognized interdependence of observations and autocorrelation of error terms (Cranmer, Heinrich, and Desmarais 2014).

Social network analysis provides a systematic approach to the study of relationships between actors. This requires first mapping out the social networks that exist within the Southwest Zone of the Khmer Rouge in order to provide a clear picture of the underlying social structure on which the organization operated. In order to make inferences about causal mechanisms, however, a network map must be supported by the statistical analysis of social networks using models specifically designed to properly handle the interdependence of observations.

In the articles below, I adopt two classes of models for this task, namely exponential random graph models and network autocorrelation models. Exponential random graph models treat the network itself as the dependent variable to explain the formation of an observed network. This class of models can be used to predict the likelihood of tie formation, enabling the modeling of network topology as the product of endogenous mechanisms of self-organizations and exogenous node attributes (Lusher, Koskinen, and Robins 2013). In an extension of the standard exponential random graph model, I also use a temporal exponential random graph model to examine the stability of the network across time. The temporal exponential random graph model adds inter-temporal dependencies to longitudinal models that allow for the estimation of the effect of previous ties on subsequent realizations of the network (Leifeld, Cranmer, and Desmarais 2018). This, in turn, opens the door to understanding network dynamics across time.

Second, I use network autocorrelation models to understand the effect that individual network position and exposure might have on the likelihood of becoming a purge victim.

Network autocorrelation models represent a class of models that account for the interdependencies among actors and are specifically designed to deal with the issue of network autocorrelation in regression analysis (Ord 1975; Doreian 1980; Doreian et al. 1984; Ibarra and Andrews 1993; Franzese and Hays 2007; Franzese, et al. 2012; Hadden and Jasny 2017). I use this class of models to consider how violence spreads similar to a contagion across a network.

The methodological approach taken in this dissertation is designed to facilitate inferential analysis of social network data. Importantly, the models used in each of the chapters gives proper consideration to the interdependent nature of relation data so often discussed in conceptual terms in political science but rarely tested. Through the use of exponential random graph modeling and network autocorrelation models, I test several hypotheses related to network formation and contagion across networks in order to gain additional insight into the internal dynamics of militant organizations and revolutionary parties.

1.6. Data

This dissertation relies data gathered from the digital archives of the Documentation Center of Cambodia, which hold the biographical records of more than 30,000 Khmer Rouge officials down to the district level. Founded in 1995 as a non-profit organization dedicated to preserving the historical legacy of the Khmer Rouge period, the Documentation Center of Cambodia is supported by the Royal Government of Cambodia and the United States of America with a mission of educating the public, memorializing victims, and working to preventing genocide with lessons learned from the Cambodian context (Documentation Center of Cambodia 2019). The Biographic Database provides an online digital archive of Khmer Rouge personnel with information about each individual's name, alias, sex, age, place of birth, place of death, education, job before 1975, party membership, geographic area during the Democratic

Kampuchea era, agency or employer 1975-1979, office or subdivision 1975-1979, arrest record, execution record, and date of execution. Individuals fall into four broad categories in the Khmer Rouge, including military, administrative, labor, and political roles.

In addition to specific details about individual members of the regime, the Biographical Database contains information about personal relationships that existed among Khmer Rouge personnel, including parents, siblings, extended family, friends, superiors, subordinates, and other affiliations. These ties represent regular face-to-face contacts that occurred between officials and their immediate associates. The resulting data are organized into three datasets, a cross-sectional network of all individuals associated with members of the Southwest Zone, a cross-sectional network of Southwest Zone personnel, and a longitudinal network of Southwest Zone personnel that tracks the evolution of the network across the forty-eight months in which the Khmer Rouge ruled Cambodia. Using this data, I then reconstruct the social networks of Khmer Rouge personnel in the Southwest Zone for further analysis.

1.7. Organization and Scope

To present the findings and analysis, I put forward a collection of four standalone articles connected by the theme of networks within revolutionary organizations. Beginning with an examination of the extended social networks in the Southwest Zone, I then shift the focus of the dissertation to intra-organizational networks in order to test a series of hypotheses related to network formation and the effect of network structure on internal regime dynamics. The chapters are organized as follows. Chapter 2 provides a detailed description of the social networks present in the Southwest Zone. In this chapter, I present a map of the topological features of the network to analyze the social structures that existed beneath the formal institutional structures of the Khmer Rouge.

Chapter 3 turns to the emergence of informal institutions, such as patron-client relations, using a relational approach that relies on social network analysis to explain how endogenous dependencies influence the formation of networks within revolutionary organizations. Using an exponential random graph model, I examine the entangled nature of homophily and different self-organizing processes driven by network topology to better understand the complex nature of network formation that lies beneath informal institutions.

In Chapter 4, I move to focus on the consequences of individual network position during violent political purges, such as those that tore through the ranks of the Khmer Rouge, resulting in the arrest and execution of nearly 63% of the personnel in the Southwest Zone. With the help of a network autocorrelation model, I examine the influence of network position and exposure to violence on an individual's likelihood of becoming a victim of a purge.

Chapter 5 investigates the sources of organizational resilience in the Khmer Rouge with a longitudinal network that records the evolution of relations in the Southwest Zone during the forty-eight months of communist rule. After conducting a series of checks to see if the network is indeed robust across time, I then use a temporal exponential random graph model to examine how the mechanisms of embeddedness and cohesion each contribute to the development of resilient networks within the organization, demonstrating the stability of ties over time.

Chapter 6 concludes the dissertation with a brief review of the main findings and their implications for the study of organizations engaged in internal conflict and state formation. The results of the dissertation point toward the critical nature of social networks as the backbone of militant organizations and revolutionary parties. The chapter also includes a discussion of recommendations for future research.

Finally, this dissertation is limited in scope to the networks among personnel within the Khmer Rouge administration in Cambodia's Southwest Zone between 1975-1979. The choice to focus on this narrow aspect of the broader social structure was driven, in part, by the need to define a clear network boundary to facilitate the analysis. A second factor in the choice to concentrate on intra-organizational networks was the availability of data preserved in the historical record. Complete information is available primarily for individuals who actually joined and served in the Khmer Rouge while additional details on their extended networks outside the organization are sparse at best and non-existent at worse. In the chapters that follow, I provide a detailed examination of the social networks inside the Khmer Rouge in order to generate new insight into the internal dynamics of militant organizations and revolutionary parties.

Chapter 2: Network Structure and Communities in the Khmer Rouge, 1975-1979

Abstract

Militant organizations making the transition from clandestine insurgencies to rebel groups to full-fledged revolutionaries are situated in a broader social context that poses the challenge of how best to establish security and efficiency. This paper examines how individuals attempt to solve this dilemma by analyzing a large network including 4,701 Khmer Rouge officials and their immediate relations in more than 400 identifiable social groups who governed the Southwest Zone of Democratic Kampuchea between 1975-1979. Creating a unique map of the social networks of the Southwest Zone, the analysis reveals a social structure characterized by decentralized clusters joined through key brokerage roles that enable strong within-group ties while simultaneously increasing connectivity across a sparse network. These network structures highlight the tendency for militant organizations to lean heavily on internal social networks in which a relatively few number of brokers occupy positions of significant influence despite holding lower-level positions within the formal organization.

2.1. Introduction

The transition from rebellion to governing regime involves organizational compromise. In particular, the problem of how organizations balance security and efficiency during a period of vulnerability represents a significant challenge for groups engaged in conflict and state building (Morselli, Giguère, and Petit 2007; DellaPosta 2016). For members of revolutionary organizations, security depends on strong within-group relationships that create trust through regular interactions with known actors (Granovetter 1985; Lichbach 1998). Within-group ties, however, come with a cost as closed relationships limit an organization's ability to coordinate action, resources, and communications (Lindelauf, Borm, and Hamers 2011; DellaPosta 2016; Ouellet, Bouchard, and Charette 2018). At the same time, high levels of connectivity needed for efficiency pose the danger of damage spreading rapidly through the organization (Granovetter 1985; Papachristos, Braga, and Hureau 2012).

Although existing research has examined how organizations attempt to solve the challenge of balancing security and efficiency in the context of criminal conspiracies, clandestine organizations, and organized crime (Morselli et al. 2007; DellaPosta 2016; Ouellet et al. 2018), this approach can be extended to build a better understanding of the social structures on which revolutionary organizations are built. This paper provides new insight into the dilemma facing militant organizations engaged in the process of state formation, particularly how social networks reflect a compromise between security and efficiency. Using archival material made available through the Documentation Center of Cambodia (DCCAM), which contains detailed biographical data on more than 30,000 Khmer Rouge leaders down to the district level, I reconstruct the social networks of Khmer Rouge officials located in the Southwest Zone and present a never-before-seen map of the social structure that existed within the regime.

The resulting analysis reveals a social structure defined by network closure and brokerage positions that favor security while simultaneously enabling a level of efficiency across a sparse network. Using a community detection algorithm to calculate network modularity, I find a social structure beneath the Khmer Rouge defined by decentralized clusters joined together at critical points through brokerage roles that enabled strong within-group ties while simultaneously increasing connectivity across a sparse network. These features of network topology highlight the fact that militant organizations are built on social networks that connect individuals within the organization to a broader social context.

The remainder of this paper proceeds as follows. In the next section, I present an outline of the theoretical framework used to explain how organizations balance the dilemma of security versus efficiency. The third section then briefly surveys the historical background and formal organizational structure of the Khmer Rouge. The fourth section turns to a description of the Southwest Zone followed by a discussion of the broader social context in Khmer Rouge era Cambodia, which was characterized by patron-client relations before, during, and after the period of communist rule. The sixth section introduces a dataset of biographical information used to reconstruct the social networks of Khmer Rouge personnel. In the seventh section, I map the social networks of the Khmer Rouge in the Southwest Zone and examine the social structures present that facilitate security and efficiency. A final section concludes with a summary of the main findings and implications for future research.

2.2. Security and Efficiency in Revolutionary Organizations

Parkinson and Zaks (2018) define organizations as "collections of roles, linked by relations, which produce behaviors, to work toward goals within a given context" (272). In the context of rebellion and revolution, this definition applies to armed groups attempting to

establish a new regime. Like other types of clandestine organizations, revolutionary organizations face the problem of how to maintain security against both internal and external threats (Crenshaw 1992; Lichbach 1998; Ouellet et al. 2018). As a result, members of these organizations often form cohesive sub-groups for protection against attacks, gain a sense of solidarity, and create insurance against defection (Lichbach 1998; Hafez 2003; Della Porta 2013; Ouellet et al. 2018). Such cohesion emerges from regular interactions along social networks that often lie beneath the surface of revolutionary organizations (Parkinson 2013; Staniland 2014). These networks provide informal pathways to accomplish objectives and give the organization a great deal of flexibility while also increasing security for members of the organization (Parkinson 2013).

The advantages and disadvantages of strong within-group ties become clear when viewed in the context of conflict, rebellion, and revolution. Periods of high-risk activity often occur in poor information environments, which means that members of clandestine organizations will seek to find ways to improve their ability to predict the behavior of others. Within-group ties produce clear group boundaries, which leave individuals with fewer demands for loyalty and enable groups to persist over time (Ouellet et al. 2018). In contrast, cross-factional ties can leave individuals with multiple demands for allegiance from competing factions, creating uncertainty and intensifying the likelihood of conflict or fragmentation (Staniland 2014). While strong within-group ties offer several advantages, network closure comes at a cost for members of an organization. Closure limits the ability of members of an organization to expand their network to find partners they can trust. This is particularly important in the area of recruitment, because closure restricts the number of potential recruits available to an organization (Ouellet et al. 2018). Ironically, even though closure might minimize external threats, it can increase the risk of

internal threats through dense connections in a small area of the network. In the end, security concerns often outweigh the drawbacks of cohesive within-group relationships in the interest of survival.

Clandestine networks, however, cannot remain completely closed to the outside world. The simple fact that insurgents, rebels, and revolutionaries are embedded in a wider social context means that networks also need a certain amount of connectivity in order to operate efficiently (DellaPosta 2016; Ouellet et al. 2018). Coordination and communication rely on the ability to reach across the network (Burt 1992; Kadushin 2012). Recruitment of new members requires ties to local communities outside the organization (Ouellet et al. 2018). Revolutionary organizations can achieve this objective through the presence of brokerage roles in the network (Parkinson 2013). Members of the organization can remain dispersed across different hubs joined by brokerage positions that bridge different parts of the network, helping solve the problem of organizational efficiency while minimizing the risk of connectivity (Granovetter 1973; Parkinson 2013).

Accordingly, we can expect the social networks within revolutionary organizations to display a tendency toward closure in which within-group relations are privileged over between-group ties. The resulting social structure should demonstrate a bias toward the formation of distinct but decentralized groups joined together through brokerage positions at key points. This social structure facilitates a balance between efficiency and security. The purpose of this paper is to describe and examine the social networks that exist within revolutionary organizations in an effort to better understand the compromise between security and efficiency.

2.3. The Khmer Rouge and Democratic Kampuchea, 1975-1979

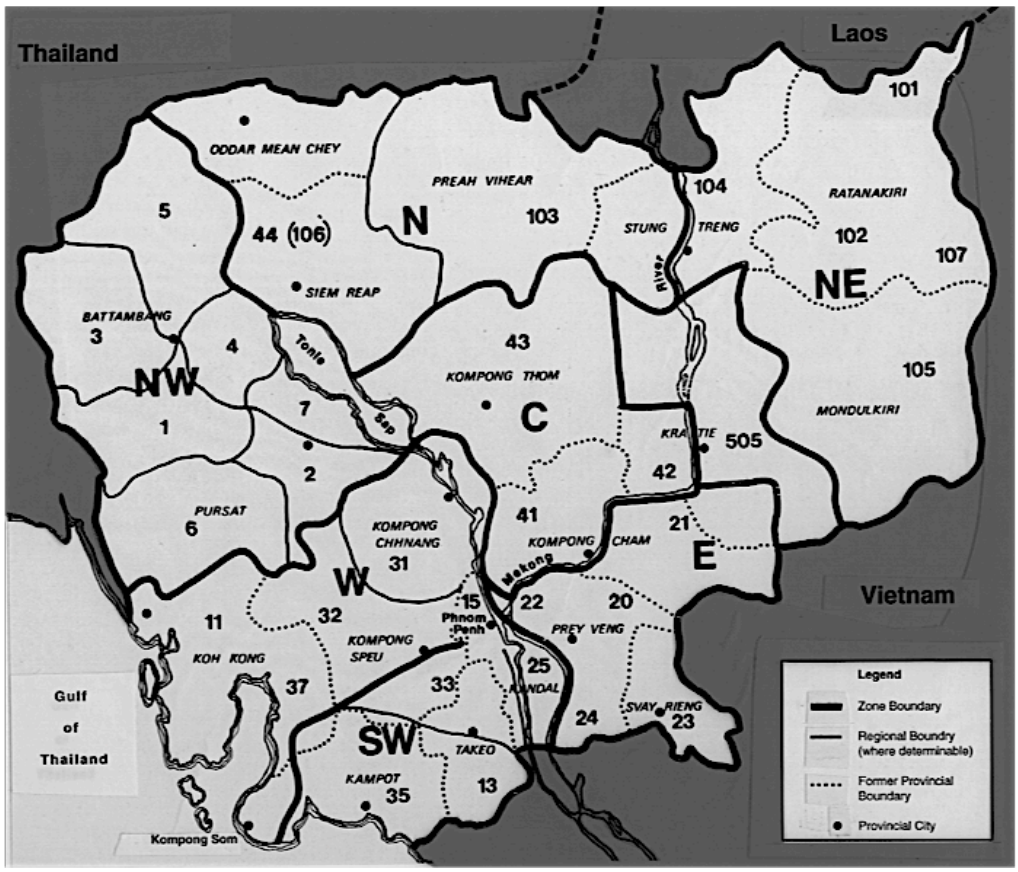
After decades of armed conflict, the Communist Party of Kampuchea (CPK), better known as the Khmer Rouge, seized control of Cambodia on April 17, 1975 with the fall of Phnom Penh to communist forces. As an organization, the CPK was officially structured hierarchically along the lines of a Leninist revolutionary party. Euphemistically, the formal institutional structure of the CPK was referred to as the *Angkar*, which means "the Organization." Pol Pot and his closest associates led the Party Center, which was also known as the *Angkar Loeu* or "Upper Organization" (Chandler 1999). As in other communist systems, the *Angkar* was meant to be all encompassing of every level of society, politics, economics, and culture. A popular Khmer Rouge slogan said the "Angkar has [the many] eyes of the pineapple," which illustrates the lengths to which the CPK leadership sought to give the party panopticon-like status in the eyes of the people (Locard 2004, 112). The Party's existence and legitimacy became synonymous with the state, meaning that any deviation from the party line would be treated as matter of life and death (Hinton 2005).

The *Angkar* was directed from the top through the Central Committee of the CPK. According to surviving historical records, the Central Committee contained of as many as 175 members in total. Commanded by Pol Pot, the Standing Committee wielded ultimate power within the Central Committee of the CPK. The Standing Committee consisted of a tight-knit group of associates who had forged close ties to Pol Pot, including Nuon Chea, Son Sen, Mok, Ieng Sary, Khieu Samphan, Ke Pauk, and Yun Yat. At different times, various zone secretaries also sat in on the Standing Committee as reserve or candidate members who were allowed to take part in meetings but lacked the decision-making authority of full rights members (Mertha 2014). A second key part of the Party's formal apparatus was the Youth League, or *Yuvakak*,

which was responsible for recruiting, indoctrinating, and training young people into the revolution. Recruits were vetted through a multi-step process that included questioning, indoctrination, observation, and training before being granted official membership. Like mafia or gang membership, joining the revolution meant individuals were members until death. Disobeying orders, refusing promotion, or resignation from one's position were likely to end in arrest and execution (Nhean 2010).

Faced with the task of now governing the entire country, the Khmer Rouge reorganized DK into six administrative zones, North, Northeast, Northwest, East, Southwest, and West, Additional administrative units included the Center and the Kratie, Siem-Riep/Uddor Meanchey, and the Preah Vihear autonomous sectors, which were created in 1977. Each zone was further divided into regions, districts, sub-districts, communes, and villages. Zones were designed to erase traditional geographic boundaries and given a unique identifying number. North Zone (303) was divided into regions 41, 42, and 43. Northeast Zone (108) encompassed regions 101, 102, 104, 105, 107, and 505 (later turned into the Kratie autonomous sector). Northwest Zone (560) was given regions 1, 2, 3, 4, 5, 6, and 7. Eastern Zone (203) included regions 20, 21, 22, 23, and 24 Southwest Zone (405) controlled regions 13, 33, 35, and 25. West Zone (401) was divided into regions, 31, 32, 37, 15, and 11 (Documentation Center of Cambodia 2007). A zone committee administered each zone together with zone based military units. Military divisions included Division 1 in the Northwest Zone, Divisions 2, 11, 12, and 117 in the North Zone, Divisions 3, 4, 5, and 170 in the East, Division 703 in the Southwest, and Division 174 in the Center Zone with additional divisions based in autonomous sectors under the supervision of the Center (Short 2004; Ea 2004; Mertha, 2014).

Figure 2.1. Map of Democratic Kampuchea, 1975-1979 (Mertha 2014)



Zone secretaries maintained powerful positions within their respective geographic areas and were given positions on the Central Committee. With a degree of autonomy, zone secretaries were responsible for decision-making and issuing orders, which were then passed on to lower levels of administration for implementation. A three-person committee modeled on the upper party structure ran lower levels of administration, including the regional, district, and commune levels (Jackson 1989; Ea 2004; Mertha 2014).

2.4. The Southwest Zone

The Southwest Zone, which was controlled by Zone Secretary Mok, also known as Chhit Chhoeun. Mok, sometimes referred to as Ta Mok or Grandfather Mok, had earned the nickname "the Butcher" while serving as one of the top military commanders of the Khmer Rouge forces

and was a member of the powerful Standing Committee of the Central Committee (Kiernan 2002; Ea 2004). Under his leadership, the Southwest Zone had become a major base of operations for Khmer Rouge activity. The Southwest Zone was situated in a geographically advantageous position with fertile soil, ample water, and access to the coast. Administratively, the Southwest Zone consisted of four regions, and of these divisions, Region 13 was considered the most important as the ancestral home of Mok and an example of the ideal communist administration (Kiernan 2002; Ea 2004; Nhean 2010). In fact, on June 30, 1977, the official magazine of the CPK, *Revolutionary Flags*, or *Tung Padevat*, announced Region 13 as one of three regions awarded an Honorary Red Flag for its "exemplary" service as a "role model" in the "defense, continuation, and construction of the socialist revolution" (Documentation Center of Cambodia). The Southwest Zone also represented an important source of manpower in the Party Center's efforts to consolidate power over the country after April 1975 (Ea 2004). For instance, the Central Committee used Southwest Zone cadres as a primary tool for the removal and replacement of rival factions in other zones, including the North, Northwest, and Eastern Zones (Kiernan 2002; Ea 2004; Hinton 2005).

2.5. Patron-client Relations Under the Khmer Rouge

In addition to the formal institutional structures of the Party, the CPK was also characterized by strong informal institutions in terms of patron-client networks that were prominently visible in the Southwest Zone. Within the Khmer Rouge regime, patron-client relations appear to have thrived alongside the formal, impersonal legal structures of the CPK. Nhean (2010) argues that nearly every cadre was part of a patron-client system that helped reinforce respect for authority and maintained an effective command structure. Even though massive social and administrative upheaval was taking place, patron-client ties influenced

behavior at every level. Individuals often approached their work in military, administrative, labor, and political roles as part of a patron-client network, which recast official governmental duties as "personalized patron-client exchanges rather than as a formal state system" (Nhean 2010, 6).

This was due, in part, to the fact that one of the most enduring features of Cambodian politics before, during, and after the DK era has been the existence of patron-client networks. During the DK era, many Cambodians sought out powerful patrons in order to gain protection and access to resources while clients gave their support and loyalty to patrons (Hinton 2005). Patron-client networks were often referred to as "lines" or "strings" (*khsae*) to describe the webs of relations that joined individuals in kinship and exchange networks. These "strings," or networks, however, did not exist in isolation. They were connected to other "strings" of higher-ranking officials in an increasing complex network of relationships (Chandler 1999, 89; Hinton 2005, 109).

Traditionally, this system of patron-client networks provided clients with protection as well as access to opportunities while patrons received support and loyalty from their base (Hinton 2005; Nhean 2010). Patron-client relations, however, were unequal, personal, and dynamic (Scott 1972; Hicken 2011). Patrons occupied a position of power and access to resources that could not be matched by their clients, making the clients somewhat dependent on the patron. Patrons also knew that clients could choose to switch their loyalty to a different patron even if such a move proved costly (Hinton 2005; Hicken 2011).

Throughout Cambodian history and especially during the DK era, patron-client relations were marked by "suspicion and distrust" (Hinton 2005, 124). Clients who began to be seen as a patron in their own right, gaining his or her own clients, were viewed as a potential rival or even

a traitor in the eyes of their former patron. At the same time, much of the maintenance of patron-client relations fell to patrons who often attempted to prevent defection and disloyalty through incentives and coercion. The instability inherent in such a system led to the absence of lasting institutions outside of kinship and an environment of paranoia and suspicion (Hinton 2005).

Zone secretaries also functioned as the head patron of their zone. Subordinates were hand-picked by zone secretary and being in the patron's circle offered protection as a client. Cliques were common and often placed priority on kinship relations in order to deal with people who could be trusted. A hardened veteran of the struggle against French colonialism and the republic, Mok was also well known for building patronage networks within the institutional apparatus of the CPK. As Southwest Zone Secretary, he installed family members, including children, siblings, and in-laws, in key positions within the military, administrative, and political structures of the CPK (Kiernan 2002; Hinton 2005; Mertha 2014).

Furthermore, the decentralized nature of its campaign to seize control of the government meant that the CPK faced the complicated task of consolidating power and governing a war-torn country while simultaneously dealing with multiple factions within its ranks. During the effort to secure a communist victory, zone secretaries had developed their own extensive patronage networks, which were seen as potential rivals with the Party Center (Hinton 2005). In the Southwest Zone, Mok took advantage of his growing power within the Pol Pot faction to give his relatives key positions in the military, administrative, and political structures of the zone (Hinton 2005). Under Mok's orders, purges were carried out to eliminate rival patronage networks among cadres in SW zone. Individuals connected to former peers and subordinates, including Chou Chet, Sok Thuok, Non Suon, and Vorn Vet, were viewed as potential enemies by Mok because they belonged to the networks of his rivals within the Southwest Zone (Nhean 2010).

Moreover, the upper leadership of the party also contained divisions between a Pol Pot-led faction and a moderate faction of intellectuals. During the DK period, the Pol Pot-led faction retained a tight grip on power at the top and moved systematically to eliminate or coopt rivals while building its own network of patron-client ties. The Party Center, led by Pol Pot, viewed rival political networks as an existential threat to the Khmer Rouge regime and sought to destroy them in a series of violent purges. CPK internal security forces, known as the Santebal, operated under the assumption that suspects were part of larger networks, or "strings of traitors," actively seeking to undermine the Party (Hinton 2005). The Party Center demanded that the Santebal identify all members of a suspect's "string" and eliminate them as well. The personal relations of a suspect immediately came under suspicion and were also targeted for arrest and execution. This included spouses, children, extended family, friends, coworkers, and other associates. This volatile mix of patron-client networks beset by suspicion and the existence of rival factions seeking to eliminate one another produced favorable conditions for a series of large-scale purges within the ranks of the CPK cadres at every level. Efforts to root out "strings of traitors" became the driving force behind the widespread purges that tore through the CPK cadres, unleashing a wave of violence within the ranks of the party (Hinton 2005).

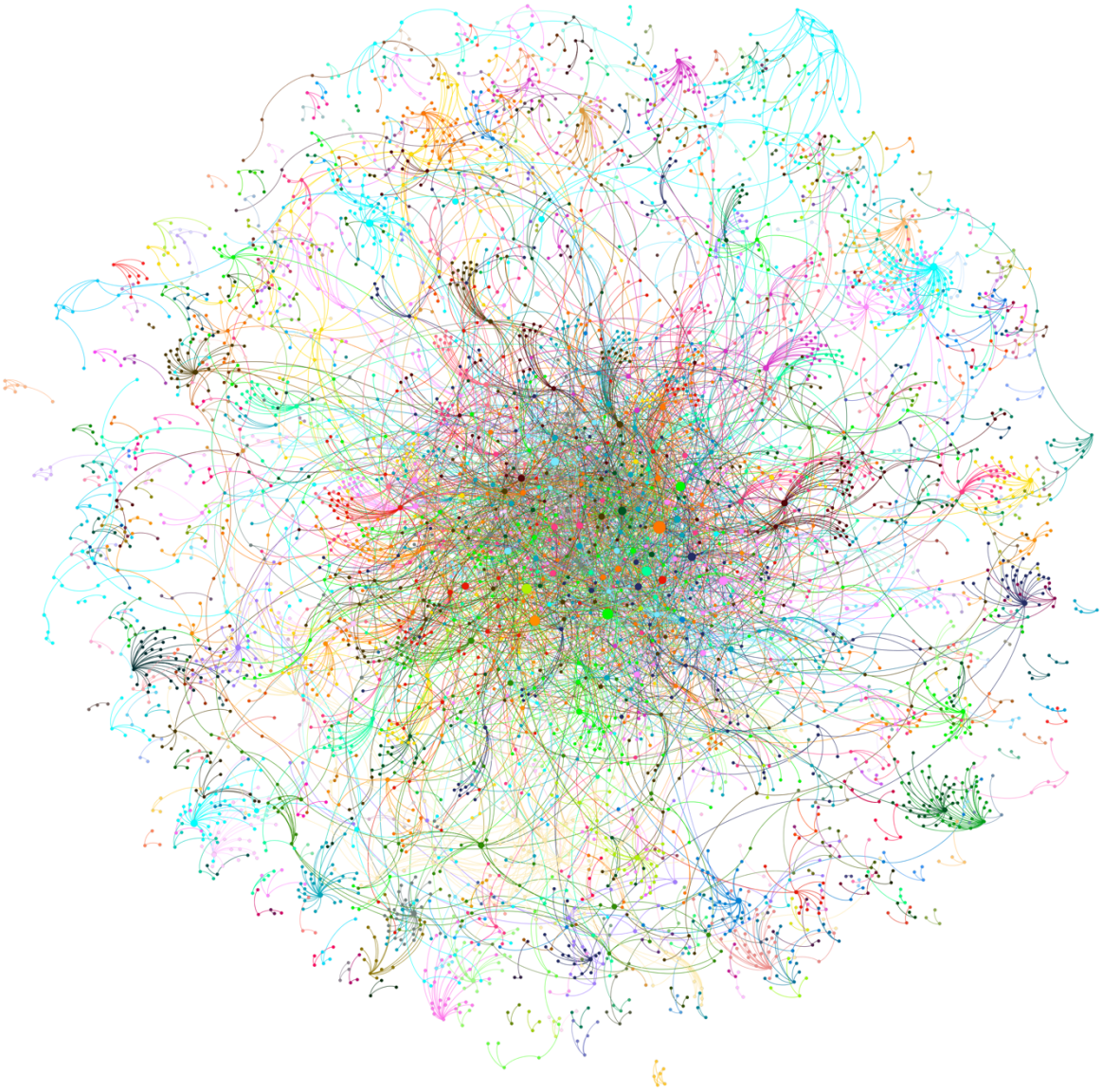
2.6. Social Networks of the Khmer Rouge in the Southwest Zone

The digital archives of the Documentation Center of Cambodia (DCCAM) contain the detailed biographical data on Khmer Rouge officials to reconstruct the social networks of zone administration officials. Data were collected from the DCCAM Biographical Database, which contains the digitized and translated biographical records of more than 30,000 Khmer Rouge leaders down to the district level. The archives record a variety of ties, including kinship, recruitment, work, and general associations for each individual, which are suitable for

reconstructing the social networks within the regime. An initial search located individuals associated with the Southwest Zone, using the category "DK Geographical Area 75-79" and search terms "Southwest" and "SW." The search results were used to collect information only on individuals who held an official position in the Khmer Rouge, which fell into four broad categories: military, administrative, labor, or political personnel. For each individual, a selection of attributes and relationships were collected, including name, aliases, gender, date of birth, birthplace, ethnicity, previous occupation, date of joining the revolution, number of years in the organization, pre-Democratic Kampuchea role, role during the Democratic Kampuchea era, geographic zone, region, district, village, kinship relationships, recruitment relationships, superiors, subordinates, and other known associates. Lastly, arrest, arrest dates, execution, and execution dates were also noted.

Using biographical data collected from the DCCAM database, this paper reconstructs the social networks of members of the Khmer Rouge in the Southwest Zone as a static, cross-sectional snapshot of the direct ties that existed between personnel during the period between 1975 and 1979. This was accomplished through a two-stage procedure, starting with the 1188 individuals identified in the search described above. Based on this initial group of individuals, I built a "two-degree" network using a snowball method. The "first degree" identified known associates listed in the records pertaining to each individual. These relationships included kinship, recruitment, and other known associates. The "two-degree" network was then completed by repeating the process for all of the associates identified in the first-degree networks (Papachristos 2011). This procedure resulted in the network seen in Figure 2.2, which began with 1,188 officials and expanded to include a total of 4,701 individuals.

Figure 2.2. Social Network of Democratic Kampuchea's Southwest Zone



Note: Colors indicate community membership and nodes are sized according to betweenness.

The full network provides an overall picture of the wider social structure of Southwest Zone officials and their connections both within and outside the Khmer Rouge. The network is comprised of 4,701 nodes and a total of 6,368 ties. A quick glance at the network graph in Figure 2.2 reveals that there are no individuals who are truly isolated socially. Each individual has an average degree of 2.86 ties, meaning that every individual has approximately 3 relationships with

others. The degree distribution, however, is skewed in favor a few individuals who possess more connections than most of the network. Given the average degree, the most common network structure is a triad (185) followed by simple dyads (119). The degree assortativity of the extended network is 0.0429, which suggests that nodes with similar degree tend to form connections with each other. Hubs are connected to other hubs, and individuals with low degree tend to connect with other individuals of low degree. The joining together of hubs makes the emergence of a giant component possible. Indeed, in the extended network seen in Figure 2.2, 3,202 (68%) of the nodes are connected in a single component of the network that consists of hubs connected to even more hubs, forming a definable core and periphery. Despite the number of ties, the extended network of Southwest Zone officials is rather sparse, with a density of 0.0006. Density represents the number of ties present out of all possible ties, which means that the extended network of Southwest Zone officials contains only 0.06% of possible ties in a network this size.

2.7.1. Network Closure and Communities

A visual inspection of the network also reveals the presence of numerous distinct social groups, even within the largest connected component that forms the core of the network of the Southwest Zone. On a local level, triads form the basic building blocks of most social networks (Kadushin 2012). Transitivity, also known as triadic closure or simply closure, provides a measure of the tendency for individuals to form strong within-group ties based on triadic relationships (Wasserman and Faust 1994; Kadushin 2012). Transitivity means that if individual *i* and *j* are connected, and *j* and *k* are also connected, then *i* and *j* are likely to form a tie (Wasserman and Faust 1994). Transitivity is measured on a scale of 0 to 1, with 1 being completely transitive. The social network of the Southwest Zone has a transitivity score of 0.07,

indicating that seven percent of the triads in the network are closed triangles (Wasserman and Faust 1994).

On a macro level, the tendency to form strong within group ties based on transitivity often results in the emergence of distinct social groups, or communities. Communities are socially dense pockets of individuals within the network that have fewer ties with other groups (Newman and Girvan 2004). Communities within a network can be located using modularity, which relies on a community detection algorithm, such as the commonly used Louvain method, to partition the network (Blondel, Guillaume, Lambiotte, and Lefebvre 2008). The resulting network modularity score ranges between 0 and 1. In general, networks with modularity scores above 0.3 display strong within-group ties. The Southwest Zone network has a modularity score of 0.76, which points to presence of distinct communities characterized by cohesive relationships (Newman and Girvan 2004). Additionally, the Louvain algorithm reveals the presence of 420 social groups composed of Khmer Rouge personnel and their immediate connections as seen in Figure 2.2. Nodes are colored according to community. The figure clearly shows several distinct groups, which is to be expected in a social system characterized by patron-client relationships. Community boundaries are relatively straightforward; however, there is also considerable overlap, revealing the presence of between-group ties.

2.7.2. Brokerage Positions and Connectivity

Between-group ties are made possible by the presence of brokerage positions in the Southwest Zone network. Brokerage positions describe individuals who sit across a number of shortest paths between different parts of the network. Brokers function as gatekeepers, controlling access to information and resources while also enabling communication and coordination (Wasserman and Faust 1994). The presence of brokerage ties in the network

enables a level of connectivity between different parts of the network that might not otherwise exist. The result is an average path length of 5.84, which refers to the average degrees of separation between any two nodes in the network. The average path length of 5.84 in the network makes it possible to reach any randomly selected node within less than six steps. This suggests that despite being organized into many small clusters, brokerage positions enable individuals to remain relatively close to one another within the network. The network diameter is 22, which represents the longest path length between two nodes as a measure of how many steps it takes to cross the entire network. Again, given a network of this size and its low density, individuals are relatively near one another.

Interestingly, many of the key brokers in the Southwest Zone network are relatively unknown individuals who held mid-level positions within the Khmer Rouge. For example, one such individual is Poeun, who has the highest betweenness centrality score of any individual in the network. Very little is known about her background or time in the Khmer Rouge. Surviving historical records indicate that she grew up in the countryside as part of a large peasant family with twelve siblings. She joined the Khmer Rouge with the stated motive of "feeling bitter toward enemies who oppressed our people" (Biographic Database, 2018). Rising quickly within the ranks, Poeun became the chief administrator of a subdistrict hospital and one of the best-connected members of the Khmer Rouge in the Southwest Zone (Biographic Database, 2018).

In contrast to Poeun, who lived and died in relative anonymity, Southwest Zone Secretary Mok was famous throughout Cambodia. Although obviously important in the day to day administration of the zone, Mok did so from a position that allowed him to operate from the side rather than as the main broker of the network. Mok's network position displays a high number of direct connections to others while at the same time avoiding brokerage ties. Mok's large number

of direct connections insulated him from potential enemies and provided a redundant system of communication (Hinton 2005). This social network configuration, however, also constrained Mok's ability to manipulate potential rivals, leaving him less room to maneuver through the kind of robust action enjoyed by brokers who could make strategically ambiguous statements and actions (Padgett and Powell 2012).

2.8. Conclusion

Scholars have noted the importance of interpersonal networks as a significant factor in the origins, development, and trajectory of revolutionary organizations (Wickham-Crowley 1992; Petersen 2001; Wood 2003; Sinno 2008; Mampilly 2011; Christia 2012; Parkinson 2013; Staniland 2014; Parkinson and Zaks 2018). Although previous research has pointed to cohesion and decentralized network structures as key to militant group survival (Parkinson 2013; Staniland 2014), I extend this line of reasoning to the analysis of a large network of Khmer Rouge officials. Using archival data from the biographic database of the Documentation Center of Cambodia, I map a network of 4,701 individuals loosely connected in 420 distinct communities within the Southwest Zone between 1975-1979. The resulting analysis reveals two main findings.

First, I find that closure appears to be a prominent feature of the network, creating distinct communities of individuals through strong within-group ties. In particular, the largest connected component is divided into several factions that represent the core of the network. This preference for within-group closure enables revolutionary organizations, like the Khmer Rouge, to meet the need for security, limiting the number of connections between members and creating regular patterns of interactions that build trust (Granovetter 1985; Lichbach 1998; Parkinson 2013). Closure also leads to a gradual decrease in the size of an individual's social circle to

include only fellow revolutionaries while simultaneously reducing communication pathways (della Porta 2013). As a result, within-group ties have the potential to bring stability to organizations in the midst of chaotic situations related to regime consolidation.

Second, the analysis also shows that despite containing many closed communities the network is nonetheless connected through brokerage positions in a way that links groups across a sparse network. The preference for closure seen in the Southwest Zone network means that individuals are relatively isolated within their own social groups. Without bridges between different parts of the network, organizational efficiency is impossible. Importantly, many of the individuals occupying brokerage roles represent mid-level members of the Khmer Rouge who played a key role in connecting various hubs throughout the network.

The implications of these findings have important consequences for how networks influence the internal dynamics of revolutionary organizations. Militants and revolutionaries do not exist in isolation but in fact live and operate in a specific social context. Social structures like those seen in the Southwest Zone of the Khmer Rouge that favor closure lead to the development of loosely connected pockets of dense ties that can give rise to a number of phenomena, including the emergence of informal institutions, the virality of violence, and organizational resilience. In sum, the findings described in this paper highlight the importance of social networks for organizations engaged in conflict and state formation as they attempt to navigate the question of how best to achieve security and efficiency.

Chapter 3: Connected to the Revolution: The Endogenous Development of Informal Institutions in Democratic Kampuchea, 1975-1979

Abstract

Explanations of the emergence of informal institutions within political organizations point toward the existence of endogenous processes, such as increasing returns and path dependence. Although our understanding of informal institutions has benefited from such explanations, we have yet to explain the relational nature of these types of informal institutions. This paper begins to tackle this shortcoming, presenting a social network analysis of the Khmer Rouge. Specifically, I explain how endogenous dependencies influence the formation of networks within a militant organization. Using evidence from the Documentation Center of Cambodia, which houses the biographical data on more than 30,000 Khmer Rouge leaders, I examine the social structure of the Khmer Rouge to provide insight into the development and trajectory of the organization. I argue that endogenous processes play a role in the formation of networks, which function as informal institutions through which militant organizations operate. I find that homophily and network structure, particularly concurrency and transitive closure, each contribute to the overall structure of the network. Ultimately, this paper demonstrates the relational nature of endogenous processes that play a role in the formation of personal networks within revolutionary organizations.

3.1. Introduction

What are the processes by which interpersonal networks emerge inside revolutionary organizations? How do social networks come to form the backbone of these organizations? Existing theories of state formation (Migdal 1988; Tilly 1992; Ertman 1997; Herbst 2000; Centeno 2003; Marx 2003; Kalyvas, Shapiro, and Masoud 2008; Nexon 2009; Straus 2015) and studies of militant organizations (Wickham-Crowley 1992; Petersen 2001; Wood 2003; Sinno 2008; Mampilly 2011; Christia 2012; Parkinson 2013; Staniland 2014; Parkinson and Zaks 2018) have both noted the importance of interpersonal networks as key elements in the process of establishing political order through violence.

Although this research has contributed much to our current understanding of the internal functions of revolutionary organizations, to date, we still know relatively little about the internal processes that lead to the formation and self-organization of networks within formal structures. Efforts to establish political order as part of the process of state formation often lead to gaps in the reach of formal institutional structures, which may or may not have the capacity to extend their reach into all areas under their control (Tsai 2006; Helmke and Levitsky 2006; Tsai 2007). As a result, groups involved in the establishment of political order often rely on informal institutions, such as patron-client networks, to compliment or even substitute for shortcomings in formal political structures (Urban 1989; Willerton 1992; Easter 2000; Hillman 2014). Thus, while the existing literature correctly identifies the importance of networks to the process of establishing political order, there have been few systematic attempts to directly examine the social networks often described as playing a critical role in shaping the development and trajectory of revolutionary organizations.

In this paper, I argue that the interdependencies found among actors' relations drive network formation within revolutionary organizations. I contend that this endogenous processes related to features of network topology, such as connectivity, degree centrality, and triadic closure, play a role in the formation of networks which, in turn, have the potential to impact institutional outcomes, including the development of natural pathways for communication, coordination, and intra-organizational control. At the same time, these self-organizing network processes are also influenced by the tendency of individuals to be attracted to others with similar attributes. Operating simultaneously, these two processes of actor covariate effects and network effects shape the development of informal institutions. Thus, the purpose of this paper is to examine an aspect of revolutionary organizations that is, thus far, unexplored in the literature, namely the extent to which structural dependencies among actors influence the formation of networks that play a key part in the state formation process.

Using archival material made available through the Documentation Center of Cambodia (DCCAM), which contains detailed biographical data on more than 30,000 Khmer Rouge leaders down to the district level, I reconstruct the social networks of Khmer Rouge officials located in the Southwest Zone to support this claim. Using social network analysis, this paper demonstrates how endogenous processes of network formation led to the development of relatively well-connected patron-client networks characterized by rivalry, suspicion, and violence. The results of an exponential random graph model (ERGM) indicate that the process of network formation is driven by a combination of homophily effects and network effects. Specifically, I find that Khmer Rouge personnel exhibit a tendency to form relationships based on the shared attributes of military and political positions as well as within-group membership in distinct social groups in tandem with network effects, such as connectivity and transitivity.

This paper contributes to the literature on informal institutions, particularly social networks within revolutionary organizations engaged in state-building. It is the first paper to visually map and examine the social structure of the Khmer Rouge. Like many militant revolutionary organizations, the social networks, in the form of patron-client relations, shaped the development and trajectory of the Khmer Rouge regime. Social network analysis provides a way to quantify and systematically inspect the underlying social structure of the Khmer Rouge in an effort to better understand the inner workings of the regime. Second, this paper provides a statistical analysis of the endogenous processes of network formation that sheds light on the internal forces at work within one of history's most notorious organizations. Thirdly, this paper also speaks to the broader literature on state formation, offering insight into a process that is often characterized by contestation and violence but rarely studied at such an intimate level.

The paper proceeds as follows. The next section turns to a relational theory of endogenous formation of informal institutions through social networks. Using Cambodia's Southwest Zone under the Khmer Rouge, the following sections then map the social networks that lay beneath the zone that the Communist Party of Kampuchea (CPK) considered one of its exemplar administrations and presents a test of several hypotheses related to actor covariate effects and structural effects on network formation using an exponential random graph model. The sixth section discusses the results. A final section concludes with a summary of the main findings and recommendations for further research.

3.2. Explaining Informal Institutions

Informal institutions have been defined a number of ways. For example, North (1990) defines institutions as "the rules of the game in a society, or more formally, the humanly devised constraints that shape human interaction" (3). O'Donnell (1994) describes institutions as

consistent patterns of communication and behavior that occur according to tacitly agreed upon norms in society. Similarly, Lauth (2000) argues that informal institutions should be considered social norms that carry the threat of sanction for violating those norms. Lauth (2000) also points out that informal institutions can have both beneficial and detrimental effects on the political process. Finally, Helmke and Levitsky (2006) define informal institutions as "socially shared rules, usually unwritten, that are created, communicated, and enforced outside officially sanctioned channels" (5). Azari and Smith (2012) note that informal institutions often exist within and alongside established formal institutions, providing clarity for individuals operating in organizational environments characterized by gaps in formal institutions or overlapping authority structures. What each of these definitions has in common is the observation that informal institutions are inherently social structures that operate within formal institutions.

According to Helmke and Levitsky (2004), informal institutions can take on at least four different forms, namely complementary, accommodating, substitutive, and competing informal institutions. Each type reflects the relationship between the effectiveness of formal institutions and the outcomes created by informal institutions operating within these structures. *Complimentary* informal institutions operate alongside effective formal institutional structures, providing a means of solving problems not articulated by written rules and enabling actors to work in accordance with the overall objective of formal institutions. *Accommodating* informal institutions allow actors to bend formal rules in order to achieve goals that sometimes run counter to the objectives of formal institutional structures. *Substitutive* informal institutions often emerge under conditions of ineffective formal institutions, where actors seek to find ways to comply with objectives despite the shortcomings of formal institutional structures. *Competing* informal institutions sometimes form in the absence of effective formal institutions, and lead to

the creation of parallel systems of norms that contradict the rules and objectives of formal institutional structures (Helmke and Levitsky 2004). Regardless of type, however, informal institutions provide individuals with opportunities to construct norms of behavior that emerge from interaction with other actors for a variety of purposes that often influence the development and trajectory of formal institutions.

Informal institutions reflect the results of internally driven processes of which various models of endogenous institutional change have been proposed. Path dependent explanations focus on the self-reinforcing nature of "increasing returns," whereby the rising cost of abandoning a particular path prohibits exit and leads to the creation of a positive feedback process (Pierson 2000). When viewed longitudinally, Greif and Laitin (2004) argue that internal processes can become self-reinforcing, creating powerful incentives for members to continue to comply with norms. If and when these self-reinforcing mechanisms weaken or are interrupted by exogenous shocks, self-undermining mechanisms may take hold, and members might begin to find reason to defect, breaking the cycle and resulting in institutional change (Greif and Laitin 2004). Thelen (2003) offers a contrasting viewpoint, claiming that the increasing returns argument fails to explain why and how institutions change over time. Rather than path dependence, change occurs as the result of the process of institutional layering, in which certain parts of institutions are renegotiated while others remain in play, and conversion, which refers to the process of "institutional transformation to bring institutions in line with changing social, political, and economic conditions" (Thelen 2003, 209).

This paper takes a third position that combines elements of path dependence, layering, and conversion by focusing on the relational nature of endogenous institutional development through what Tsai (2006) identifies as adaptive informal institutions. Tsai (2006) argues that the

mechanism driving endogenous institutional change rests upon the "regularized patterns of interactions that emerge as adaptive responses to the constraints and opportunities of formal institutions" (125-126). Interpersonal relationships form the key mechanism upon which informal institutions develop. Such an understanding of the relational nature of endogenous institutional development is needed to avoid biased estimates or misidentifying the mechanisms through which informal institutions, such as patron-client networks, form within revolutionary organizations.

3.3. Social networks and revolutionary organizations

Beneath their formal hierarchical structures, revolutionary organizations are built on the interpersonal relations that exist between members (Parkinson 2013). These relationships result in regular patterns of interactions that result in the development of informal institutions (Tsai 2006). As such, informal institutions provide militant organizations and revolutionary parties with the ability to fill gaps in institutional capacity (Helmke and Levitsky 2004). One way to conceptualize informal institutions is through mapping the social networks that emerge within formal institutions according to mechanisms defined by the interactions between individuals at the local level. Lusher, Koskinen, and Robins (2013) argue that the formation of these connections into social networks is the result of two interrelated processes, namely attraction based on individual attributes, also known as actor covariate effects, and the structure of the network itself. Moreover, the patterns of ties can reveal these mechanisms as the driving forces behind the creation of particular network structures. Thus, rather than occurring at random, social network formation is the result of specific endogenous processes related to both roles and relations (Lusher et al. 2013; Parkinson and Zaks 2018). In the case of revolutionary

organizations, social network formation represents a combination of actor covariate effects and structural effects.

3.3.1. Actor covariate effects

Individuals seeking to form patron-client ties within a revolutionary organization as a means of finding informal solutions to problems related to high-risk activity must consider the potential costs and benefits of entering into relationships that demand loyalty and support in exchange for protection and access to resources (Hinton 2005). This means that some individuals can be expected to behave in ways that are more active than others in seeking out connections and are attracted to persons with similar attributes. Actor covariate effects, or actor relation effects, reflect this natural tendency of individuals to form relationships with others through selection. These effects are known as actor covariate effects and can be divided into two types based on actor activity and homophily (Lusher et al. 2013).

3.3.1.1. Actor activity

Actor activity effects, also called main effects, reflect the tendency of actors with certain attributes to be more active in the network, regardless of whether or not the actor shares an attribute with others (Lusher et al. 2013). Within revolutionary organizations, it is to be expected that members who occupy particular roles are more likely to be socially active as a natural function of their positions. Role represents an individual's position in relation to others that is characterized by the attributes each individual possesses or the tasks he or she performs within the organization (Parkinson and Zaks 2018). Knoke (1990) argues that roles are "the basic units of any complex political system" (7). Moreover, roles can be defined by gender, age, and length of time in the organization as well as official positions, such as military, administrative, or

political positions. Roles or positions, however, are most accurately defined in relation to other positions, which are connected by social interactions.

3.3.1.2. Homophily

While acknowledging that members of revolutionary organizations do not share equal levels of participation according to their roles, it is important to remember that organizations are built on relations. Relations are defined as the interactions between individuals within a revolutionary organization. Social interaction is governed by norms that create expectations and obligations on actors to behave in certain ways (Knoke 1990; Parkinson and Zaks 2018). Moreover, organizations engaged in high-risk activities like civil war and revolution face internal and external threats to their existence that drive members to form strong within-group ties in an effort to seek protection and clarify group loyalties while also increasing a propensity to adopt a paranoid conspiratorial mindset toward outsiders (Lichbach 1998). Within-group ties strengthen cohesion and solidarity because they reduce uncertainty and create trust through regular contact (Granovetter 1985).

Social network analysis identifies the tendency for individuals to form strong within-group relationships, often with others who share similar attributes, as homophily, which is sometimes explained as the idea that "birds of a feather flock together" (Lazarsfeld and Merton 1954; McPherson, Smith-Lovin, and Cook 2001; Kadushin 2012). This attraction can be based on status, values or attributes and is often founded on pre-existing relationships, such as kinship (McPherson, Smith-Lovin, and Cook 2001).

Within a revolutionary organization, relevant attributes that cause individuals to be attracted to one another can include gender, age, ethnicity, survival, geographic co-location, previous occupation, official role in the organization, and social group. Shared gender and

ethnicity can enable coordination (Parkinson 2013; Larson 2016, 2017; Larson and Lewis 2018). Moreover, survivors of intra-organizational violence are often found connected to one another as violence tends to travel along the natural pathways of social networks, producing chains of survivors and victims (Papachristos et al. 2014).

In addition to physical characteristics, homophily can also be driven by selection according to other kinds of attributes, such as being located in the same geographic location (McPherson et al. 2001), having similar skill sets related to occupational backgrounds (Huang 2017), and sharing in common experiences that create cohesion among members, such as serving together in the same unit under stressful conditions (Parkinson 2013; Staniland 2014). Due to this propensity to favor within-group ties, the presence of homophily can exert a significant effect on the structure of networks (Krivitsky and Morris 2017). Thus, it is important to test for the presence of homophily, which leads to my first hypothesis.

> Hypothesis 1: Actors are more likely to form strong ties with individuals who have similar attributes than those with different attributes.

3.3.2. Structural effects

Although individual activity and selection based on attributes play a role in network formation, the endogenous dependencies that exist between ties also contribute to the self-organization of social networks within formal institutions (Lusher et al. 2013). These self-organizing characteristics are known as structural effects and are concerned with the topology of the network itself. Three types of network structures are of particular interest when examining large, complex political organizations, namely connectivity, degree centrality, and closure.

3.3.2.1. Limited Connectivity

Revolutionary organizations face the challenge of balancing a need for cohesiveness while at the same time avoiding higher levels of connectivity in order to avoid risk. Direct ties

are often key for generating trust with other members of the organization, reflecting a preference for interacting with individuals whose reputation and history of past behavior can be known (Granovetter 1985). This, in turn, reduces uncertainty and provides a level of predictability.

Although social networks can produce trust and reliable behavior, Granovetter (1985) points out that relationships "are not sufficient to guarantee these and may even provide occasion and means for malfeasance on a scale larger than in their absence" (491). In some instances, interpersonal relationships characterized by trust actually enable betrayal and violence on a much wider level than if actors existed independently and alone. Granovetter (1985) offers three reasons for why this is the case. First, trust can also present an occasion for wrongdoing. People are less suspecting of those they know and trust. Trusting relationships also have the potential for creating vulnerabilities. Second, "force and fraud are most efficiently pursued by teams," which depend on trust that often emerges out preexisting personal connections (Granovetter 1985, 492). The trust found in networks enables groups to carry out misdeeds efficiently; however, it also creates the possibility that entire networks can be taken down through the arrest or elimination of a single member. Third, Granovetter (1985) argues that the scale and reach of bad conduct is shaped by the social structure of these relations. Moreover, networks do not penetrate society evenly, meaning that some individuals are more connected than others, placing them in situations with differing degrees of opportunity and constraint as coalitions form and dissolve. For some, these networks offer protection while preying on victims. At the same time, networks can also create risk for other actors who occupy vulnerable roles (Granovetter 1985). As a result, the need to maintain security often leads individuals to limit their connectivity among members of clandestine organizations in an attempt to avoid vulnerability under the assumption that fewer

ties will lead to safety (Simmel 1950; Erickson 1981; DellaPosta 2016). This leads to my second hypothesis.

> Hypothesis 2: Individuals are more likely to limit their relationships in an effort to establish positions of security than build more relationships to create efficiency.

3.3.2.2. Degree Centrality

Although members of revolutionary organizations exhibit a bias toward forming fewer connections, the desire for security in high-risk environments often happens in the context of patron-client relations (Scott 1972; DellaPosta 2016). As a particular kind of informal institution, patron-client ties are characterized by networks, factions, and coalitions that often exist within formal institutions, such as political parties and bureaucracies, of the modern state (Scott 1972; Hicken 2011; McLean 2011). Traditionally, systems of patron-client relations provide clients with protection as well as access to opportunities while patrons received support and loyalty from their base. These informal structures are based on clusters of individuals who form communities dependent on a patron and exhibit multiplex behavior in the overlapping ties that form out of kinship and other types of relationships (Scott 1972; Hinton 2005; Hicken 2011). Patron-client relations, however, are also rarely equal. Patrons usually occupy a position of power and access to resources that cannot be matched by their clients, making the clients somewhat dependent on the patron. Even though this relationship is instrumental in nature, it does not give patrons absolute power (Hinton 2005).

Moreover, patrons know that their clients can choose to switch their loyalty to a different patron even if such a move proves costly. This tends to create an atmosphere of "suspicion and distrust" (Hinton 2005, 124). Clients who begin to be seen as a patron in their own right, gaining their own clients, can come to be viewed as potential rivals or even traitors in the eyes of their former patron. Rival patrons are viewed as enemies who seek to undermine one's own position

of power. At the same time, much of the maintenance of patron-client relations falls to patrons who often attempt to prevent defection and disloyalty through incentives and coercion. The instability inherent in such a system often leads to the absence of lasting institutions outside of kinship and an environment marked by paranoia and suspicion (Hinton 2005).

From a network perspective, patron-client relations can be understood through the concept of degree centrality, which refers to the number of direct connections that each individual possesses (Freeman 1978). Actors with a large degree, such as patrons, are considered more prominent than other actors because they have many direct connections to others that offer opportunities and options in the form of access to power, information, and resources. In contrast, actors with a low degree have significantly less influence due to their peripheral position characterized by few direct ties to others (Wasserman and Faust 1994). Moreover, degree is rarely distributed evenly across a network. Large numbers of ties are often concentrated in the hands of a powerful few while most members have only a few direct connections (Kadushin 2012). This phenomenon leads to the formation of multiple star-like structures that serve as the building blocks of patron-client networks. Degree centrality gives an indication of the overall tendency toward centralization or decentralization within the network (Scott 1972; Lusher et al. 2013). Thus, given the frequent presence of multiple patron-client networks within the formal organizational structure, it can be expected that multiple clusters will exist rather than a single hub. This raises a third hypothesis.

> Hypothesis 3: Individuals are likely to form decentralized clusters of patron-client relations more than a single, centralized cluster.

3.3.2.3. Closure

Alongside the tendency to cluster around patrons, DellaPosta (2016) argues that in the case of clandestine and criminal networks, individuals face transaction costs in finding partners

they can trust, reputational costs that accompany the formation of between-group ties, and opportunity costs in time spent developing those relationships. Individuals face transaction costs in the formation and maintenance of relationships that prioritize trust. Strong ties offer better security and are easier to form along the lines of pre-existing relationships, such as kinship. Members of revolutionary organizations also face reputational costs as relationships with outsiders can raise questions about within-group loyalty to one's own patron-client network. Moreover, opportunity costs can restrict the choices of individuals to seek relationship outside their own social group. Under these circumstances, it becomes much easier to rely on within-group ties for access to resources and opportunities than to build relationships with outsiders (Erickson 1981; DellaPosta 2016).

As a result, individuals in clandestine networks often exhibit a preference for network closure, which is characterized by strong within-group ties, in pursuit of security at the expense of network effectiveness (DellaPosta 2016). The formation of within-group relationships, however, is not without its own costs. Closure limits both the sharing of information across the network as well as coordination with other parts of the network (DellaPosta 2016). Network closure, also knowns as transitivity, refers to the tendency for groups of three individuals to form closed triangles within a network (Lusher et al. 2013). Undirected networks can contain four possible types of relations among three nodes (no tie, one tie, two ties, and three ties); however, triangular ties tend to be structurally balanced, which means that if *i* and *j* share a relationships and *j* and *k* also share a relationship, then *i* is likely to form a relationship with *k* as well (Wasserman and Faust 1994). More often than not, these triangular structures are found grouped in clusters that form the basis of network communities. This leads to my fourth and final hypothesis.

Hypothesis 4: Individuals are likely to form closed triangles in an effort to increase security rather than leave their relations open for efficiency.

3.4. Method

Traditional statistical methods are not well-suited for studying social networks because of the interdependence of ties within the network. Standard linear regression models assume independent and identically distributed (i.i.d.) random variables. The i.i.d. assumption implies that observations can be replaced with any randomly selected sample and that such an exchange of rows of data would not impact the inferences made. In other words, standard regression models operate under the assumption that observations have no influence on each other (Cranmer, Desmarais, and Menninga 2012). The relational nature of the data used in network analysis, however, violate this assumption due to the interdependence of observations and autocorrelation of the error terms (Cranmer, Heinrich, and Desmarais 2014). Moreover, traditional likelihood models based on the i.i.d. assumption tend to underestimate network effects and sometimes even fail to identify their presence (Cranmer et al. 2012).

In order to properly account for properly account for the dependencies present in relational data, this paper abandons the i.i.d. assumption and turns to a different class of likelihood models, namely the exponential random graph model (ERGM). ERGMs are used to predict the likelihood of tie formation and identify the processes through which tie formation occurs. ERGMs operate under the assumption that network ties are the product of endogenous self-organizing processes related to interdependence among actors that may simultaneously be shaped by actor attributes and other exogenous factors (Lusher et al. 2013).

ERGMs have the general form

$$\Pr(Y = y) = \left(\frac{1}{k}\right) exp\left\{\sum_{A} \eta_A g_A(y)\right\}$$

where (1) the summation is over all configurations A; (2) η_A is the parameter corresponding to configuration A; (3) $g_A(y)$ is the network statistic corresponding to configuration A, so that $g_A(y) = 1$ if the configuration is observed in the network y, and $g_A(y) = 0$ otherwise; and (4) k is a normalizing quantity that ensures a proper probability distribution (Robins, Pattison, Kalish, and Lusher 2007, 178-179).

ERGMs enable modelling of the macro-level topology of the network as the product of interacting properties that include endogenous mechanisms of self-organization and exogenous node attributes at the micro-level. Thus, ERGMs are useful for "explaining patterns of ties in a social network" (Lusher et al. 2013, 16). ERGMs do not, however, predict individual level outcomes. Instead, an ERGM considers the network itself as the dependent variable. The ERGM used in this paper was estimated using the statnet and xergm packages in R, the open source language and environment for statistical computing and graphics.

3.5. Data Collection and Measurement

The Communist Party of Kampuchea (CPK), also known as the Khmer Rouge, provides an appropriate case with which to test the hypotheses described above. As a revolutionary organization engaged in the violent process of state formation, the Khmer Rouge was structured along the lines of a Leninist revolutionary party, known as the *Angkar*, which means "the Organization" (Chandler 1999; Chandler 2008). Directed by a powerful Central Committee led by Pol Pot, the Khmer Rouge reorganized the country into six administrative zones, North, Northeast, Northwest, East, Southwest, and West. Additional administrative units included the Center as well as the Kratie, Siem-Riep/Uddor Meanchey, and Preah Vihear autonomous sectors (Jackson 1989; Short 2004; Documentation Center of Cambodia 2007; Mertha 2014). Each of

these administrative zones was ruled by a powerful zone secretary who, in turn, often installed their own patron-client networks, known as *khsae* or "strings" (Chandler 1999; Hinton 2005).

The Southwest Zone under the control of Zone Secretary Mok, also known as Chhit Chhoeun, represents a clear case in which patron-client relations continued to function as informal institutions under the Khmer Rouge. Mok, sometimes referred to as Ta Mok or Grandfather Mok, had earned the nickname "the Butcher" while serving as one of the top military commanders of the Khmer Rouge forces and a member of the powerful Standing Committee of the Central Committee. A hardened veteran of the struggle against French colonialism and the republic, Mok was also well known for building patronage networks within the institutional apparatus of the CPK. As Southwest Zone Secretary, he installed family members, including children, siblings, and in-laws, in key positions within the military, administrative, and political structures of the CPK. Under Mok's guidance the Southwest Zone gained repeated recognition from the Party Center as most effective communist administration in the country (Kiernan 2002; Ea 2004).

Although these networks provided support and protection, the Party Center, led by Pol Pot, viewed rival political networks as an existential threat to the Khmer Rouge regime and sought to destroy them in a series of violent purges. CPK internal security forces, known as the *Santebal*, operated under the assumption that suspects were part of larger networks, or "strings of traitors," actively seeking to undermine the Party (Hinton 2005). In response, the Party Center demanded that the Santebal identify all members of a suspect's "string" and eliminate them as well. The personal relations of a suspect immediately came under suspicion and were also targeted for arrest and execution. This included spouses, children, extended family, friends, coworkers, and other associates. These efforts to root out "strings of traitors" can be considered

one of the driving forces behind the widespread purges that tore through the CPK cadres, unleashing a wave of violence within the ranks of the party (Hinton 2005).

This paper uses evidence from the digital archives of the Documentation Center of Cambodia (DCCAM), which contain detailed biographical information on Khmer Rouge officials to reconstruct the social networks of Southwest Zone personnel. Data were collected from the DCCAM Biographical Database, which contains the digitized and translated biographical records of more than 30,000 Khmer Rouge members down to the district level. The archives record a variety of ties, including kinship, recruitment, work, and general associations for each individual, which are suitable for reconstructing the social networks that existed within the organization as a single contact network based on direct personal ties.

An initial search of the Biographic Database located 1,188 individuals associated with the Southwest Zone through the category "DK Geographical Area 75-79" and search terms "Southwest" and "SW." The search results were used to collect information only on individuals who held an official position in the Khmer Rouge, which fell into four broad categories: military, administrative, labor, or political personnel. For each individual, a selection of attributes and relationships were also collected, including name, aliases, gender, date of birth, birthplace, ethnicity, previous occupation, date of joining the revolution, number of years in the organization, pre-Democratic Kampuchea role, role during the Democratic Kampuchea era, geographic zone, region, district, village, kinship relationships, recruitment relationships, superiors, subordinates, and other known associates. Lastly, arrest, arrest dates, execution, and execution dates were also noted.

Using the biographical data collected from the DCCAM database, I then reconstructed the social networks of members of the Khmer Rouge in the Southwest Zone as a binary,

undirected, cross-sectional network. In order to maximize the data available, this study restricts its scope to the social networks within the Khmer Rouge as a militant revolutionary organization, limiting the analysis to the 1,188 individuals who held an official position and their relationships with one another inside the organization in the Southwest Zone. The resulting network can be seen in Figure 3.1 below.

Table 3.1. Descriptive Statistics for Individual Attributes.

Variables	Mean	Standard Deviation	Min	Max	N
Gender	0.70	0.46	0	1	1188
Age	26.53	8.77	6	60	1188
Khmer	0.96	0.18	0	1	1188
Previous Occupation					
Military	0.08	0.27	0	1	96
Professional	0.07	0.25	0	1	82
Service	0.03	0.16	0	1	33
Agriculture	0.69	0.46	0	1	818
Skilled	0.05	0.22	0	1	58
Unskilled	0.04	0.19	0	1	44
Student	0.05	0.21	0	1	57
Joined before 1975	0.63	0.48	0	1	1188
Role in Regime					
Military	0.37	0.48	0	1	440
Administrative	0.39	0.49	0	1	469
Labor	0.15	0.36	0	1	184
Political	0.08	0.27	0	1	95
Purged	0.63	0.48	0	1	1188

Demographically, the population of 1,188 Khmer Rouge officials in the Southwest Zone represents a predominantly male group with males accounting for 70% while females make up only 30%. The average age of Khmer Rouge members is 26, but age ranges between the youngest at 6 and the oldest at 60 years old. The Khmer Rouge officials in the Southwest Zone also represent a largely homogenous ethnic background of 96% Khmer. A solid majority of these officials (63%) joined the Khmer Rouge prior to the seizure of power in 1975 and came from an

agricultural background. Most officials served in administrative roles followed by military, labor, and political positions respectively. During the period of Khmer Rouge rule, officials in the Southwest Zone represented 567 different villages scattered throughout the zone. Out of this population of Khmer Rouge officials, a total of 63% were purged between 1975-1979.

3.5.1. The Social Network of Southwest Zone Personnel

The outcome variable of interest in this study is the network itself. The network of Khmer Rouge officials described below represents face-to-face relationships within the organization. It does not include those individuals connected to regime officials who were not part of the Khmer Rouge, but instead, focuses on the internal connections among those who were part of the Southwest Zone administration.

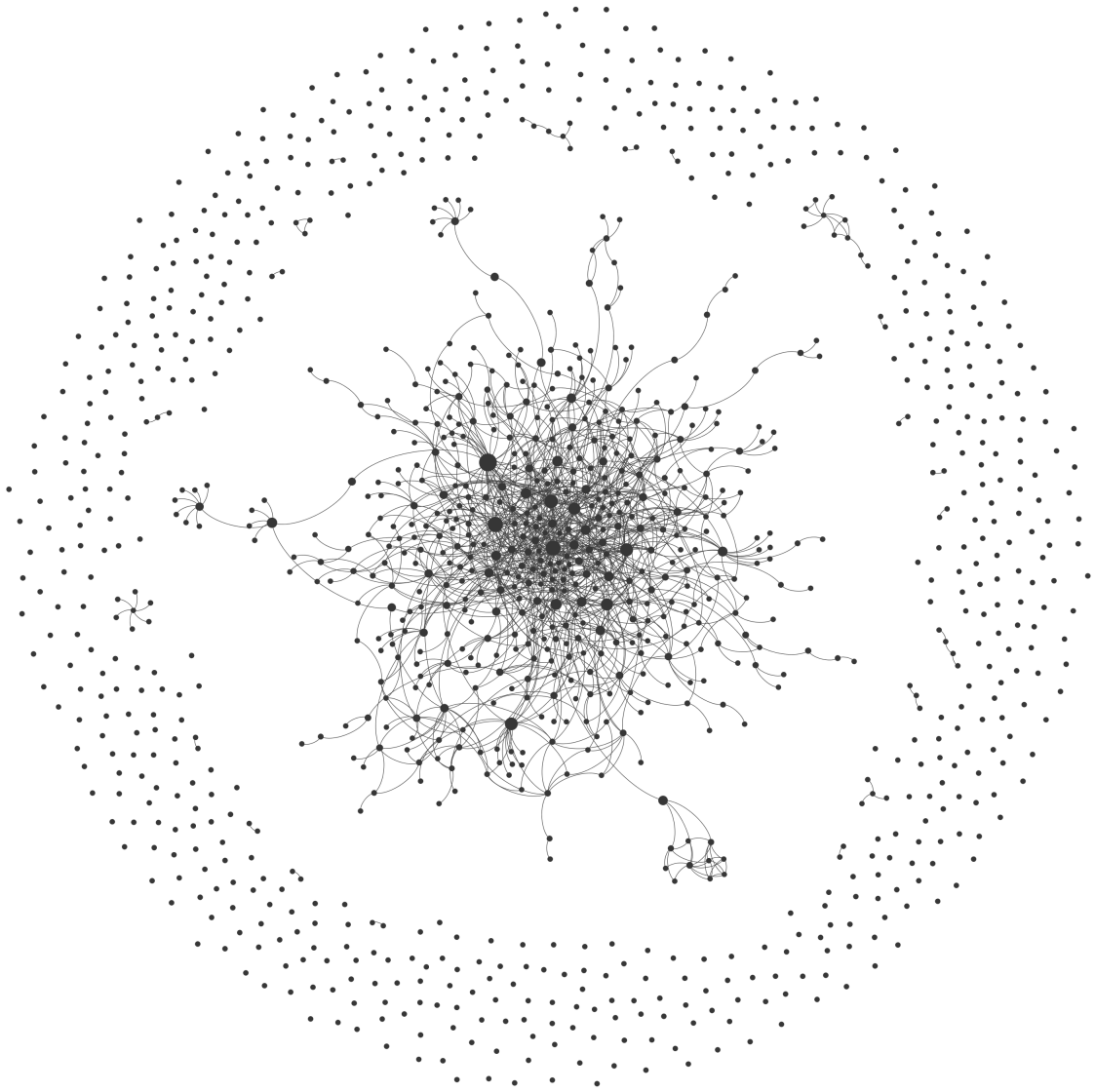
Table 3.2. Southwest Zone Network Summary Statistics

Nodes	1188
Edges	1807
Isolates	571
Average Degree	3.04
Maximum Degree	60
Density	0.0026
Diameter	10
Transitivity	0.27
Assortativity	0.32
Average path length	4.25

A visualization of the Southwest Zone personnel network can be seen in Figure 3.1. The network contains 1,807 connections among 1,188 Khmer Rouge officials. Despite the number of ties, the network of Southwest Zone officials is rather sparse, with a density of only 0.0026. Each individual has an average degree of 3.04 ties, meaning that every individual has approximately 3 connections to others. The distribution of degree, however, is skewed in favor of a few

individuals who possess more connections that the rest of the network. This uneven distribution of ties indicates that the network of Southwest Zone personnel is remarkably open, suggesting an overall lack of cohesion that may have prevented any single individual from exerting absolute power over the entire network.

Figure 3.1. Social Network of Southwest Zone Personnel



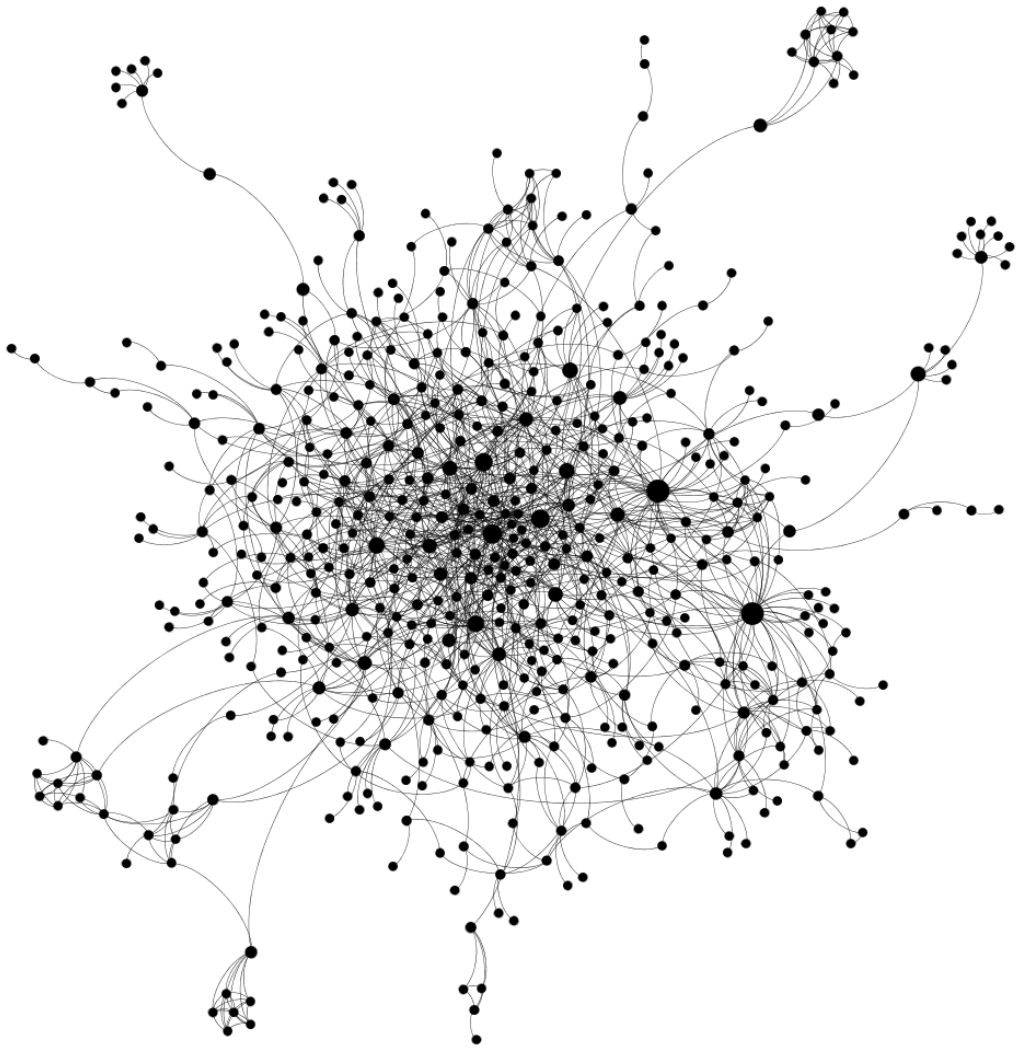
Betweenness is similarly distributed. A relatively small number of individuals occupy brokerage positions between smaller clusters. The network diameter is 10, which represents the

longest path length between two nodes as a measure of how many steps it takes to cross the entire network. Average path length is 4.25, which indicates the average degree of separation between any two nodes in the network. With an average path length of 4.25, it is possible to reach any randomly selected node within less than five steps, reflecting a high level of connectivity within the network. For example, even though he occupied a powerful position as Southwest Zone Secretary, Mok had the ability to reach only 42% of the network within a relatively few number of steps, suggesting that although he had strong influence, there were limits to Mok's power.

Moreover, the network of Southwest Zone personnel consists of several visually identifiable features. First, there are a considerable number of isolates. In fact, there are 571 individuals who possess no ties to other organizational members. Second, the remaining 617 officials are clustered in 26 identifiable components of which the largest contains 525 individuals. This large connected component consists of 525 individuals and 1,217 ties, meaning that connections within the network are concentrated largely in this cluster. Nested within the largest connected component, there are 22 distinct social groups. The largest connected component is shown in Figure 3.2 below.

The presence of a large connected component reflects the tendency of individuals to form clusters. For example, the degree assortativity of the network is 0.32, which suggests that nodes with similar degree tend to form connections with each other. Hubs are connected to other hubs, and individuals with low degree tend to connect with individuals of low degree. The joining together of these hubs makes the emergence of a giant component possible. The giant component represents 44% of the personnel but contains 67% of the ties in the Southwest Zone.

Figure 3.2. Largest Connected Component within the Southwest Zone Network



Upon visual inspection of the largest connected component, it can be seen that individuals appear to be clustered near one another. There appears to be a clear core-periphery structure in which the majority of ties are densely clustered in a few groups around the center. Thus, the largest connected component of the Southwest Zone network provides an appropriate analytic sample with which to study the connections between personnel. Taking the largest connected component among the observed network of Khmer Rouge personnel as the dependent

variable, this paper examines the endogenous dependencies that drive the formation of networks within the Khmer Rouge by studying actor covariate effects and structural effects.

3.5.2. Model Specification

3.5.2.1. Actor covariate effects

In an ERGM, actor covariate effects can take several forms that enable testing of activity and homophily. Actor activity effects, or main effects, indicate whether an individual with a particular attribute is more or less likely to be socially active in forming ties to others within the network. In the models used in this paper, a total of four actor activity effects (gender, age, length of time in the organization, and purge status) are used as control variables. The actor covariate effects for activity included in the model are gender (0=Female, 1=Male), age (in years), whether or not a person joined before the 1975 takeover (0=No, 1=Yes), and purge status (0=No, 1=Yes) as a measure of the social activity of individuals through the number of times an actor with a particular attribute appears in an edge (Morris, Handcock, and Hunter 2008).

Homophily effects account for the tendency for individuals who share attributes to form ties with one another. A total of six homophily terms (gender, ethnicity, purge status, geographic co-location, previous occupation, role in the Khmer Rouge, and social group) are included in Models 3 and 4. Gender (0=Female, 1=Male), Khmer ethnicity (0=No, 1=Yes), purge status (0=No, 1=Yes) are operationalized using categorical variables. Previous occupational background is divided into dummy variables for military, professionals, service workers, agricultural workers, skilled labor, unskilled labor, and students (0=No, 1=Yes). Formal role within the Khmer Rouge regime is accounted for using dummy variables for military, administrative, labor, and political roles (0=No, 1=Yes).

To account for the presence of patron-client relations within the largest connected component, a community detection algorithm is used to identify the presence of distinct social groups.[1] These communities represent interconnected social groups within the largest connected component. Using this procedure, each individual was assigned membership in one of 22 social groups, which is then operationalized as a homophily term to test the likelihood of tie formation based on within-group membership. Positive coefficients indicate likelihood of tie formation.

3.5.2.2. Structural effects

Structural effects are measured using terms specifically designed to account for the dependencies among ties in the network. The structural effects included in the models are edges, monogamy, degree centrality, and transitivity. The edge term indicates the propensity for ties to form within the network and reflects the overall density (in log-odds) of the network. A negative term signifies a sparse network (Morris, Handcock, and Hunter 2008). Following Krivitsky and Morris (2017), connectivity is operationalized using a monogamy term, which captures an individual's tendency to have a single relationship. I expect the coefficient to be positive, which indicates that while most individuals have relatively few ties within the network most have at least one tie (Krivitsky and Morris 2017).

One option to address the endogenous dependencies related to degree centrality, or the number of ties an individual has within the network, is to use the kstar(2) term, which provides a count of the number of times a structure consisting of two ties occurs in the network. Moreover, the number of connections a person has within the network follows an exponentially decaying distribution, where a few members have a large number of ties. The use of terms like kstar to

[1] Community detection was accomplished using a *fastgreedy* algorithm, which implements an iterative search to partition the network in a way that optimizes modularity. This process identified 22 distinct social groups.

account for such structures, however, often leads to model degeneracy in larger networks (Lusher et al. 2013). Fortunately, the kstar and alternating kstar statistics can be represented using an endogenous dependency term known as geometrically weighted degree distribution (GWD) (Hunter 2007). I therefore operationalize degree centrality using GWD to model the degree distribution and obtain a better model fit (Lusher et al. 2013). To capture transitivity, or triadic closure, within the network, a geometrically weighted edgewise shared partners (GWESP) term is used. GWESP is used instead of a triangle term because like degree, the edgewise shared partner distribution decays exponentially, which tends to lead to model degeneracy when using a standard triangle term (Hunter 2007; Lusher et al. 2013; Leifeld 2018).

3.6. Results

The ERGM results are presented in Table 3.3. The variable names for actor covariate effects and structural effects are given in the first column. The remaining columns contain the coefficients for each model. Model 1 contains the main effects that act as control variables. Model 2 adds homophily terms to test for the likelihood of tie formation based on shared attributes. Model 3 includes the structural terms to capture the presence of network effects. The models indicate that both actor covariate effects and structural effects influence the formation of the observed network. The edges term consistently produces a negative coefficient across all three models, indicating that the network is rather sparse.

Table 3.3. Summary of Exponential Random Graph Model Results.

	Model 1	**Model 2**	**Model 3**
Edges	-4.6593 (0.1446)***	-7.4428 (0.4670)***	-6.8461 (0.3970)***
Actor Covariate Effects			
Actor Activity Effects			
Gender	-0.0826 (0.0482)	0.0297 (0.0521)	0.1288 (0.0451)**
Age	0.0078 (0.0026)**	0.0051 (0.0029)	0.0021 (0.0024)
Length of Time in Organization	-0.0099 (0.0465)	-0.0491 (0.0495)	-0.0643 (0.0403)
Social Activity of Purge Victims	-0.4921 (0.0532)***	-0.0067 (0.0547)	0.1232 (0.0443)**
Homophily			
Same Gender		-0.0386 (0.0673)	-0.0537 (0.0652)
Both Khmer		0.3138 (0.1650)	0.2656 (0.1348)*
Both Purged		0.7357 (0.0752)***	0.6951 (0.0705)***
Same Location		0.5750 (0.0901)***	0.5399 (0.0804)***
Previous Military		-0.1015 (0.1425)	-0.1050 (0.1205)
Previous Professional		-0.4096 (0.1098)***	-0.2938 (0.0988)**
Previous Agriculture		0.4567 (0.0944)***	0.3812 (0.0873)***
Previous Skilled		-0.0570 (0.1840)	-0.0783 (0.1479)
Previous Unskilled		0.2663 (0.1830)	0.0945 (0.1545)
Previous Student		0.0626 (0.1672)	-0.0625 (0.1522)
Both Military		0.3852 (0.0683)***	0.3245 (0.0621)***
Both Admin		0.1214 (0.0695)	0.1232 (0.0661)
Both Labor		0.0750 (0.1023)	0.0852 (0.0891)
Both Political		0.1527 (0.0781)	0.1553 (0.0706)*
Same Social Group		3.0101 (0.0655)***	2.4593 (0.0739)***
Structural Effects			
Female Limited Connectivity			1.7186 (0.2469)***
Male Limited Connectivity			2.2434 (0.1984)***
Clustering (Degree)			0.5417 (0.2942)
Triadic Closure			0.4061 (0.0385)***
AIC	13810.5641	11006.5893	10593.7832
BIC	13859.7228	11203.2241	10829.7450
Log Likelihood	-6900.2821	-5483.2946	-5272.8916

***p < 0.001, **p < 0.01, *p < 0.05

3.6.1. Actor covariate effects

The actor covariate effects reflect both main effects and homophily effects. Although used as control variables, the main effects for gender, age, length of time in the organization, and survival status provide useful information about the social activity of Khmer Rouge personnel in the Southwest Zone. The main effects indicate that actor attributes indeed led some individuals to be more socially active than others in the formation of network ties. The positive and significant coefficient for gender indicates that men were more socially active than women in forming ties to others. Age returns as positive but does not attain a level of significance. Similarly, length of time in the organization, defined as joining the Khmer Rouge prior to their takeover in 1975, is negative but also fails to attain statistical significance. Together, the lack of significance for both age and length of time in the organization suggest that seniority played little role in the social activity of Khmer Rouge personnel. Interestingly, purge victims had an increased tendency to form relationships compared to survivors as indicated by the positive and statistically significant coefficients for the main effects of purge status. Purge victims were 13% more likely (exp[0.1232]=1.13) than survivors to form ties to others.

The results for homophily effects reveal variation on different attributes. For instance, there is no indication that having the same gender increases the likelihood of tie formation. Although not statistically significant, gender returns as negative, which implies that men and women were more likely to form ties with one another than with members of the same gender. On the other hand, shared ethnicity is positive and significant, which indicates that when both members shared the Khmer identity, they were more likely to form a tie. The models also reveal a positive and significant effect related to ties among to purge victims. Purge victims tend to be connected to one another, and survivors tend to have ties with other survivors. This finding

supports the argument that violence does not spread randomly but likely moves along social networks. Geographic co-location is positive and significant, which implies that individuals from the same village are more likely to form relationships with one another.

Moreover, a key mechanism of tie formation within the network appears to be homophily based on previous occupational background, official role within the Khmer Rouge, and social groups. Former professionals, including teachers and monks avoided one another while agricultural workers were more likely to form relationships. Former military, skilled and unskilled workers, and students did not exhibit a preference for ties with each other. As for roles within the Khmer Rouge, positive and significant coefficients for military and political personnel mean that members of the armed forces were more likely to form ties to other military personnel while and political officials were more likely to seek out other individuals in similar political roles. The results for administrative and labor personnel, however, are not statistically significant. This suggests that officials working in administrative or labor roles possibly did not trust one another within their respective units. As expected, within-group ties among members of the same social group exert a significant influence on tie formation. Overall, the results for homophily effects support both hypothesis 1, indicating that shared attributes and within-group ties were important drivers of network formation within the Khmer Rouge.

3.6.2. Structural effects

Positive and significant coefficient estimates on structural effects indicate that particular network structures, such as limited connectivity, clustering, and closure, are observed in the network more often than would be the case by chance. As anticipated, the results of Model 3 reveal a positive and significant result for limited connectivity for both men and women, reflecting the tendency to privilege security concerns over efficiency. This suggests that both

men and women were likely to form a limited number of connections, most likely a single relationship, rather than multiple relationships within the Southwest Zone in an effort to prioritize security. The coefficient for degree distribution is positive but not statistically significant, meaning that the results do not support hypothesis 3. The positive coefficient implies that there is a propensity among Khmer Rouge personnel toward centralization; however, this conclusion must be viewed with caution since the term lacks statistical significance and the confidence interval includes zero. Closure, or transitivity, is positive and significant, supporting hypothesis 4. Triadic closure increases the odds of having a tie with another member of the Khmer Rouge by a factor of 1.50 (exp[0.4061]=1.50). Combined with the homophily effect for within-group ties, the presence of a statistically significant result on transitivity indicates that Khmer Rouge personnel tended to pursue network closure. Closure has the potential to prevent information from moving from one part of the network to another, which can offer protection while limiting coordination (DellaPosta 2016). Overall, the results for structural effects lend support to hypotheses 2 and 4, related to connectivity and transitivity, respectively, but fail to confirm hypothesis 3 related to clustering.

3.7. Discussion

This paper has analyzed several attribute-based and structural processes that influence the endogenous formation of social networks within revolutionary organizations. The data on Khmer Rouge personnel in the Southwest Zone reveal a social network of predominantly young males who worked in mostly military and administrative roles within the regime. Social network analysis shows a network of 1,188 individuals with an average of 3 personal connections to other members inside the organization. Additionally, ties are clustered in a large connected component consisting of 1,217 ties among 525 individuals, which represents nearly 44% of the personnel

and 67% of the ties in the Southwest Zone. This concentration of connections among Khmer Rouge personnel constitutes the backbone of the Southwest Zone administration.

The results of the exponential random graph models indicate that social networks among Khmer Rouge personnel in the Southwest Zone were likely the product of a combination of homophily, limited connectivity, and closure. Consistent with theoretical expectations, I find that members of a revolutionary organization engaged in high-risk activities were motivated to seek out relationships primarily within their own social groups defined, in part, by shared attributes. Homophily effects among rural peasants, geographically co-located individuals, and military and political personnel were found to be important in the creation of network ties.

Given the threats that organizations engaged in high-risk activities like civil war and revolution face, the presence of homophily effects within the social network of members of the Southwest Zone of the Khmer Rouge appears to drive an endogenous process of network formation in an effort to seek protection and clarify group loyalties while also increasing a tendency to adopt a paranoid conspiratorial mindset toward outsiders (Lichbach 1998). Within-group ties strengthen cohesion and solidarity because they reduce uncertainty and create trust through regular contact with a small number of individuals (Granovetter 1985). The tendency to form limited connectivity among both men and women identified in this study reveals an important mechanism in the formation of social networks within revolutionary organizations that are engaged in the process of state formation and regime consolidation. Khmer Rouge personnel in the Southwest Zone exhibit a strong preference for having few relationships.

Lastly, the results also indicate the presence of transitivity, or triadic closure, as a key mechanism of network formation among Khmer Rouge personnel. Triadic closure indicates a preference for security over effectiveness from an organizational perspective. Closure, however,

brings both costs and benefits, increasing cohesion while limiting the flow of information and coordination across the network (DellaPosta 2016). Moreover, closure is key to creating a sense of solidarity within small-scale clusters. The closure of revolutionary networks around members of the same social group leads to a gradual decrease in the size of an individual's social circle to include only members of fellow revolutionaries while simultaneously reducing communication pathways (della Porta 2013).

Overall, the findings of this study add support to the extensive historical evidence of the existence of patron-client networks and rivalry inside the Khmer Rouge regime. The presence of homophily and network effects highlight the complex nature of network formation. Social networks within the Khmer Rouge are not simply the product of individuals seeking out connections with others with similar attributes but also network self-organization along the lines of preferential attachment (Kim and Altmann 2017). Under the conditions of high-risk activity, homophily and network effects become mutually reinforcing mechanisms of network formation (della Porta 2013). Together, the network effects revealed in this study support the conclusion that criminal and clandestine networks, such as those found in revolutionary organizations, limit information and coordination across the network in an effort to protect members from internal and external threats.

3.8. Conclusion

In conclusion, this paper offers insight into the ways in which endogenous dependencies among actors and their relations drive network formation within formal political organizations. The purpose of this paper was to provide a statistical test of the processes that shape network tie formation within revolutionary organizations. The results of an ERGM reveal that network formation among Khmer Rouge personnel in the Southwest Zone was driven by attraction based

on similar attributes and network self-organization through limited connectivity and closure. This combination of actor covariate effects and network effects resulted in strong within-group ties that limited the flow of information and coordination across different parts of the network while also increasing connectivity and enabling the arrest and execution of Khmer Rouge personnel to spread throughout the network.

Although formally established as a Marxist-Leninist command and control hierarchy designed for efficiency, this ability for coordination was undercut by a social structure defined by a preference for security, compartmentalization, and limited connectivity. The social structure highlighted here appears to have enabled a system of governance that relied on personal loyalty and strong within-group ties a source of organizational cohesion that ironically stood in the way of creating more robust formal institutions needed to establish control over the country under communist rule. The presence of rival patron-client networks within the formal organization actually hindered coordination and collective action.

The results of this paper open the door to several interesting questions for future research. First, how does network formation differ across different types of ties, such as kinship, recruitment, and friendship? Second, given the nested nature of network effects, what else might be learned by disentangling homophily effects and network effects even further? Third, how do within-group ties and between-group ties influence the distribution and patterns of political violence found in revolutionary organizations like the Khmer Rouge? Finding answers to these questions would advance our knowledge of the inner workings of militant organizations and political parties while also contributing to a better understanding the dynamics of real-world networks.

Chapter 4: Strings of Traitors: Networks and the Contagion of Violence in Khmer Rouge Era Cambodia

Abstract

Why do some members of revolutionary organizations become victims of violent purges while others do not? Explanations of political violence have shown that violence is rarely the result of random events but instead used instrumentally; however, we have yet to adequately explain the interpersonal nature of violence and its spread. Using Cambodia's Southwest Zone, this paper provides evidence from the digital archives of the Documentation Center of Cambodia, which contain detailed biographical data on more than 30,000 Khmer Rouge leaders. This paper presents a fine-grained analysis of social networks within the Khmer Rouge to demonstrate how interpersonal relationships shaped patterns of intense political violence. The results of a network autocorrelation model indicate that there is indeed a network effect on victimization among Khmer Rouge cadres. Specifically, I find that exposure to other victims within the network is directly related to the likelihood of victimization.

4.1. Introduction

Why do some people fall victim to political violence during periods of regime change while others do not, despite sharing similar background characteristics as members of high-risk populations? More specifically, why are some members of revolutionary political organizations purged violently while others are not? Existing theories of political violence that focus on intergroup relations (Varshney 2003), regime type (Harff 2003; Davenport 2007), territorial control (Kalyvas 2006), pre-existing grievances (Kalyvas 2006; Balcells 2017), revenge (Hinton 2005; Balcells 2017), and prewar social relations (Hinton 2005; Fujii 2009; Kopstein and Wittenberg 2011; Su 2011; Braun 2016; Finkel 2017) largely take social structure for granted while emphasizing the instrumental nature of violence.

Although much of this research has added to our knowledge about the motives and perpetrators of political violence, these explanations cannot make a convincing case for why some people fall victim to violent purges while others do not. In some instances, victims and survivors alike share similar personal attributes as members of the same high-risk population. If victimization is based on possession of certain characteristics, then it could be argued that purges simply represent a random phenomenon. Our current understanding of political violence, however, is that it is not a random event (Kalyvas 2003). Moreover, instrumentality is based on interests that are based on identity, and identity is constructed out of social relations (McLean 2011; Padgett and Powell 2012). Thus, while the existing literature correctly identifies the importance of social structure as a key factor in explaining violence (Fujii 2009; Su 2011; Straus 2015; Braun 2016), it has rarely dealt explicitly with understanding how the relational nature of politics plays a direct role in the spread of violence.

In this paper, I argue that victimization during a violent purge can be better explained by examining the social networks in which it occurs. Individuals are not purged only because they possess particular characteristics. Attributes such as gender, ethnicity, previous occupation, official position, or length of time in an organization offer an incomplete explanation on their own for the seemingly chaotic nature of a purge. I contend that during violent political purges individuals are arrested and killed because they are socially embedded in a set of social networks that shape the likelihood of becoming a victim or a survivor. As victims are identified, arrested, imprisoned, and executed, their relationships with family, friends, neighbors, and coworkers often become suspect as well. The result is that violence spreads in an epidemic-like fashion in a contagion along social networks, placing individuals at risk according to their personal relationships with others.

I support this claim with evidence from the digital archives of the Documentation Center of Cambodia (DCCAM), which contain detailed biographical data on more than 30,000 Khmer Rouge leaders to reconstruct the social networks of zone administration officials. Using social network analysis, this paper demonstrates how interpersonal relationships shaped patterns of intense political violence under the Khmer Rouge. The results of a network autocorrelation model indicate that there is indeed a network effect on victimization among Khmer Rouge cadres. Specifically, I find that network position, as defined by degree, betweenness, structural similarity, and exposure, is directly related to the likelihood of victimization.

This paper contributes to the literature on political violence in three ways. It is the first study to date to visually map and examine the social structure of the Khmer Rouge. Like any other militant revolutionary organization, social networks shaped the development and trajectory of the Khmer Rouge regime. Social network analysis provides a way to quantify and

systematically inspect the underlying social structure of one of history's most notorious political organizations in an effort to better understand the inner workings of the Khmer Rouge. Second, this paper sheds light on how social relations structure the distribution and patterns of violence in post-revolutionary settings. Social structure has long been identified as a key part of how violence spreads. This paper turns to social network analysis as a means of understanding the relational pathways along which violence moves through a population. Third, this paper brings together the literatures on political violence and genocide/mass killing in order to present new insights into the phenomenon of intra-elite violence in post-civil war and revolutionary settings. The introduction of social networks as independent variable has the potential to add new insight into research at the micro-level.

The remainder of this paper proceeds as follows. The next section situates a theory of violent political purges as a socially embedded phenomenon characterized by social networks within the wider context of studies on violence. Then, the paper turns to a case study of violent political purges from Cambodia's Southwest Zone under the Khmer Rouge, mapping and describing the networks of relationships that lay beneath the zone that the Communist Party of Kampuchea considered one of its premier administrations. The fourth section presents a test of several hypotheses related to the influence of social networks on the distribution of violence from the perspective of individual network position using a network autocorrelation model. The fifth section presents the results followed by discussion. A final section concludes with a summary of the main findings, implications, and possible avenues for further research.

4.2. The Logic of Violent Purges

Internecine violence in the form of fratricide is a frequent feature of revolutionary organizations engaged in the process of regime consolidation, especially in the wake of civil war

(Kalyvas 2006; Fjelde and Nilsson 2012; Staniland 2012; Sudduth 2017; McLauchlin and La Parra-Perez 2018). Fratricide involves violence against loyal supporters using a repertoire of deadly tools, including assassination, mass arrests, torture, and execution (Staniland 2012; Gutierrez-Sanin and Wood 2017). The causes of fratricide, however, are numerous and difficult to disentangle. Fratricide can emerge out of factional competition and conflict over territory, resources, or personality. In other instances, fratricide is the result of ideological dogmas that incentivize adherents to engage in violence against their rivals. Regardless of its origins, fratricide is often seen as a useful strategy through which revolutionaries can consolidate power (Fjelde and Nilsson 2012; Staniland 2012). In particular, political purges in the wake of rebel victory in civil war represent an exceptionally public and lethal form of fratricide aimed at eliminating potential rivals within the regime (Staniland 2012).

Following a successful seizure of power, revolutionaries face the problem of consolidating power from a position of relative weakness, which leaves them vulnerable to a possible coup d'état from regime insiders as well as overthrow by external enemies (Roessler 2011). Under pressure to secure their rule, revolutionaries often pursue coup-proofing strategies, beginning with the elimination of potential internal enemies through purges (Roessler 2011). Given the lack of robust institutions, political survival becomes a deadly game characterized by intrigue, betrayal, and paranoia (McLauchlin and La Parra-Perez 2018). Regime insiders have little guarantee of their safety and thus turn to building their own alliances and base of supporters with the expectation that rivals will eventually move to eliminate them (Roessler 2011). Roessler (2011) argues that under these conditions "eliminating one's rival from power is the only viable strategy to guarantee political and personal survival" (311). Thus, the goal for regime supporters

is the elimination of rival networks in order to consolidate power while their competitors are vulnerable (Sudduth 2017).

Ironically, a coup-proofing strategy of violent purges often undermines a revolutionary regime's ability to produce effective internal governance and defend itself against external threats (Braithwaite and Sudduth 2016). Failure to completely eliminate members of rival factions can lead to defection to the opposition, which can create additional enemies (Roessler 2011; Staniland 2012). Roessler (2011) refers to this situation as the internal security dilemma. Much like the security dilemma that states face in the international system, fratricidal purges can set off a spiral of escalation within the regime as paranoia and suspicion of potential rivals increases (Roessler 2011). Efforts to drive out internal threats carry the risk of creating even more enemies of the regime.

As a form of pre-emptive and selective violence, purges are driven by the assumption that anyone is potentially disloyal and thus, an existential threat to the regime (McLauchlin and La Parra-Perez 2018). Collective targeting in a poor information environment characterized by secrecy, suspicion, and paranoia within the ranks means that the perpetrators of fratricidal violence often rely on stereotypes of disloyalty based on personal attributes. Rather than carried out in response to an actual threat to the regime, individuals are selected based on a perpetrator's belief that a suspect is likely to become an enemy because they fit a specific profile, whether that be gender, age, personal history, ethnicity, or formal role in the regime (McLauchlin and La Parra-Perez 2018).

4.2.1. Networks and the Contagion of Violence

Although an individual's profile certainly plays a role in selection for arrest and execution, violent purges in post-civil war settings appear to be driven by more than identity. In

low information environments characterized by high levels of suspicion and paranoia, purges not only operate on assumptions of guilt but also guilt by association. During a purge, the personal relationships of victims often become suspect. As individuals are arrested and executed, their families, friends, and acquaintances are likely to suffer a similar fate. Thus, guilt by association becomes possible through the underlying social structure found within a revolutionary organization, which can often be described in terms of patron-client relationships.

Much like other post-civil war contexts, revolutionary regimes are not always ruled through strong formal institutions, such as bureaucracies, but by patron-client networks (Baberowski 2012). Moreover, even as bureaucratic power begins to develop, patron-client relationships often find ways to continue to thrive within the formal structures of party and government (McLean 2011). Patron-client relationships are characterized by the networks, factions, and coalitions that exist within the formal structures of party, bureaucracy, and government. Individual clients cluster around a patron to form communities dependent on that patron's position of power. Under this type of system, patrons provide clients with protection and access to resources in exchange for loyalty and support (Scott 1972; McLean 2011).

Patron-client relations also tend to be unstable as clients can choose to move their loyalty to a different patron even if such a shift in support carries a high price. Clients who emerge as patrons with their own following of clients can come to be considered potential rivals or even traitors in the eyes of their former patron. Rival patrons are perceived as enemies who threaten the base of support of their competitors. At the same time, much of the maintenance of patron-client relations falls to patrons who often attempt to prevent defection and disloyalty through a combination of incentives and coercion. The instability inherent in such a system often undermines the development of enduring institutions outside of kinship and contributes to an

atmosphere of competition, suspicion, and paranoia in which patrons engage in a zero-sum contest of survival of the fittest against rivals to claim supporters and amass power (Hinton 2005). Under these conditions, a rapid contagion of violence associated with purges becomes possible as personal relationships provide natural pathways for arrests and executions to follow.

In order to better explain the role of personal connections in purges, a different conceptual framework is needed to understand how violence spreads and how networks can affect the diffusion of arrests and executions. One way to accomplish this objective is to model the contagion of violent purges as an epidemic (Papachristos 2009; Papachristos, Braga, and Hureau 2012; Zhukov 2012). A simple contagion model, also known as a susceptibility and infection (SI) model requires the presence of three conditions, namely an infection, a susceptible population, and pathways along which the epidemic can spread. Transmission occurs as infected individuals come into contact with susceptible individuals (Bianconi 2018). Using an SI model, purges can be conceptualized as specific type of pathogen that affects a high-risk population consisting of members of a revolutionary organization. Just like a lethal virus, purges that result in the execution of suspected disloyal members do not offer the possibility recovery.

Moreover, the ability of a purge to spread is conditioned on the topology of the social networks on which it takes place (Granovetter 1985; Zhukov 2012; Papachristos and Wildeman 2014). A network can be defined as a collection of relationships, identified using graph theory and data visualization to draw the nodes and edges with individuals representing each node and edges the connections between them (Kadushin 2012). The topology of social networks inside an organization refers to the general properties of the networks, including but not limited to distinct communities and structures (Kadushin 2012). Given that individuals vary in the number of connections and occupy positions of different vulnerability, network topology can both constrain

and facilitate the spread of violence during a purge, producing in an uneven distribution of victims and survivors (Papachristos and Wildeman 2014).

Using social networks as an independent variable, this paper examines the patterns of violence that tore through the ranks of the Khmer Rouge during its brief time in power between 1975-1979, focusing on the effect of individual network position on the likelihood of becoming a victim of a violent political purge. I argue that victimization is contagious, and connection to purge victims is likely to increase an individual's own chances of becoming a victim (Papachristos and Wildeman 2014). As a result, contagion is influenced by two factors, namely individual network position and exposure to violence within the network. Individual network position, which is an individual's location within a network, and exposure, which refers to the extent an individual's connections are victimized, allow violence to spread along social networks as a form of contagion. Personal contacts and network structures facilitate the spread of violence and help determine its distribution across the network (Papachristos, et al. 2012).

4.2.2. Network Position

Individual network position within a revolutionary organization plays a part in determining who falls victim during a purge and who survives. In general, network position can be defined as the set of relationships that connect actors in a network (Burt 1976). This paper follows Papachristos's (2011) usage in reference to position as an actor's location within a network in relation to other actors. Moreover, network position can be operationalized using a number of different measures related to network centrality. The following section focuses on three centrality measures, namely degree, betweenness, and structural equivalence. Centrality represents the extent to which an actor is involved in relationships with other actors (Wasserman and Faust 1994). For example, an individual at the center of a star shaped network is said to

occupy a central position. Such a position confers power, prominence, and influence within a network through better access to and control over information or resources while also making an actor more visible (Wasserman and Faust 1994).

Actors with a large number of connections are considered more prominent than other actors because they have many direct connections to others that offer opportunities and options in the form of access to power, information, and resources. In contrast, actors with a low degree have significantly less influence due to their peripheral position characterized by few direct ties to others (Wasserman and Faust 1994). A corresponding network concept, degree refers to the number of direct connections that each individual possesses (Freeman 1978). Moreover, degree is rarely distributed evenly across a network. Large numbers of ties are often concentrated in the hands of a few while most members have only a few direct connections (Kadushin 2012). As a result, it can be expected that actors who have more ties to others are generally more privileged, influential, and prominent within the network, making them better targets as potential threats to rivals. The concept of degree gives rise to my first hypothesis:

> Hypothesis 1: Individuals with a higher number of connections will be more likely to become victims themselves.

While most individuals within militant organizations and revolutionary parties often have relatively few ties compared with a select number of prominent individuals, these peripheral individuals can sometimes occupy key positions that connect different parts of the organization. This concept of betweenness rests on the idea of brokerage or bridging ties. Betweenness is defined as the number of shortest paths an individual sits across, connecting different segments of the network. Individuals who occupy brokerage roles serve as gatekeepers in the network, controlling access to information and resources through their position between different parts of the network (Wasserman and Faust 1994). Although brokerage roles can give an actor with

relatively few direct connections to others a great deal of power, this type of network position also poses a particularly difficult problem during a violent political purge. Sitting across multiple paths between different parts of a network places an individual in a vulnerable position as attacks can come from several directions at once. The concept of betweenness gives rise to my second hypothesis:

> Hypothesis 2: Individuals sitting across multiple paths occupy positions of greater vulnerability and thus are more likely to become victims.

The concept of network position within a militant organization or revolutionary party can also be understood through the concept of structural similarity. Structural similarity is defined as comparable patterns of relations between individuals. In this case, the nodes may represent different actors, but the structural configuration of their ties is similar. Thus, actors that share specific network structures are considered to have a similar network position (Borgatti and Everett 1992). If network structure is a significant factor in determining the pattern of purge victims, then structurally similar positions should result in similar outcomes. This leads to my third hypothesis:

> Hypothesis 3: Purge victims are more likely to share structurally similar positions within the network.

4.2.3. Network Exposure

In addition to properties characterizing network position, it is important to also consider the effect that the exposure to purge victims has on an individual's own chances of becoming a victim. Exposure refers to the extent to which an actor's connections are victimized (Papachristos et al. 2015). Individuals have higher exposure if their network contains victims and lesser exposure if they are not connected to purge victims. In the context of violent political purges, large numbers of connections can be both a blessing and curse. Connections to others

who are victims pose an increased risk for an individual while ties to survivors can increase protection. Direct exposure can be operationalized as a path distance of 1 to a victim. In this case, the immediate friends of an individual are victimized; thus, exposing him or her to also becoming a victim. This suggests a clear connection between network position and exposure to violence and generates my fourth hypothesis:

> Hypothesis 4: Individuals with direct connections to victims are more likely to become victims themselves.

Given the socially embedded nature of individuals within networks inside organizations, indirect connections can also matter in the process of social contagion (Papachristos et al. 2015). Networks that possess higher levels of connectivity can provide pathways along which violence can spread. Indirect exposure can be operationalized as a path distance of 2 to a victim, meaning that a friend of a friend has the potential to put an individual at risk. This leads to my fifth hypothesis:

> Hypothesis 5: Individuals whose indirect connections are purged are more likely to be victimized than individuals whose indirect connections were not victims.

In sum, the likelihood of becoming a purge victim can be best understood as an effect of one's network position and exposure to other victims. Rather than considering individual attributes, I argue that individuals are targeted during a violent political purge in part because of their embeddedness in social networks within revolutionary political parties. As a result, personal relationships facilitate the spread of violence throughout the network.

4.3. Explaining Patterns of Purge Victims

In order to test these hypotheses, fine-grained relational data on the interpersonal connections of the members of a revolutionary organization is required. This paper turns to evidence from the digital archives of the Documentation Center of Cambodia (DCCAM), which

contain detailed biographical data on Khmer Rouge leaders to reconstruct the social networks of administration officials in the Southwest Zone. Using these reconstructed networks, I test the hypotheses outlined in the previous section about individual network position and exposure with members of the Khmer Rouge regime between 1975-1979.

4.3.1. The Data

The Communist Party of Kampuchea (CPK), also known as the Khmer Rouge, provides an ideal case with which to test the hypotheses described in the previous section. As a revolutionary organization, the Khmer Rouge was structured along the lines of a Leninist revolutionary party, known as the *Angkar*, which means "the Organization" (Chandler 1999; Chandler 2008). Directed by a powerful Central Committee led by Pol Pot, the Khmer Rouge reorganized the country into six administrative zones, North, Northeast, Northwest, East, Southwest, and West. Additional administrative units included the Center as well as the Kratie, Siem-Riep/Uddor Meanchey, and Preah Vihear autonomous sectors (Jackson 1989; Short 2004; Documentation Center of Cambodia 2007; Mertha 2014). Each of these administrative zones was ruled by a powerful zone secretary who, in turn, often installed their own patron-client networks, known as *khsae* or "strings" (Chandler 1999; Hinton 2005). For example, the Southwest Zone was controlled by Zone Secretary Mok, also known as Chhit Chhoeun. Mok, sometimes referred to as Ta Mok or Grandfather Mok, had earned the nickname "the Butcher" while serving as one of the top military commanders of the Khmer Rouge forces and a member of the powerful Standing Committee of the Central Committee. A hardened veteran of the struggle against French colonialism and the republic, Mok was also well known for building patronage networks within the institutional apparatus of the CPK. As Southwest Zone Secretary, he installed family members, including children, siblings, and in-laws, in key positions within

the military, administrative, and political structures of the CPK. Under Mok's guidance the Southwest Zone gained recognition from the Party Center as most ideologically pure communist administration in the country (Kiernan 2002; Ea 2004).

Although these networks provided support and protection, the Party Center, led by Pol Pot, viewed rival political networks as an existential threat to the Khmer Rouge regime and sought to destroy them in a series of violent purges. CPK internal security forces, known as the *Santebal*, operated under the assumption that suspects were part of larger networks, or "strings of traitors," actively seeking to undermine the Party (Hinton 2005). In response, the Party Center demanded that the *Santebal* identify all members of a suspect's "string" and eliminate them as well. The personal relations of a suspect immediately came under suspicion and were also targeted for arrest and execution. This included spouses, children, extended family, friends, coworkers, and other associates. These efforts to root out "strings of traitors" was one of the driving forces behind the widespread purges that tore through the CPK cadres, unleashing wave after wave of violence within the ranks of the party (Hinton 2005).

Using the biographical data collected from the Documentation Center of Cambodia (DCCAM) database, this study reconstructs the social networks of members of the Khmer Rouge in the Southwest Zone as a static, cross-sectional network. The digital archives of the DCCAM contain detailed biographical data on Khmer Rouge officials to reconstruct the social networks of zone administration officials. Data were collected from the DCCAM Biographical Database, which contains the digitized and translated biographical records of more than 30,000 Khmer Rouge leaders down to the district level. The archives record a variety of face-to-face ties, including kinship, recruitment, work, and general associations for each individual, which are suitable for reconstructing the social networks within the regime. An initial search located 1,188

individuals associated with the Southwest Zone, using the category "DK Geographical Area 75-79" and search terms "Southwest" and "SW." The search results were used to collect information only on individuals who held an official position in the Khmer Rouge, which fell into four broad categories: military, administrative, labor, or political personnel. For each individual, a selection of attributes and relationships were collected, including name, aliases, gender, date of birth, birthplace, ethnicity, previous occupation, date of joining the revolution, number of years in the organization, pre-Democratic Kampuchea role, role during the Democratic Kampuchea era, geographic zone, region, district, village, kinship relationships, recruitment relationships, superiors, subordinates, and other known associates. Lastly, arrest, arrest dates, execution, and execution dates were also noted. In order to maximize the data available, this study restricts its scope to the social networks within the Khmer Rouge regime, limiting the analysis to the 1,188 individuals who held an official position and their relationships with one another inside the organization in the Southwest Zone.

4.3.2. The Empirical Analysis

The analysis proceeds in two stages. The first stage uses social network analysis to map the social structure of Khmer Rouge officials in the Southwest zone, providing a detailed description of the intra-organizational network. The second stage uses a network autocorrelation model to examine the effect of individual network position on the likelihood of becoming a victim. To evaluate the impact of social networks on the distribution of violence in the Southwest Zone, this paper focuses on individual Khmer Rouge members as the unit of analysis.

The dependent variable used in this paper is whether or not a person falls victim to a purge or not. This is operationalized as a dichotomous variable (No=0, Yes=1). In the case of purges within the Khmer Rouge, individuals who were arrested and/or executed were counted as

victims. While some victims lack information regarding the date of execution, their presence in the records from interrogation and execution center S-21 indicate they were indeed killed as part of the purge. The independent variables of interest in this paper are network position and exposure. Network position is operationalized using degree centrality, betweenness centrality, and structural similarity. Each of these measures captures different aspects of individual position, such as the number of ties, brokerage roles, and configuration of immediate contacts in the network respectively.

Exposure is estimated using an exposure term that accounts for direct and indirect exposure to violence within the network. The exposure term is calculated by multiplying the social network influence weight matrix, which is simply the adjacency matrix of the undirected network, and a vector indicating whether each individual was purged or not (Fujimoto and Valente 2012; Papachristos et al. 2015). The resulting vector is then row normalized, which divides the first vector by another vector indicating the total number of people to which each individual is connected. The resulting term represents the level of peer influence of *j* on *i* as the average effect. This enables the calculation of an individual's network exposure to victims as the percent of an individual's direct contacts who are victims, friends of friends, and other contacts out to a distance of four handshakes away (Leenders 2002; Fujimoto and Valente 2012; Papachristos et al. 2015).

Individual attributes, such as gender (0=Female, 1=Male), age (in years), Khmer ethnicity (0=No, 1=Yes), and previous occupational background, which is divided into dummy variables for military, professionals, service workers, agricultural workers, skilled labor, unskilled labor, and students, are included as exogenous nodal covariates. Whether or not a person joined before the 1975 takeover (0=No, 1=Yes), and role in the Khmer Rouge regime, for which dummy

variables for military, administrative, labor, and political roles, are used. I also include a variable for geographic location, using village as an additional exogenous variable.

Table 4.1. Descriptive Statistics for Individual Attributes.

Variables	Mean	Standard Deviation	Min	Max	N
Gender	0.70	0.46	0	1	1188
Age	26.53	8.77	6	60	1188
Khmer	0.96	0.18	0	1	1188
Previous Occupation					
Military	0.08	0.27	0	1	96
Professional	0.07	0.25	0	1	82
Service	0.03	0.16	0	1	33
Agriculture	0.69	0.46	0	1	818
Skilled	0.05	0.22	0	1	58
Unskilled	0.04	0.19	0	1	44
Student	0.05	0.21	0	1	57
Joined before 1975	0.63	0.48	0	1	1188
Role in Regime					
Military	0.37	0.48	0	1	440
Administrative	0.39	0.49	0	1	469
Labor	0.15	0.36	0	1	184
Political	0.08	0.27	0	1	95
Purged	0.63	0.48	0	1	1188

Demographically, the population of 1,188 Khmer Rouge officials in the Southwest Zone represents a predominantly male group with males accounting for 70% while females make up only 30%. The average age of Khmer Rouge members is 26, but age ranges between the youngest at 6 and the oldest at 60 years old. The Khmer Rouge officials in the Southwest Zone also represent a largely homogenous ethnic background of 96% Khmer. A solid majority of these officials (63%) joined the Khmer Rouge prior to the seizure of power in 1975 and came from an agricultural background. Most officials served in administrative roles followed by military, labor, and political positions respectively. During the period of Khmer Rouge rule, officials in the

Southwest Zone represented 567 different villages scattered throughout the zone. Out of this population of Khmer Rouge officials, a total of 63% were purged between 1975-1979.

4.3.3. The Social Network of Southwest Zone Officials

The network of Khmer Rouge officials described below represents face-to-face relationships within the organization. It does not include those individuals connected to regime officials who were not part of the Khmer Rouge, but instead, focuses on the internal connections among those who were part of the Southwest Zone administration.

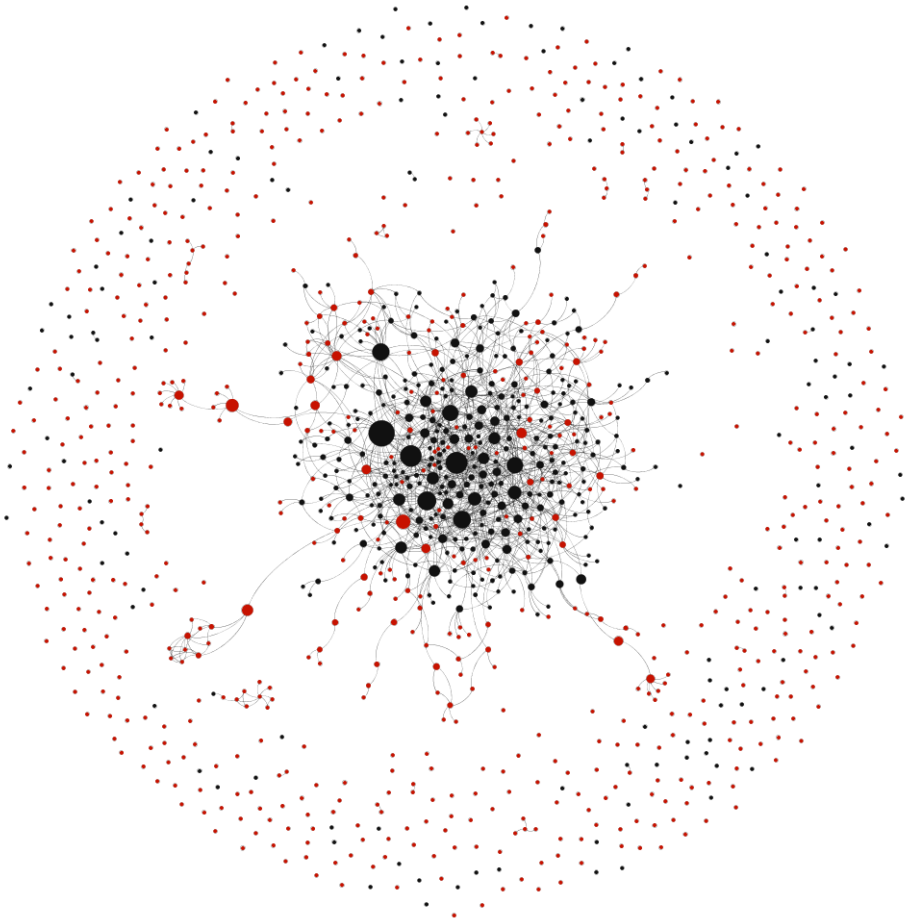
Table 4.2. Southwest Zone Network Summary Statistics

Nodes	1188
Edges	1807
Isolates	571
Average Degree	3.04
Maximum Degree	60
Density	0.0026
Diameter	10
Transitivity	0.27
Assortativity	0.32
Average path length	4.25
Components	597

A visualization of the Southwest Zone personnel network can be seen in Figure 4.1. The network contains 1,807 connections existed among the 1,188 Khmer Rouge officials. Despite the number of ties, the network of Southwest Zone officials is rather sparse, with a density of 0.0026. Each individual has an average degree of 3.04 ties, meaning that every individual has approximately 3 connections to others. The distribution of degree, however, is skewed in favor of a few individuals who possess more connections that the rest of the network. This indicates that the network of Southwest Zone personnel is remarkably open, suggesting a lack of cohesion and that

prevented any single individual from exerting absolute power over the entire network. The network diameter is 10, which represents the longest path length between two nodes as a measure of how many steps it takes to cross the entire network. Average path length is 4.25, which indicates the average degree of separation between any two nodes in the network. With an average path length of 4.25, it is possible to reach any randomly selected node within less than five steps, reflecting a high level of connectivity within the network. For example, even though he occupied a powerful position as Southwest Zone Secretary, Mok had the ability to reach only 42% of the network within a relatively few number of steps, suggesting that although he had strong influence, there were limits to Mok's power.

Figure 4.1 Social Network of Southwest Zone Personnel.

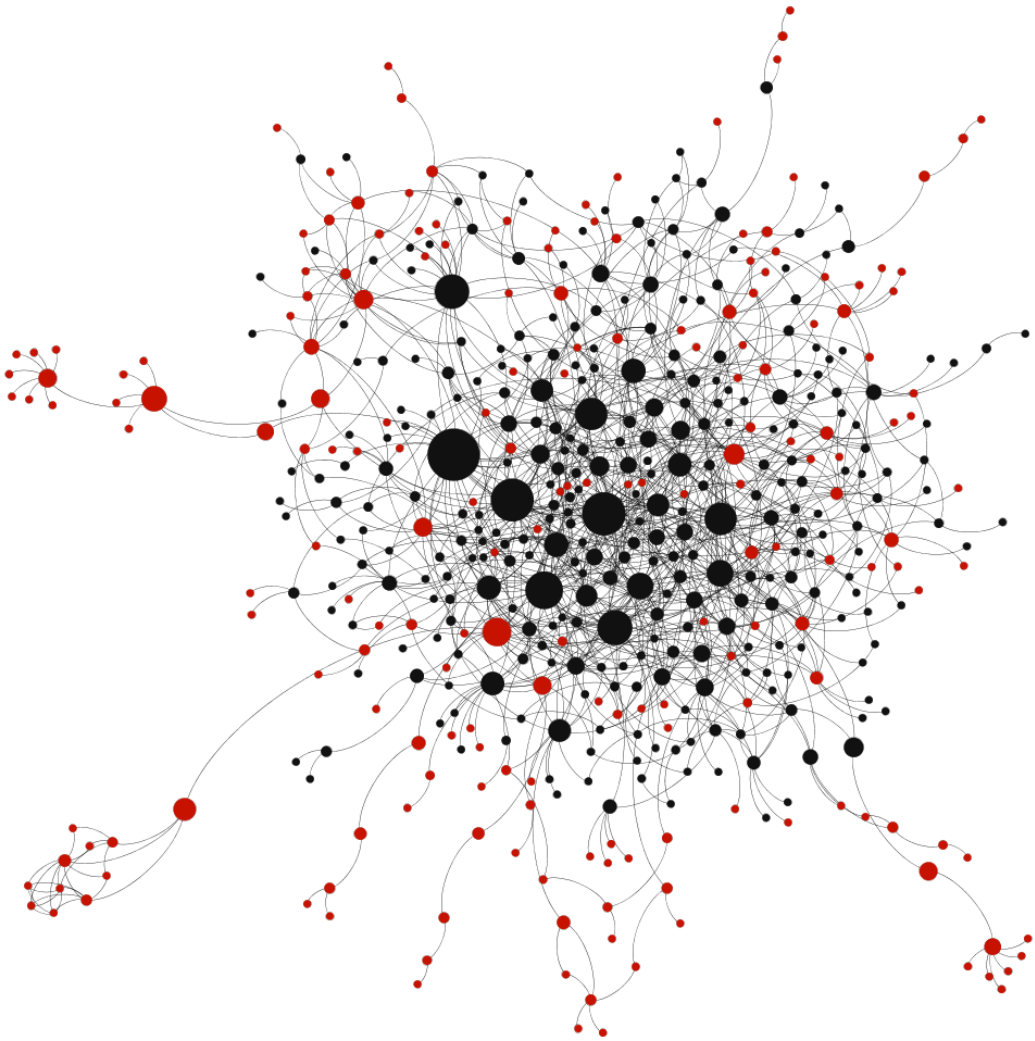


Red nodes = purge victims, Black nodes = survivors

Moreover, the network of Southwest Zone personnel consists of several visually identifiable features. There are 571 individuals who isolates within the organization. These individuals possess no ties to other organizational members. The remaining 617 officials are clustered in 26 identifiable components of which the largest contains 525 individuals. The remaining components vary in size but represent much smaller clusters of individuals or isolates. This large connected component consists of 525 individuals and 1,217 ties, meaning that connections within the network are concentrated largely in this cluster. This is shown in Figure 4.2 below. The presence of a large connected component reflects the tendency of individuals to form clusters. For example, the degree assortativity of the network is 0.32, which suggests that nodes with similar degree tend to form connections with each other. Hubs are connected to other hubs, and individuals with low degree tend to connect with individuals of low degree. The joining together of these hubs makes the emergence of a giant component possible. The giant component represents 44% of the personnel in the Southwest Zone.

Upon visual inspection of the largest connected component, it can be seen that purge victims appear to be clustered. There are areas of the network where victims concentrate and, in many instances, are only a few connections away from each other. On the other hand, there are other parts of the network without any victims where survivors are concentrated. Thus, the largest connected component of the Southwest Zone network provides an appropriate analytic sample with which to study the connections between personnel. The following analysis uses a network autocorrelation model to test for network effects on individual level outcomes related to purge victimization.

Figure 4.2 Largest Connected Component within the Southwest Zone Network.



Red nodes = purge victims, Black nodes = survivors

4.4. Modeling Network Effects

In order to understand the effect that network position and exposure might have on an individual's chance of becoming a purge victim, this paper uses a network autocorrelation model (NAM), using the Temporal Network Autocorrelation Model (tnam) package in R. Although previous studies of violence have accounted for network effects on the distribution of violence using linear regression models, this approach poses a problem when dealing with relational data common to network analysis (Papachristos et al. 2015). Standard linear regression analysis

assumes independent and identically distributed (i.i.d.) random variables. This means that observations can be replaced with any random sample and such an exchange of rows of data would not impact the inferences made. In other words, regression models operate under the assumption that observations have no influence on each other (Cranmer, Desmarais, and Menninga 2012). The relational nature of the data used in network analysis, however, violate this assumption due to the interdependence of observations and autocorrelation of the error terms (Cranmer, Heinrich, and Desmarais 2014). If not accounted for in the model, network effects are likely to be attributed to covariate effects, when in reality, covariate effects might exert no influence on the likelihood of being purged. This is problematic when using regression analysis with network data because it would imply that the model is not specified properly, thereby violating the properties of maximum likelihood estimation (Greene 2003; Cranmer, Desmarais, and Menninga 2012). Therefore, a different approach is needed to examine the effects of the network itself on purge victimization.

Network autocorrelation models are the most widely used statistical models to account for social influence and were developed to specifically deal with the issue of network autocorrelation in regression analysis (Ord 1975; Doreian 1980; Doreian et al. 1984; Ibarra and Andrews 1993; Franzese and Hays 2007; Franzese, et al. 2012; Hadden and Jasny 2017). Network autocorrelation models can take one of two forms. One type, known as the peer effects or network effects model, considers social contagion as the result of not only individual attributes but also interactions with others in the network (Doreian et al. 1984; Leenders 2002; Vitale, Porzio, and Doreian 2016). The network effects model reflects the direct influence of others on an individual within the network (Leenders 2002). A second type of network autocorrelation model is the network disturbances model in which social contagion is modeled as

the result of comparison to others that results in changes in an individual's behavior (Ord 1975; Doreian et al. 1984; Dow et al. 1984; Leenders 2002). This study uses a network effects model to estimate the impact of network position and exposure on the likelihood of victimization.[2]

Network autocorrelation models are not without their own limitations. Mizruchi and Neuman (2008) note that network autocorrelation procedures tend to produce negatively biased estimates of network influence. Mizruchi and Neuman (2008) find that negative bias holds consistent across network types and sizes. This poses two problems for the analysis of social ties using a network autocorrelation model. First, models might not identify that network effects exist. Second, network autocorrelation models consistently underestimate the effects of network influence (Mizruchi and Neuman 2008). This problem of underestimation becomes more problematic with higher density networks; however, for low-density networks like those found in the Khmer Rouge, the bias tends to be less pronounced and only occurs in the case of positive coefficients (Mizruchi and Neuman 2008). Thus, in the case of the Khmer Rouge, the effects can be interpreted in a straightforward manner because significant and negative effects are unlikely biased while significant and positive effects are likely greater than estimates indicate.

[2] The network autocorrelation models used in this paper were implemented using the **tnam** package in R, which is an extension of the **xergm** package for network analysis using temporal network autocorrelation models. **tnam** builds on the spatial autocorrelation model through the **xergm** package and is designed to account for the interdependence of phenomena that are embedded within social networks in a way that satisfies the requirements of maximum likelihood estimation (Leifeld, Cranmer and Desmarais 2014). Additionally, the **tnam** package can be used for either a single time period or multiple time periods by simply adjusting the number of time steps in the model as a well as a dichotomous dependent variable by changing the settings for the type of model (Leifeld, et al. 2014).

Although originally intended to measure the effects of physical proximity, the spatial autocorrelation model can be used to account for peer effects within a social network (Leenders 2002). The network autocorrelation model takes the general form

$$Y = \rho WY + X\beta + \epsilon$$

In this model, purge victimization or survival, Y, is a function of exogenous covariates X and a weight matrix W multiplied by Y so that it represents the effect of an individual's connections. The error term is represented by ϵ. In its simplest form, the weight matrix W is the adjacency matrix for the network (Leenders 2002). The network autocorrelation model does not require the assumption that purge victims are independent of one another. Instead, within the tnam package, the network autocorrelation model can be configured to deal with a variety of network dependencies, including individual network position, network structures, and exposure.

4.5. Results

The results of the models are summarized in Table 4.3. Model 1 is a simple linear regression model in which I examine only the attributes of individual Khmer Rouge members as determinants of purge status. Inspection of individual-level predictors show that the likelihood of becoming a purge victim is greater for males than females and increases for individuals who occupy military, administrative, and labor roles within the regime. Each of these variables attains statistical significance. Occupational background, however, has no effect on the chance of being arrested and executed. Joining the Khmer Rouge before 1975 has a positive effect on the risk of becoming a victim; however, this variable does not attain statistical significance. Thus, the amount of time spent in the organization appears to have been neither protective nor harmful. Likewise, ethnicity is not significant in any of the models due to the fact that most personnel share the same Khmer background. The findings for the effects of personal attributes remain

consistent across all three models. Although not entirely exhaustive, the results suggest that younger, female members of the Khmer Rouge who joined prior to 1975 and served in non-military roles during the DK era were more likely to avoid becoming victims of violent purges. On the other hand, relatively young males who served in labor, military, and administrative roles within the regime stood a higher chance of becoming victims.

In Model 2, I introduce three variables to account for individual network position, defined as degree, betweenness, and structural similarity. The inclusion of network position improves the overall fit of the model with a difference in AIC of 12.25. Finally, Model 3 adds the exposure terms for both direct and indirect exposure. These two terms measure the effect of path distances of 1, a direct connection, as well as indirect connections up to a distance of 4 handshakes away on the likelihood of becoming a victim. Again, the inclusion of the exposure term further lowers the AIC, showing an improvement over Model 2 by 47.60.

Table 4.3. Results of the Network Autocorrelation Models

	Model 1	**Model 2**	**Model 3**
(Intercept)	-4.3341 (1.2673)***	-4.6127 (1.2892)***	-4.8031 (1.3857)***
Gender	2.4105 (0.3485)***	2.3541 (0.3553)***	2.4231 (0.3943)***
Age	0.0570 (0.0170)***	0.0593 (0.0177)***	0.0588 (0.0186)**
Khmer	0.6706 (0.8020)	0.9521 (0.8426)	0.7136 (0.8754)
Previous Occupation			
Military	0.3301 (1.0533)	0.2622 (1.0325)	0.6267 (1.1534)
Professional	-0.4998 (0.8449)	-0.1435 (0.8469)	-0.6585 (0.9835)
Service	1.0532 (1.2086)	0.6948 (1.2039)	0.8245 (1.3147)
Agriculture	-1.2693 (0.7062)	-1.3191 (0.6703)*	-0.9149 (0.7997)
Skilled Labor	-0.4490 (1.1257)	-0.5617 (1.0913)	-0.3632 (1.2699)
Unskilled Labor	-0.8119 (0.9440)	-1.0342 (0.9192)	-0.8645 (1.0559)
Joined Before 1975	-0.1095 (0.3096)	0.0263 (0.3237)	0.1719 (0.3571)
Official Role			
Military	1.4041 (0.3472)***	1.1923 (0.3556)***	1.0096 (0.3834)**
Administrative	0.9842 (0.3889)*	0.7408 (0.4003)	0.8756 (0.4278)*
Labor	2.8695 (0.6609)***	2.8703 (0.7041)***	3.0807 (0.7747)***
Network Position			
Degree		-0.3532 (0.1477)*	-0.4088 (0.1664)*
Betweenness		0.0001 (0.0001)	0.0002 (0.0001)*
Structural Similarity		-0.1221 (0.0619)*	-0.1575 (0.0698)*
Direct Exposure			0.9636 (0.4052)*
Indirect Exposure (Path dist. of 2)			5.5209 (1.5541)***
Indirect Exposure (Path dist. of 3)			-5.8093 (3.7290)
Indirect Exposure (Path dist. of 4)			-15.1586 (8.9764)
AIC	484.9022	472.6571	425.0603
BIC	544.5897	545.1349	514.5916
Log Likelihood	-228.4511	-219.3286	-191.5301
Deviance	456.9022	438.6571	383.0603
Num. obs.	525	525	525

***p < 0.001, **p < 0.01, *p < 0.05

Individual network position defined as degree, betweenness, and structural similarity each return as statistically significant. The models indicate a negative correlation exists between degree centrality and purge victimization. This implies that the more connections an individual possesses the less likely they are to become purge victims, which runs counter to my expectation in Hypothesis 1. Instead, it appears that having a greater number of connections offers a level of security from purges by insulating individuals against the arrest. This negative correlation between number of contacts and purge victimization also suggests that social cohesion is not necessarily the mechanism driving the contagion of violence (Hadden and Jasny 2017). In fact, the results support the opposite conclusion. While cohesion appears to be key to survival, purge victims seem to suffer from the strength of weak ties noted by Granovetter (1973). Betweenness centrality, or brokerage, is positively correlated with purge victimization; however, an increase in the number of paths between other nodes does not lead to a noticeable increase in the odds of being purged. This null finding reveals that betweenness does not affect the likelihood of victimization, contrary to the expectations of Hypothesis 2, which claims that sitting across a greater number of shortest paths between other nodes places an individual in a potentially vulnerable position.

The statistical significance of both degree and structural similarity appear to confirm that the contagion of violence in the Southwest Zone was driven by both divergence and competition within a sparse network. The negative correlation between structural similarity and purge victimization points toward targeting based on structural differentiation, which is indicative of competition within the network aimed at the removal of rivals (Burt and Talmud 1993; Hadden and Jasny 2017). Sharing a structurally similar position decreases the odds of becoming a purge victim. Rather than spreading via similar network substructures, the models indicate that the

contagion of violence is driven by dissimilar structures within an unstable network. This finding is in line with the results found in Models 2 and 3 for betweenness.

Lastly, Model 3 provides evidence that direct and indirect exposure are significant and positively correlated to becoming a purge victim, confirming Hypotheses 4 and 5. This means that an increase in direct exposure to each additional purge victim puts an individual at an increased risk of being purged. For each additional indirect connection at a path distance of 2 that is victimized, the risk of an individual becoming a victim increases. In other words, having a friend of a friend arrested and executed was a cause for concern that an individual would suffer a similar fate. Beyond a path distance of 2, the risk of purge declines. Thus, exposure to purge victims increases the chances that an individual will also be victimized while the further an individual is from purge victims, the less likely they will be arrested and executed.

To better understand the impact of network position on the risk of being purged, I calculated the average marginal effects (AMEs) from the coefficients estimated by Model 3.[3] Average marginal effects provide a useful indicator of the probabilistic impact of network position on the risk of being purged by summarizing the network effects across all observations and reporting the average (LeSage and Pace 2009). Average marginal effects have rarely been used with network models; however, the results are consistent with the overall evidence suggesting the impact of network position on the risk of being purged. Additionally, the results of the network autocorrelation model and its average marginal effects are similar to those produced by standard logistic regression. The results of this comparison are presented in the appendix. Moreover, the findings suggest that the models used in this paper are correctly

[3] Average marginal effects were calculated using the **margins** package in R, which is designed to produce similar results as the margins function in Stata.

identifying a network effect in the contagion of violence. The average marginal effects for the statistically significant results from Model 3 are seen in Table 4.4.

Table 4.4. Average Marginal Effects for Model 3.

	AME
Gender	0.2838
Age	0.0069
Military	0.1183
Administrative	0.1026
Labor	0.3609
Degree	-0.0479
Betweenness	0
Structural Similarity	-0.0185
Direct Exposure	0.1129
Indirect Exposure (Path Dist. Of 2)	0.6467

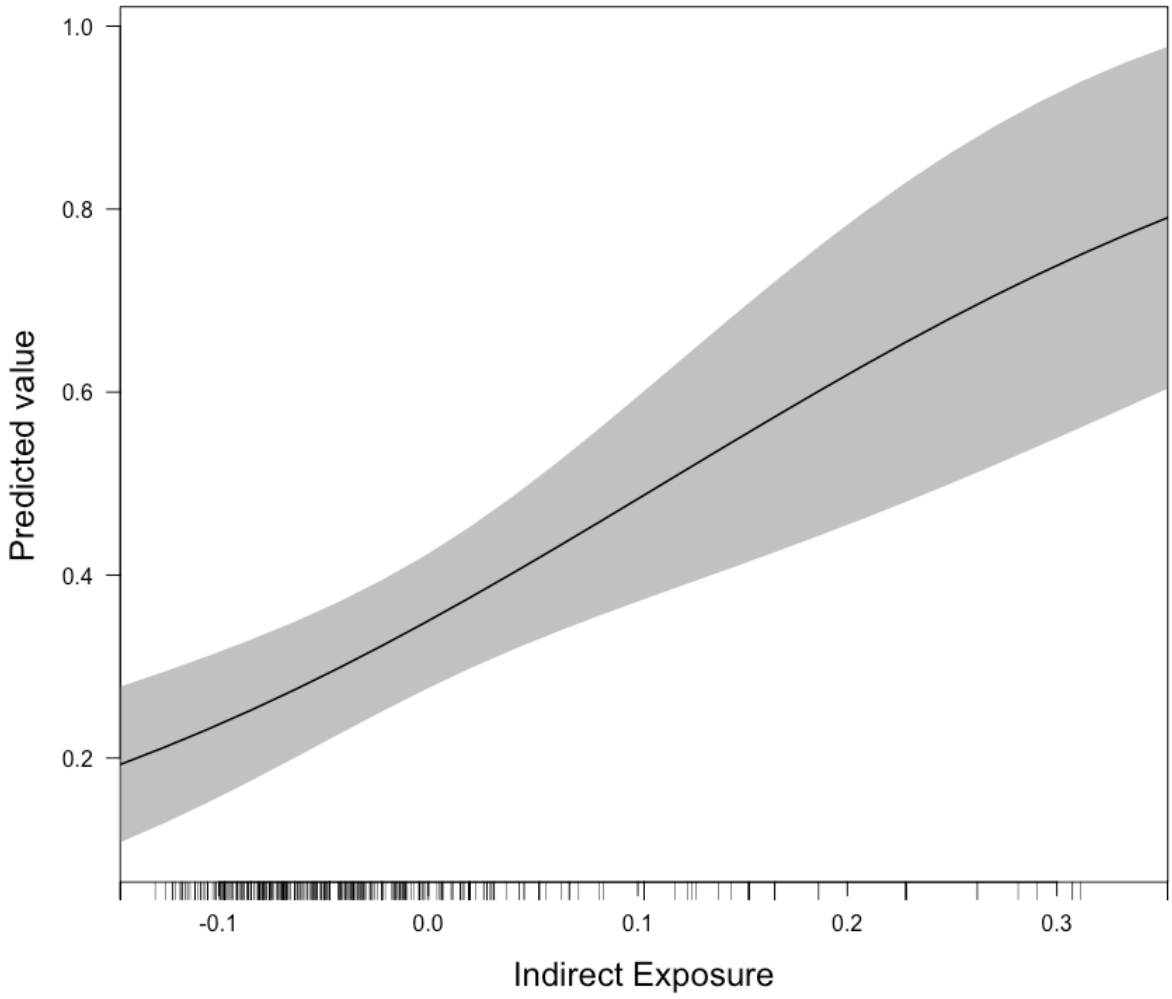
N = 525

Although the effect of degree centrality and structural similarity each lead to a slight decrease in the chance of becoming a victim, the impact is quite small. The null results for betweenness means that brokerage roles do not affect the likelihood of victimization. On the contrary, the statistically significant but negligible findings related to betweenness suggest that brokerage is profitable in terms of survival for some members of the network but also creates risk for others. This is possibly indicative of a more complex phenomenon at work, such as an interaction effect taking place between different variables or differences in the types of relations in the network that would require a more detailed investigation in the future using different network models, such as exponential random graph modeling, as a starting point.

The average marginal effects highlight how direct and indirect exposure dramatically increase the risk of being purged. For instance, the model suggests that having a greater number of connections in general offers protection; however, this ceases to be the case when and if ties are arrested and executed. Rather than insulating an individual from violence, an increase in

direct exposure to each additional victim leads to an 11% increase in the likelihood of being purged.

Figure 4.3 Average Marginal Effect of Indirect Exposure



An increase in indirect exposure at distance of 2 leads to an even greater increase in the likelihood of being arrested and executed than direct exposure. For every additional friend of a friend that is purged, the chance of becoming a victim increases 64%. Figure 4.3 highlights this point by plotting the predicted probabilities from model 3 against the average effect of indirect exposure at a distance of 2. Interestingly, indirect exposure has a larger impact than direct exposure on the likelihood of being purged, which is indicative of a spillover effect, or social

contagion within the network (LeSage and Pace 2009). The quantitative findings also compliment historical evidence that the purges within the Khmer Rouge often reached beyond the initial arrest into the social network of a victim, which was often immediately targeted for arrest and execution. This included spouses, children, extended family, friends, coworkers, and other known associates. The efforts to root out "strings of traitors" led internal security forces to carry out widespread purges that eliminated CPK cadres in large numbers (Hinton 2005). Together, these findings confirm that social networks indeed played a part in the contagion of violence in Cambodia's Southwest Zone during the Khmer Rouge era.

4.6. Discussion

The data on Khmer Rouge personnel in the Southwest Zone reveal a social network of relatively young males who worked in mostly military and administrative roles within the regime. Social network analysis shows a network of 1,188 individuals with an average of 3 personal connections to other members inside the organization. Additionally, ties are clustered in a large connected component consisting of 1,217 ties among 525 individuals. This concentration of connections among Khmer Rouge personnel was instrumental in the contagion of violence across the network, resulting in the arrest and execution of 62.7% of members of the Southwest Zone administration.

The results of the network autocorrelation model clearly indicate a network effect on victimization. Consistent with theoretical expectations, I find that individual network position and exposure are correlated with the contagion of violence victimization during a political purge. Individual network position surprisingly benefits from an increase in the number of direct ties in general. Contrary to expectations, cohesion appears to be a key factor in the survival of Khmer Rouge members in the Southwest Zone rather than the contagion of violence. The estimates for

brokerage roles, however, offer a less clear picture. For some individuals, occupying a bridging position between different parts of the network introduces an element of vulnerability while for others sitting across paths between others offers protection. The tests of structural similarity reveal evidence of instability and competition within the network. This is possibly indicative of the fact that despite official efforts to rid the CPK of personal networks, patron-client ties continued to play a significant role in shaping the behavior of personnel within the organization (Hinton 2005).

Direct exposure to purge victims leads to an increased risk of arrest and execution. While the network autocorrelation model does not indicate causal direction, the results clearly demonstrate a positive correlation between direct exposure to victims and an increased chance of being purged. The results also indicate that this risk extends to indirect exposure through a friend-of-a-friend being purged. Moreover, these findings are consistent with similar research into homicide victims and the contagion of gang violence across social networks in North America, which reveal that network structure plays an important role in the spread of murder across a high-risk population (See Papachristos et al. 2015).

4.7. Conclusion

This paper provides insight into why some individuals fall victim to violent political purges while others do not despite sharing similar characteristics as members of high-risk populations. The results of the network autocorrelation models offer support to the argument that violence is a socially embedded phenomenon that spreads in contagion-like fashion across a network. Individual attributes, such as gender, age, ethnicity, previous occupation, official roles, or length of time in the organization cannot adequately explain why purge victims tend to cluster around another. On the contrary, the results of this study imply that victimization during a

violent purge is better explained by examining individual network position and exposure. The evidence suggests that during violent political purges individuals are arrested and killed because they inhabit a set of social networks that shape the likelihood of becoming a victim or a survivor. As victims are identified, arrested, imprisoned, and executed, their relationships with family, friends, neighbors, and coworkers become natural pathways through which violence spreads.

This paper also highlights the need for a better understanding of the influence of social structure in micro-level studies of political violence. If political violence is indeed a socially embedded phenomenon, then approaches such as those used in this paper should be considered vital to explaining important questions about victimization and survival. The wider implications of these findings suggest that the spread of political violence in general relies on social networks with important consequences for how we understand repression and violence against civilians in general. A secondary implication of this study is the value of using social network analysis in the study of comparative politics and international relations. Given the interdependent nature of many phenomena of interest, network models can help explain a wide range of different puzzles, including ones related to political violence, conflict, peace, trade, alliances, and political economy.

To be clear, the conclusions of this study are limited. Although the network autocorrelation models used in this study do not provide conclusive evidence for a causal test, the results point toward a conceivable causal relationship between network position and exposure and purge victimization. Further research using a temporal network autocorrelation model could possibly help tease out the causal relationship with greater clarity.

Finally, this paper points toward several additional questions for further study. One area of interest deserving additional research is a closer examination of cohesion and structural

similarity, or in some instances, divergence and competition, as mechanisms that drive the contagion of violence. Why, as in the case of the Khmer Rouge, do these particular network features facilitate the spread of violence? Is one more important than the other? Answering these questions would add to our understanding of the underlying mechanisms behind the contagion of violence. Another area in need of more research is the exploration of network structures that drive contagion and produce the observed pattern of victimization. Do network structures help explain the observed differences in the distribution and patterns of victims and survivors within the network? Finding an answer to this question would provide additional evidence that could be used to explain the mechanisms underlying the spread of violent purges. Lastly, the results presented in this paper suggest that using social network analysis can further our understanding of the violent processes related to state formation and the establishment of political order. Further research should seek to identify the types of networks and mechanisms that contribute to resilience and survival.

Chapter 5: Backbone of the Revolution: Networks and the Structural Determinants of Organizational Resilience

Abstract

Why are some militant organizations more resilient than others? What gives some organizations the ability to continue to operate despite losses while others collapse? Existing research points to a number of factors, such as access to resources, formal structure, and ideology; however, missing from these explanations is a detailed analysis using empirical data on the actual networks themselves found within militant organizations. In this paper, I explain how endogenous dependencies influence the resilience of networks within a militant organization. Using Cambodia's Southwest Zone under the Khmer Rouge as an illustrative case, this paper presents evidence from the digital archives of the Documentation Center of Cambodia, which contain detailed biographical data on more than 30,000 Khmer Rouge leaders down to the district level. The archives record a variety of ties, including kinship, recruitment, work, and general associations, which are suitable for reconstructing the social networks within the regime. I argue that endogenous processes play a key role in the formation of networks, which function as the backbone of revolutionary organizations. Using a temporal exponential random graph model, I find that network structure, particularly brokerage and transitive closure, each contribute to the formation of a resilient network structure over time. Ultimately, this paper demonstrates the importance of personal networks to the performance of revolutionary organizations.

5.1. Introduction

Why are some militant organizations more resilient than others? What gives some organizations the ability to continue to operate despite losses while others collapse? Existing research on terrorist organizations (Jordan 2014), mafia syndicates (Agreste, Cantese, De Meo, Ferrara, and Fiumara 2016), and criminal gangs (Ouellet, Bouchard, and Charette 2018) has offered a number of possible explanations as the cause of organizational resilience, including size (Haveman 1993), formal structures (Minkoff 1999; Parkinson 2013; Jordan 2014), and access to resources (Schulman 1993; Minkoff 1999; Weinstein 2007; Humphreys and Weinstein 2008). Moreover, studies of militant organizations in particular have noted the importance of interpersonal networks as a significant factor in the creation of group longevity and survival (Wickham-Crowley 1992; Petersen 2001; Wood 2003; Sinno 2008; Mampilly 2011; Christia 2012; Parkinson 2013; Staniland 2014; Parkinson and Zaks 2018). Although this research has contributed much to our present understanding of the internal dynamics of revolutionary organizations, to date, we still know relatively little about the internal processes that lead to the formation of resilient social networks within these formal institutional structures. Missing from this research is a detailed analysis using empirical data on the actual networks themselves found within militant organizational structures.

In this paper, I argue that the underlying social networks within revolutionary organizations are key to understanding organizational resilience among militant groups. I contend that embeddedness and cohesion play a critical role in the formation of networks which provide the ability of revolutionary organizations to withstand significant losses over time. The temporal evolution of these networks reflects a combination of endogenous processes, such as a tendency to create brokerage positions through weak ties, a preference for decentralized clusters,

and an inclination to seek triadic closure, which each have a direct bearing on organizational capacity for communication and coordination. Operating simultaneously, the processes of cohesion and embeddedness shape the development and effectiveness of formal institutional structures over time. Thus, the purpose of this paper is to examine an aspect of revolutionary organizations that is, thus far, unexplored in the literature, namely the extent to which structural dependencies among actors influence the evolution of networks that are vital to the longevity of militant organizations.

Using archival material made available through the Documentation Center of Cambodia (DCCAM), which contains detailed biographical data on more than 30,000 Khmer Rouge leaders down to the district level, I reconstruct the social networks of Khmer Rouge officials located in the Southwest Zone to support this claim. Through social network analysis, this paper demonstrates how endogenous processes of network evolution led to the resilience of social networks within the Khmer Rouge. The results of a temporal exponential random graph model (TERGM) indicate that the formation of a resilient network is driven by a combination of embeddedness and cohesion.

This paper contributes to the literature on militant organizations, particularly our understanding of social networks as sources of organizational resilience. I present a rare visual map of the social structure of Khmer Rouge personnel, which is then examined in detail. Like many militant revolutionary organizations, social networks shaped the development and trajectory of the Khmer Rouge regime. Longitudinal social network analysis provides a way to quantify and systematically investigate the underlying social structure of the Khmer Rouge in an effort to better understand the inner workings of the regime. Second, this paper provides a statistical analysis of the endogenous processes of network formation that sheds light on the

internal forces that sustained one of history's most notorious militant organizations. Thirdly, this paper also speaks to the broader literature on militant organizations and non-state actors who engage in state formation, offering insight into a process that is often characterized by contestation and violence but rarely studied at such an intimate level.

The remainder of the paper proceeds as follows. The next section turns to a relational theory of organizational resilience as the result of robust social networks. Using Cambodia's Southwest Zone under the Khmer Rouge, I map the social networks beneath the Southwest Zone, which the Communist Party of Kampuchea (CPK) considered one of its model administrations and presents a test of several hypotheses related to network formation using a temporal exponential random graph model. The sixth section discusses the results. A final section concludes with a summary of the main findings and recommendations for further research.

5.2. Organizational resilience

The concept of resilience has developed across a diverse body of research in a number of different fields, including the physical sciences (Holling 1973), social sciences (Meyer 1982; Weick 1993), and management (Christopher and Peck 2004; Sheffi and Rice, Jr. 2005). In general, resilience can be described from two different perspectives. Ecological resilience refers to the ability to withstand external shocks and remain viable as a system while engineering resilience focuses on the "resistance to disruption and speed of return to the pre-existing equilibrium" (Annarelli and Nonino 2016, 3). When applied to organizations, resilience can be defined as the capacity of an organization to withstand shocks and continue operations despite the continued existence of stress (Sutcliffe and Vogus 2003). Additionally, organizational resilience represents a temporal process and is best viewed from a longitudinal perspective that

emphasizes how organizations respond to external shocks over time (Bakker, Raab, and Milward 2012).

Research across an interdisciplinary landscape has identified a number of explanations as the possible source of organizational resilience, including the size of an organization (Haveman 1993), diversification of roles and bureaucratization (Minkoff 1999; Parkinson 2013; Jordan 2014), and access to resources (Schulman 1993; Minkoff 1999; Weinstein 2007; Humphreys and Weinstein 2008). Empirical evidence indicates that there is a positive relationship between size of an organization and its flexibility. Medium to large-sized organizations have the resources and formal structures needed to adapt, making them able to absorb external shocks and reposition resources to meet changes in the environment (Haveman 1993).

Moreover, the size of an organization is directly related to the level of diversification and bureaucratization within the organization. As size increases, organizations often diversify to specialize in different functions, creating routines, rules, and processes to establish order, stability, and efficiency (Jordan 2014). Militant group diversification, in terms of the development of differentiated roles within an organization, is a key source of group longevity, flexibility, and survival (Parkinson 2013). This diversification of roles within militant organizations often takes on the form of bureaucratization through the creation of specific command and control hierarchies as well as separate military, political, and social branches responsible for carrying out specialized functions (Jordan 2014). These formal structures provide an internal system of rules and procedures that give the organization stability as well as clear roles and responsibilities for members when placed under stress (Jordan 2014).

Size and bureaucratization are also important factors that affect an organization's access to resources. Larger, more diversified organizations possess more slack resources, which refer to

resources available within the organization that can be shifted to areas of need in response to external environmental changes (Schulman 1993; Minkoff 1999). In sum, as they age and grow in size, organizations are more likely to have a variety of specialized units, which can provide the flexibility, resources, and speed needed to adjust to changes in the environment without losing operational readiness (Haveman 1993; Minkoff 1999).

5.2.1. A Network perspective on organizational resilience

Although size, diversification, and access to resources are correlated with organizational resilience, these factors fail to explain why some militant organizations are able to continue operating in the face of severe shocks while others with similar traits cease to exist. The fact that large, bureaucratized organizations sometimes fail while smaller, less diversified organizations survive suggests that there are additional causal mechanisms at work. Thus, in order to gain further insight into the internal dynamics of militant organizations, I turn to a relational explanation based on the interdisciplinary study of social networks that examines interpersonal relationships among members as the source of organizational resilience.

Like other kinds of organizations, revolutionary organizations are built and operate on the interpersonal relations that exist between members. Organizations can be defined as identifiable configurations of roles joined by relations that are created for the purpose of accomplishing a particular task (Kadushin 2012; Parkinson and Zaks 2018). Role represents an individual's position in relation to others that is characterized by the attributes each individual possesses or the tasks he or she performs within the organization (Parkinson and Zaks 2018). Knoke (1990) argues that roles are "the basic units of any complex political system" (7). Moreover, roles can be defined by gender, age, and length of time in the organization as well as official positions,

such as military, administrative, or political positions. Roles or positions, however, are most accurately defined in relation to other positions, which are connected by social interactions.

While true that members of revolutionary organizations often take on distinct roles, it is important to consider that organizations also depend on the relations among members. Relations are defined as the interactions between individuals within a revolutionary organization. Social interaction is governed by norms that create expectations and obligations on actors to behave in certain ways (Knoke 1990; Parkinson and Zaks 2018). Moreover, organizations engaged in high-risk activities like criminal activity, terrorism, insurgency, or revolution face internal and external threats to their existence that drive members to form strong within-group ties in an effort to seek protection and clarify group loyalties while also increasing a propensity to adopt a paranoid conspiratorial mindset toward outsiders (Lichbach 1998). Within-group ties strengthen cohesion and solidarity because they reduce uncertainty and create trust through regular contact (Granovetter 1985).

Moreover, formal organizational structures are intended to create a clear chain of command that directs members as they carry out day to day tasks. Diversification often leads to the development of siloed bureaucratic structures designed to carry out specialized tasks or functions, such as military operations or administrative functions (Kadushin 2012). Informal networks, however, often emerge across vertical structures as individuals seek to gain security, efficiency in cooperation, access to resources, and positions of power, which can either align with the goals of the organization or actively work against them (Kadushin 2012). These networks thus form the backbone of a militant organization (Kilduff and Krackhardt 2008; Kadushin 2012; Parkinson 2013; Parkinson and Zaks 2018). Although a hierarchical structure might exist on paper, the "important work in most organizations gets done through networks"

(Cross and Parker 2004, 4). These networks often take priority over formal organizational structures, shaping the way communication and coordination take place within an organization and exerting a direct influence on performance, particularly the capacity to respond to extreme stress (Cross and Parker 2004; Pedahzur and Perliger 2006).

Intra-organizational networks are key to understanding the behavior, cohesion, and dynamics that determine the trajectory of militant organizations (Staniland 2014). For example, insurgent organization trajectories are influenced by pre-war social networks that become part of militant operations (Staniland 2014). Parkinson (2013) identifies this overlap of organizational hierarchy and quotidian relationships within militant organizations as the main source of organizational resilience over time. Pre-existing networks, such as kinship and friendship, that become part of a militant organization provide a supply of ready participants who can be easily mobilized. Additionally, resilience emerges from a combination of horizontal and vertical ties between peers and leaders respectively that determine the level of cohesion within an organization (Staniland 2014). Networks are able to bridge gaps between specialized units, such as military, administrative, social, and political units, providing critical links that create the flexibility necessary for innovation and adaptation in the face of significant disruptions (Pedahzur and Perliger 2006; Parkinson 2013).

Resilience can be defined as a function of the robustness of the networks within an organization that enable it to withstand attacks and continue to exist as a defined network (Barabasi 2016; Annarelli and Nonino 2016). As such, robustness is directly related to network topology, which refers to the overall structure of the network and its properties as a whole (Barabasi 2016; Gao, Barzel, and Barabasi 2016). In general, the topology of a network can provide a measure of robustness by considering the level of network connectivity, which is

associated with the distance between nodes and the diameter. Distance represents the length of the shortest path between a given pair of nodes while diameter indicates to the longest path between a given pair of nodes. Both of these measures capture the reachability of the network. Moreover, if a path exists between every pair of nodes in the network, a connected subgraph called a component is present (Wasserman and Faust 1994). The key question behind understanding robustness then becomes, does the network remain connected as nodes are removed? In other words, robustness can be measured as the effect of node removal on network connectivity, and a network is said to be robust if connectivity remains relatively stable in the face of attacks (Wasserman and Faust 1994; Barabasi 2016). Lastly, network robustness can be calculated directly using the Malloy-Reed criterion to obtain the critical threshold at which the largest connected component ceases to exist.[4] The measure found using this approach reveals the percent of nodes that must be removed in order for the network to collapse and provides a clear indicator of network robustness (Barabasi 2016).

In addition, network robustness is not only related to type of network determined by the topology but also the nature of an attack. Random networks refer to networks in which degree distribution follows a normal distribution, meaning that connections between nodes occur according to probability. Random networks are able to absorb attacks until a certain percentage of nodes are removed, which then results in the collapse of the network into disconnected components (Barabasi 2016). On the other hand, scale free networks describe networks in which degree distribution follows a power law or exponential curve, which reveals that connections

[4] The Malloy-Reed Criterion is defined as $k = \frac{\langle k^2 \rangle}{\langle k \rangle} > 2$, where k = average degree. When k > 2, a giant component is likely to exist. Using the Malloy-Reed Criterion, the robustness of the network can be calculated to locate the critical threshold f_c using the following formula:

$$f_c = 1 - \frac{1}{\frac{\langle k^2 \rangle}{\langle k \rangle} - 1}$$ (Barabasi 2016).

between nodes are unevenly distributed with a few nodes possessing most of the connections found in the network. Although able to withstand random attacks, scale free networks are particularly vulnerable to targeted removal of high degree nodes (Barabasi 2016). In sum, robustness can be measured and analyzed using social network analysis to examine the topology of the network, specifically the level of connectivity present, which has a direct influence on the network's ability to withstand attacks. Of particular analytical interest are the mechanisms that lead to the formation of networks that create organizational resilience.

5.3. Mechanisms of network formation that lead to resilience

For clandestine organizations, such as criminal groups, gangs, terrorists, insurgents, and revolutionaries, resilience and longevity often reflect a tradeoff between the ability to continue to grow through the recruitment of new members and conservation of resources that places a priority on security (Ouellet et al. 2018). Organizational preference for security over efficiency can create a built-in flexibility that provides resilience to attacks but also can produce tension between coordinating collective action through information sharing and maintaining secrecy (Lindelauf, Borm, and Hamers 2011). Balancing these two seemingly opposite organizational needs requires the presence of two different but interrelated mechanisms, namely embeddedness and cohesion, that drive network formation within the organization (Ouellet et al. 2018).

5.3.1. Embeddedness

First, revolutionary organizations have a clear need for efficiency that enables information sharing and coordinates collective action. This organizational efficiency is directly related to the concept of social embeddedness. In general, social embeddedness refers to the fact that actors exist within interactive networks of social relationships, which shape both identities and interests (Granovetter 1985). More specifically, embeddedness is defined as the number of

common neighbors between two individuals (Wasserman and Faust 1994). Accordingly, members of revolutionary organizations are embedded within social networks that exist inside the organization, which produces a level of connectedness necessary for resilience (Parkinson 2013; Staniland 2014).

For Granovetter (1985), the connectivity between actors is key to understanding social embeddedness as the source of trust between members of a network. In general, social relationships provide reliable information that allows actors to know the reputation of others based on past behavior. As a result, social networks mitigate the problem of the Prisoner's Dilemma by allowing actors to gain a degree of certainty about the preferences of others and anticipate their actions. In the context of revolutionary organizations, direct ties are necessary for generating trust with other members of the organization, reflecting a preference for interacting with individuals whose reputation and history of past behavior can be known (Granovetter 1985). This, in turn, reduces uncertainty and provides a level of predictability.

Even though social networks create trust and reliable behavior, Granovetter (1985) points out that relationships "are not sufficient to guarantee these and may even provide occasion and means for malfeasance on a scale larger than in their absence" (491). In some instances, interpersonal relationships characterized by trust actually enable betrayal and violence on a much wider level than if actors existed independently and alone. Granovetter (1985) offers three reasons for why this is the case. First, trust can also present an occasion for wrongdoing. People are less suspecting of those they know and trust. Trusting relationships also have the potential for creating vulnerabilities. Second, "force and fraud are most efficiently pursued by teams," which depend on trust that often emerges out preexisting personal connections (Granovetter 1985, 492). The trust found in networks enables groups to carry out actions efficiently; however, it also

creates the possibility that entire networks can be taken down through the arrest or elimination of a single member. Third, Granovetter (1985) claims that the scale and reach of bad conduct is shaped by the social structure of these relations. Additionally, networks are not distributed evenly society evenly, meaning that some individuals are more connected than others, placing them in situations with differing degrees of opportunity and constraint as coalitions form and dissolve. For some, these networks offer protection while preying on victims. At the same time, networks can also create risk for other actors who occupy vulnerable roles (Granovetter 1985). As a result, the need to maintain security can create incentives for members of an organization to limit their connectivity (Simmel 1950; Erickson 1981; DellaPosta 2016).

5.3.1.1. Brokerage Roles

Under these circumstances, organizational efficiency can often be achieved through brokerage positions. According to Granovetter (1973), acquaintances, or "weak ties," provide key points of contact by acting as bridges or brokers between different parts of a network that might otherwise be disconnected. Social networks among members of a revolutionary organization are likely to contain brokerage positions, which offer a number of distinct advantages that aid the development of organizational efficiency (Parkinson 2013). For example, weak ties guarantee the ability of information and resources to move from one part of a network to another (Parkinson 2013). Clusters or hubs within a network resemble closed systems that are cut off from other parts of the network, which limits members' ability to access information and resources. Brokerage positions help overcome this problem by providing important connections between distant parts of a network (Burt 1992; Kadushin 2012). Thus, brokerage positions allow revolutionary organizations to avoid the problem of vulnerability posed by large clusters of

members directly linked to one another, giving the organization a level of functional connectivity and flexibility needed to remain resilient (Parkinson 2013). This leads to my first hypothesis.

> Hypothesis 1: Brokerage positions are likely to be a key factor in the formation of resilient networks.

5.3.2. Cohesion

Although revolutionary organizations can benefit from the efficiency of embeddedness, they also face pressure to maintain cohesion against both internal and external threats (Crenshaw 1992; Lichbach 1998; Ouellet et al. 2018). Cohesion describes the way in which social structure, particularly multiple independent paths between individuals, enables members of a group to stick together. In a more technical sense, cohesion refers to the minimum number of individuals that can be removed from the group before it ceases to remain connected. In other words, cohesion is a reflection of the robustness of the underlying networks within an organization (Moody and White 2003).

Strong within-group ties to other members tend to help insulate the group against attacks, create a shared sense of identity, and reduce the chance of defections (Lichbach 1998; Hafez 2003; Della Porta 2013; Ouellet et al. 2018). Such solidarity is the result of regular interaction, often along preexisting social networks that run much deeper than formal organizational structures (Parkinson 2013; Staniland 2014). These social networks strengthen cohesion by reducing uncertainty and building trust among members (Granovetter 1985). Lusher, Koskinen, and Robins (2013) argue that the formation of cohesive personal relationships into social networks is the result of two interrelated processes, namely attraction based on individual attributes, also known as homophily, and the structure of the network itself, which is the product of endogenous processes such as clustering and network closure.

5.3.2.1. Homophily

Relationships within revolutionary organizations are often the product of individual selection. Social network analysis identifies the tendency for individuals to form strong within-group relationships, often with others who share similar attributes, as homophily, which is sometimes explained as the idea that "birds of a feather flock together" (Lazarsfeld and Merton 1954; McPherson, Smith-Lovin, and Cook 2001; Kadushin 2012). This attraction can be based on status, values or attributes and is often founded on pre-existing relationships, such as kinship (McPherson, Smith-Lovin, and Cook 2001).

Among members of a revolutionary organization, relevant attributes that attract individuals to one another can often gender, age, ethnicity, survival, geographic co-location, previous occupation, official role in the organization, and social group. Shared gender and ethnicity can enable coordination (Parkinson 2013; Larson 2016, 2017; Larson and Lewis 2018). Moreover, survivors of intra-organizational violence are often found connected to one another as violence tends to travel along the natural pathways of social networks, producing chains of victims and survivors (Papachristos et al. 2014).

In addition, homophily can also be driven by other kinds of characteristics, such as being located in the same geographic location (McPherson et al. 2001), having similar skill sets related to occupational backgrounds (Huang 2017), and sharing in common experiences that create cohesion among members, such as serving together in the same unit under stressful conditions (Parkinson 2013; Staniland 2014). Each of these characteristics can cause members to build and maintain strong ties with one another. Due to the propensity to favor within-group ties, the presence of homophily can exert a significant effect on the structure of networks (Krivitsky and

Morris 2017). Thus, it is important to test for the presence of homophily, which leads to my next two hypotheses.

> Hypothesis 2: Actors are more likely to form strong ties with individuals who have similar attributes than build relationships with others who have different attributes.
>
> Hypothesis 3: Actors are more likely to form strong ties with members of their own social groups than between-group ties.

Although individual attributes play a role in network formation, the self-organization of social networks via endogenous dependencies that exist between ties also contribute to the development and trajectory of networks within formal organizational structures (Lusher et al. 2013). These self-organizing characteristics are known as structural effects and are related to the topology of the network itself. Two types of network structures are of particular interest when examining large, complex militant organizations, namely degree centrality and closure.

5.3.2.2. Degree Centrality

Although members of revolutionary organizations must address the need for connectivity, the demand for cohesion in high-risk environments often leads to the formation of strong within-group relations (Scott 1972; DellaPosta 2016). As a particular type of within-group structure, patron-client ties characterized by networks, factions, and coalitions that often exist within the formal institutions of militant organizations, political parties, and bureaucracies of the modern state (Scott 1972; Knoke 1990; Hicken 2011). Traditionally, systems of patron-client relations provide clients with protection as well as access to opportunities while patrons received support and loyalty from their base. These informal structures are based on clusters of individuals who form communities dependent on a patron and exhibit multiplex behavior in the overlapping ties that form out of kinship and other types of relationships (Scott 1972; Knoke 1999; Hinton 2005). Patron-client relations, however, are also rarely equal. Patrons usually occupy a position of

power and access to resources that cannot be matched by their clients, making the clients somewhat dependent on the patron. Even though this relationship is instrumental in nature, it does not give patrons absolute power (Hinton 2005).

Moreover, patrons must deal with the reality that their clients can choose to switch their loyalty to a different patron even if such a move proves costly. This tends to create an atmosphere of "suspicion and distrust" within patron-client systems (Hinton 2005, 124). Clients who begin to be seen as a patron in their own right, gaining their own clients, can come to be viewed as potential rivals or even traitors in the eyes of their former patron. Rival patrons are viewed as enemies who seek to undermine one's own position of power. At the same time, much of the maintenance of patron-client relations falls to patrons who often attempt to prevent defection and disloyalty through incentives and coercion. The instability inherent in such a system often leads to the absence of lasting institutions outside of kinship and an environment marked by paranoia and suspicion (Hinton 2005).

Using social network analysis, patron-client relations can be understood through the concept of degree centrality, which refers to the number of direct connections that each individual possesses (Freeman 1978). Actors with a large degree, such as patrons, are considered more prominent than other actors because they have many direct connections to others that offer opportunities and options in the form of access to power, information, and resources. In contrast, actors with a low degree have significantly less influence due to their peripheral position characterized by few direct ties to others (Wasserman and Faust 1994). Moreover, degree is rarely distributed evenly across a network. Large numbers of ties are often concentrated in the hands of a powerful few while most members have only a few direct connections (Kadushin 2012). The overall tendency in systems characterized by patron-client networks and clandestine

activity means that there is often a tendency toward decentralization within the network. This phenomenon leads to the formation of multiple star-like clusters that serve as the building blocks of patron-client networks (Scott 1972; Hicken 2011; Lusher et al. 2013). This raises a fourth hypothesis.

Hypothesis 4: Individuals are likely to form multiple, decentralized star-shaped clusters.

5.3.2.3. Closure

In addition to a tendency to gather in clusters around patrons connected by brokers, DellaPosta (2016) argues that in the case of clandestine and criminal networks, individuals face transaction costs in finding partners they can trust, reputational costs that accompany the formation of between-group ties, and opportunity costs in time spent developing those relationships. Individuals face transaction costs in the formation and maintenance of relationships that prioritize trust. Strong ties offer better security and are easier to form along the lines of pre-existing relationships, such as kinship. Members of revolutionary organizations also face reputational costs as relationships with outsiders can raise questions about within-group loyalty to one's own patron-client network. Opportunity costs restrict the choices of individuals to seek relationship outside their own social group. It becomes much easier to rely on within-group ties for access to resources and opportunities than to build relationships with outsiders (Erickson 1981; DellaPosta 2016).

Due to these concerns, individuals in clandestine networks can exhibit a preference for network closure, which is characterized by strong within-group ties, in order to gain security at the expense of network effectiveness (DellaPosta 2016). Closure constrains both the sharing of information across the network as well as coordination between other parts of the network (DellaPosta 2016). Network closure, also knowns as transitivity, refers to the tendency for

groups of three individuals to form closed triangles within a network (Lusher et al. 2013). Undirected networks can contain four possible types of relations among three nodes (no tie, one tie, two ties, and three ties); however, triangular ties tend to be structurally balanced, which means that if *i* and *j* share a relationships and *j* and *k* also share a relationship, then *i* is likely to form a relationship with *k* as well (Wasserman and Faust 1994). More often than not, these triangular structures are found grouped in clusters that form the basis of network communities. This leads to my fifth and final hypothesis.

> Hypothesis 5: Individuals are more likely to form closed triangles than open relationships designed for efficiency.

In sum, the resilience of militant organizations is driven by much more complicated mechanisms than embeddedness or cohesion alone. In reality, the formation of resilient networks on which organizational longevity is built emerge from both embeddedness and cohesion. Together, these two mechanisms give organizations the ability to balance between efficiency and security (Ouellet at al. 2018).

5.4. Method

Standard statistical approaches, such as logistic regression, are not well-matched for analyzing social networks due to the interdependence of ties within the network. Linear regression models operate under the assumption that observations are independent and identically distributed (i.i.d.). The i.i.d. assumption suggests that an observation can be replaced with any randomly selected sample and that such an exchange of rows of data does not affect the inferences that can be drawn from the data. Put differently, standard regression models assume that observations are completely independent from one another (Cranmer, Desmarais, and Menninga 2012). The complex relational nature of network data, however, clearly violates this

assumption due to the interdependence of observations and autocorrelation of the error terms (Cranmer, Heinrich, and Desmarais 2014).

One approach to deal with these interdependencies between observations is the use of exponential random graph models (ERGMs). ERGMs can be used to predict the likelihood of tie formation and are useful for identifying the processes through which network formation happens (Cranmer, Desmarais, and Menninga 2012). Rather than focusing on individual level outcomes, an ERGM uses the network itself as the dependent variable to explain the pattern of ties found in an empirical network (Lusher et al. 2013). Moreover, an ERGM assumes that network ties are the outcome of a combination of exogenous factors, including actor attributes, and endogenous, self-organizing principles related to network topology (Lusher et al. 2013). Thus, ERGMs offer a way to model both exogenous and endogenous mechanisms of network formation in a single approach.

In this paper, I use an extension of a standard ERGM to analyze the longitudinal networks within a revolutionary organization. The temporal exponential random graph model (TERGM) is designed to include inter-temporal dependencies in longitudinal networks. As such, a TERGM "conditions the realization of the network in each year on previous realizations of the network" (Leifeld, Cranmer, and Desmarais 2018). I estimate the TERGM using bootstrap pseudolikelihood (MPLE) (Desmarais and Cranmer 2012). In contrast to an ERGM, which uses a computationally expensive Markov chain Monte Carlo (MCMC) approach, a TERGM using bootstrap pseudolikelihood offers a less intensive method for estimating maximum likelihood distributions with large networks as well as longitudinal networks (Leifeld et al. 2018). Additionally, unlike other network models, a TERGM using bootstrapped pseudolikelihood

estimation can correct the downward bias in uncertainty measures associated with this method in single network ERGMs (Desmarais and Cranmer 2012; Leifeld et al. 2018).[5]

5.5. Data and measurement

In order to test the hypotheses described above, I turn to the case of the Communist Party of Kampuchea (CPK), also known as the Khmer Rouge, which began as a clandestine effort to establish communist rule in Cambodia and eventually seized power to establish a violent revolutionary regime from 1975-1979. As a revolutionary organization engaged in the process of state formation, the Khmer Rouge was structured along the lines of a Leninist revolutionary party, known as the *Angkar*, which means "the Organization" (Chandler 1999; Chandler 2008). Directed by a Central Committee led by Pol Pot, the Khmer Rouge reorganized the country into six administrative zones, North, Northeast, Northwest, East, Southwest, and West. Additional administrative units included the Center as well as the Kratie, Siem-Riep/Uddor Meanchey, and Preah Vihear autonomous sectors (Jackson 1989; Short 2004; Documentation Center of Cambodia 2007; Mertha 2014). Each of these administrative zones was controlled by a powerful zone secretary who, in turn, often installed their own patron-client networks, known as *khsae* or "strings" (Chandler 1999; Hinton 2005).

For example, the Southwest Zone was controlled by Zone Secretary Mok, also known as Chhit Chhoeun. Mok, sometimes referred to as Ta Mok or Grandfather Mok, had violent reputation that earned him the nickname "the Butcher" while serving as one of the top military commanders of the Khmer Rouge forces and a member of the powerful Standing Committee of the Central Committee. A veteran of the fight against French colonialism and the republic, Mok

[5] This is accomplished using the btergm function, which is part of the **xergm** package in R (Leifeld et al. 2018).

was also well known for building patronage networks within the formal structures of the CPK. As Southwest Zone Secretary, he installed family members, including children, siblings, and in-laws, in strategic positions within the military, administrative, and political structures of the CPK. The practice of establishing and maintaining patron-client networks gave zone secretaries a degree of autonomy from the Party Center, especially during the period of civil war leading up to the fall of Phnom Penh and into the early months of the new regime (Kiernan 2002; Hinton 2005). This meant that zone secretaries often operated through extensive patron-client networks (Hinton 2005).

These networks provided support and protection for members of the Khmer Rouge; however, the Party Center, led by Pol Pot, viewed these rival political networks as an existential threat to the regime and sought to destroy them in a series of violent purges. CPK internal security forces, known as the *Santebal*, operated under the assumption that suspects were part of larger networks, or "strings of traitors," actively seeking to undermine the Party (Hinton 2005). In response, the Party Center demanded that the Santebal identify all members of a suspect's "string" and eliminate them as well. The personal relations of a suspect immediately came under suspicion and were also targeted for arrest and execution. This included spouses, children, extended family, friends, coworkers, and other associates. These efforts to root out "strings of traitors" drove widespread purges that tore through the CPK cadres during the party's 48 months in power (Hinton 2005).

The Southwest Zone, however, represents a particularly interesting case from which to examine the resilience of the Khmer Rouge. Under Mok's administration the Southwest Zone gained recognition from the Party Center for its accomplishments in advancing the goals of the revolution (Kiernan 2002; Ea 2004). Moreover, in the face of challenges associated with regime

consolidation, the Party Center relied on Mok's loyalty to Pol Pot to use Southwest Zone cadres as its main weapon against potential rivals from other zones (Kiernan 2002; Ea 2004; Hinton 2005). Thus, the Southwest Zone represents a significant part of the Khmer Rouge that deserves further investigation.

This paper relies on evidence from the digital archives of the Documentation Center of Cambodia (DCCAM), which contain detailed biographical information on Khmer Rouge officials to reconstruct the social networks of Southwest Zone personnel. Data were collected from the DCCAM Biographical Database, which contains the digitized and translated biographical records of more than 30,000 Khmer Rouge members down to the district level. The archives record a variety of ties, including kinship, recruitment, work, and general associations for each individual, which are suitable for reconstructing the social networks that existed within the organization as a single contact network based on direct personal ties.

An initial search of the Biographic Database located 1,188 individuals associated with the Southwest Zone through the category "DK Geographical Area 75-79" and search terms "Southwest" and "SW." The search results were used to collect information only on individuals who held an official position in the Khmer Rouge, which fell into four broad categories: military, administrative, labor, or political personnel. For each individual, a selection of attributes and relationships were also collected, including name, aliases, gender, date of birth, birthplace, ethnicity, previous occupation, date of joining the revolution, number of years in the organization, pre-Democratic Kampuchea role, role during the Democratic Kampuchea era, geographic zone, region, district, village, kinship relationships, recruitment relationships, superiors, subordinates, and other known associates. Lastly, arrest, arrest dates, execution, and execution dates were also noted. This information was coded and placed into two data structures,

one containing attributes of individuals and the other listing all of the dyadic relationships within the Southwest Zone administration. Using the biographical data collected from the DCCAM database, I then reconstructed the social networks of members of the Khmer Rouge in the Southwest Zone as an undirected, temporal network for each month between March 1975-February 1979, producing a longitudinal network that covers a 48-month period. In order to maximize the data available, this study restricts its scope to the social networks within the Khmer Rouge as a militant revolutionary organization, limiting the analysis to the 1,188 individuals who held an official position and their face-to-face relationships with one another inside the organizational structure of the Southwest Zone.

5.5.1. The social network of Southwest Zone personnel

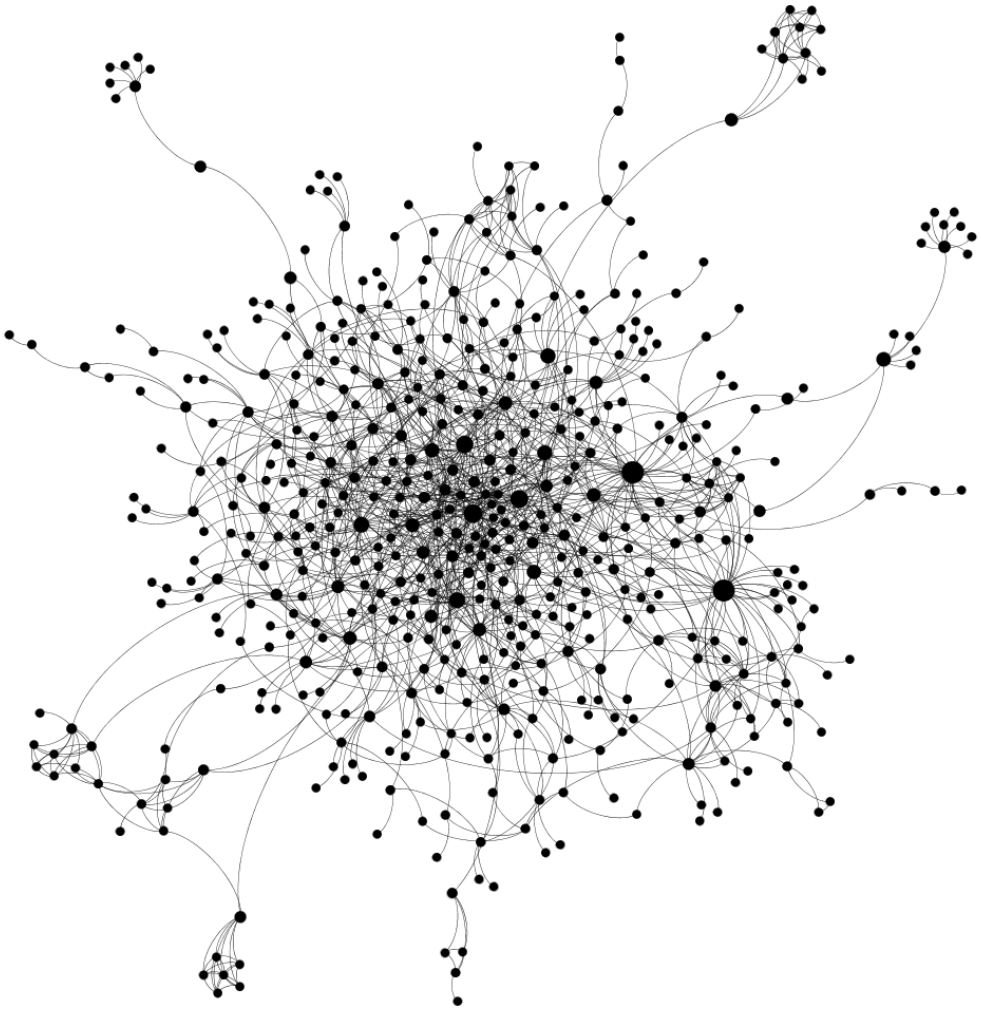
The dependent variable of interest in this study is the network itself in order to uncover the properties that give rise to organizational resilience over time. The network of Khmer Rouge officials described below represents a contact network, consisting of face-to-face relationships among personnel within the organization. It does not include individuals connected to regime officials who were not actually part of the Khmer Rouge, but instead, focuses on the internal connections among those who were part of the Southwest Zone administration.

The social network of Khmer Rouge personnel in the Southwest Zone contains 1,807 connections among 1,188 officials. The population of 1,188 Khmer Rouge officials in the Southwest Zone provides a picture of an organization consisting of mostly male members with men comprising 70% of the personnel and women the other 30%. The average Khmer Rouge member was relatively young 26 years old, but age ranges between the youngest at 6 and the oldest at 60 years old. The Khmer Rouge officials in the Southwest Zone also represent a largely homogenous ethnic group with 96% identifying as Khmer. A solid majority of these officials

(63%) joined the Khmer Rouge prior to victory in the civil war in April 1975 and came from an agricultural background as peasant farmers. Most officials served in administrative roles followed by military, labor, and political positions respectively. During the period of Khmer Rouge rule, officials in the Southwest Zone were scattered throughout 567 different village locations.

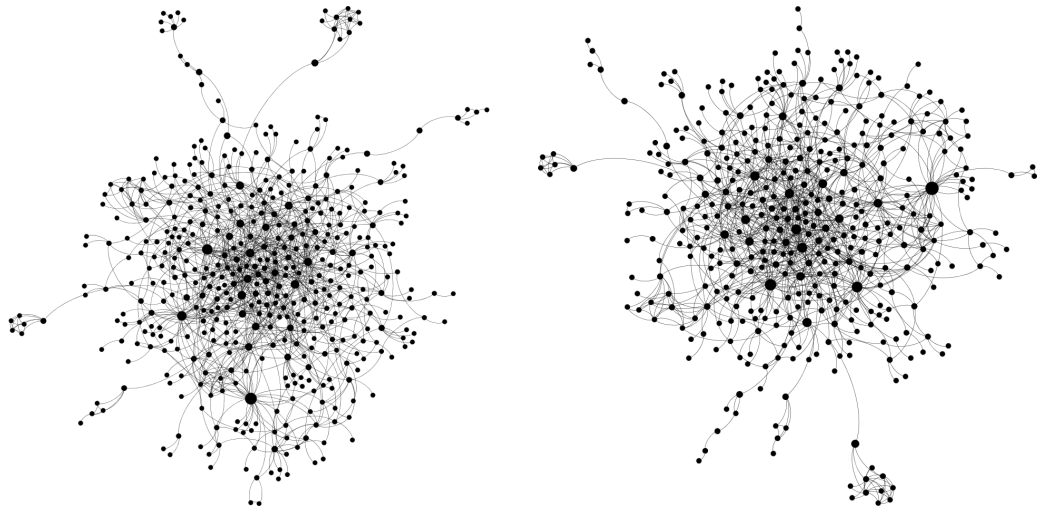
On first glance, the network reveals also several visually distinct features. First, there are a considerable number of isolates. In fact, there are 571 individuals who possess no ties to other organizational members. Second, the remaining 617 officials are clustered in 26 identifiable components of which the largest contains 525 individuals. This large connected component consists of 525 individuals and 1,217 ties, meaning that connections within the network are concentrated in this component with 44% of the personnel and 67% of all ties in the Southwest Zone. Additionally, there are 22 distinct social groups nested within the largest connected component, reflecting a tendency for individuals to form smaller clusters joined together by brokerage positions. There is, however, a clear core-periphery structure in which the majority of ties are densely clustered in a few groups around the center. The largest connected component as it existed in April 1975 is shown in Figure 5.1 below.

Figure 5.1. Largest Connected Component within the Southwest Zone Network, April 1975



Between 1975-1979, the Khmer Rouge sought to rid itself of internal enemies through a series of intra-party purges that led to the arrest and execution of 63% of Southwest Zone personnel. As a result, the network of Khmer Rouge officials in the Southwest Zone shrank from 525 to 334 between 1975 and 1979. In the same period, however, no new relationships were formed among officials. This loss represents a significant shock to the organization, yet despite this self-inflicted wound, the Southwest Zone continued to operate. Changes to the network over time can be seen in Figure 5.2.

Figure 5.2. Southwest Zone Networks, 1976-1979



a. 1976 b. 1977

c. 1978 d. 1979

Annual measures of network robustness, including diameter, average path length, and connectivity can be seen in Table 1. Between 1975-1979, network diameter remained relatively consistent, changing from 10 to 8. This means that the longest path between any given pair of nodes shortened by a distance of two individuals. Average path length decreased each year, falling from 4.26 in 1975 to 3.64 in 1979. This suggests that as members were forcibly removed

the network closed ranks, decreasing the distance between individual personnel and making it easier to reach other members within the network.

Table 5.1. Robustness measures for Southwest Zone networks, 1975-1979.

	1975	1976	1977	1978	1979
Diameter	10	12	11	10	8
Average Path Length	4.26	4.18	4.05	3.93	3.64
Connectivity	1	0	0	0	0
Critical threshold	0.725	0.712	0.704	0.701	0.703

Vertex connectivity moves from 1 to zero, meaning that although the largest connected component continues to exist, small pieces of the network are easily removed. Using the Molloy-Reed Criterion, the critical threshold remains above 70% throughout the forty-eight months Khmer Rouge rule (Barabasi 2016). In contrast, the percent of members removed from the network is below 50%. This indicates that the losses fail to reach the critical threshold required to cause the core of the network to break down, implying the presence of a robust network (Barabasi 2016). Together, these measures demonstrate that the Southwest Zone displayed a remarkable amount of resilience during the period of Khmer Rouge rule despite suffering significant losses due to internal party purges.

5.5.2. Model specification

Given its ability to withstand a considerable shock, further examination of organizational resilience based on network topology of the Khmer Rouge in the Southwest Zone requires understanding the underlying mechanisms that drive network formation. In a TERGM, actor covariate effects can used to control for actor activity. Actor activity effects, or main effects, indicate whether an individual with a particular attribute is more or less likely to be socially active in forming ties to others within the network. In the model used in this paper, a total of

three actor activity effects (gender, age, and length of time in the organization) are used as control variables. The actor covariate effects for activity included in the model are gender (0=Female, 1=Male), age (in years) and whether or not a person joined before the 1975 takeover (0=No, 1=Yes) as a measure of the social activity of individuals through the number of times an actor with a particular attribute appears in an edge (Handcock, Hunter, and Morris 2008).

5.5.2.1. Embeddedness

Embeddedness, which is characterized by brokerage positions within the network, can be operationalized using an alternating k-2-path across dyads, also known as dyadwise shared partner distribution (Lusher et al. 2013). This term enables a test of "whether *k* shared partners encourage the presence of a tie between two nodes" (Lusher et al. 2013, 70). In other words, this term is intended to capture the likelihood of the emergence of brokerage positions within the network. To capture this effect, the geometrically weighted dyadwise shared partner distribution (GWDSP) is used to help avoid issues of model degeneracy (Lusher et al. 2013).

5.5.2.2. Cohesion

Homophily effects account for the tendency for individuals who share attributes to form ties with one another. A total of five homophily terms (gender, ethnicity, geographic co-location, role in the Khmer Rouge, and social group) are included in the model. Gender (0=Female, 1=Male), and Khmer ethnicity (0=No, 1=Yes) are operationalized using categorical variables. Formal role within the Khmer Rouge regime is accounted for using dummy variables for military, administrative, labor, and political roles (0=No, 1=Yes), respectively.

To account for the tendency of individuals to cluster in patron-client relations within the largest connected component, a community detection algorithm is used to identify the presence

of distinct social groups.[6] These communities represent interconnected social groups within the largest connected component. Using this procedure, each individual was assigned membership in one of 22 social groups, which is then operationalized as a homophily term to test the likelihood of tie formation based on within-group membership. Positive coefficients indicate likelihood of tie formation.

Additionally, cohesion can also be measured using terms specifically designed to account for the dependencies among ties in the network. These structural effects include terms for edges, degree centrality, and transitivity. The edge term indicates the propensity for ties to form within the network and reflects the overall density (in log-odds) of the network. A negative term signifies a sparse network (Morris et al. 2008). The best option to address the endogenous dependencies related to degree centrality, or the number of ties an individual has within the network, is to use the kstar(2*)* term, which provides a count of the number of times a structure consisting of two ties occurs in the network. Moreover, the number of connections a person has within the network follows an exponentially decaying distribution, where a few members have a large number of ties. The use of terms like kstar to account for such structures, however, often leads to model degeneracy in larger networks (Lusher et al. 2013). Fortunately, the kstar and alternating *kstar* statistics can be represented using an endogenous dependency term known as geometrically weighted degree distribution (GWD) (Hunter 2007). I therefore operationalize degree centrality using GWD to model the degree distribution and obtain a better model fit (Lusher et al. 2013).

[6] Community detection was accomplished using a *fastgreedy* algorithm, which implements an iterative search to partition the network in a way that optimizes modularity. This process identified 22 distinct social groups.

To capture transitivity, or triadic closure, within the network, a geometrically weighted edgewise shared partners (GWESP) term is used. GWESP is used instead of a triangle term because like degree, the edgewise shared partner distribution decays exponentially, which tends to lead to model degeneracy when using a standard triangle term (Hunter 2007; Lusher et al. 2013; Leifeld 2018). Lastly, I include a memory term to account for intertemporal dependencies among ties (Leifeld et al. 2018). I operationalize the memory term using a positive autoregression term, which simply captures the stability of ties over time and tests the extent to which previous ties continue to exist in the following iteration of the network (Leifeld et al. 2018). Coefficients can be interpreted as the persistence of ties from one time period to the next (Leifeld et al. 2018).

5.6. Results

The results of the TERGM are presented in Table 2. The variable names for control variables, embeddedness, and cohesion are listed in the first column. The second column contains the coefficients for the model followed by 95% confidence intervals. The model indicates that both embeddedness and cohesion drive the formation of resilient networks within the organization. The edges term produces a negative coefficient, highlighting the sparse nature of the network.

5.6.1. Embeddedness

As anticipated, the results of the model reveal a positive and significant effect of brokerage on the emergence of a robust network within the Khmer Rouge. This suggests that network resilience is, in part, based on the development of brokerage positions, which increase network efficiency by connecting different parts of the network (Granovetter 1973). Moreover, these kinds of brokerage positions present several advantages to revolutionary organizations. For

instance, the presence of brokerage positions gives organizations the ability to access information and resources. Brokerage also helps sustain global cohesiveness throughout the network, providing a level of connectedness that would otherwise be unlikely (Granovetter 1973). Thus, brokers facilitate a decentralized structure that avoids vulnerability and creates flexibility for revolutionary organizations (Parkinson 2013).

Table 5.2. Summary of Temporal Exponential Random Graph Model Results.

	Model 1
Edges	-5.5692 [-5.7788; -5.3822]*
Gender	-0.0016 [-0.0204; 0.0173]
Age	-0.0014 [-0.0025; -0.0003]*
Joined before 1975	-0.0143 [-0.0324; 0.0042]
Embeddedness	
Brokerage	0.0613 [0.0593; 0.0633]*
Cohesion	
Same Gender	-0.0013 [-0.0238; 0.0232]
Both Khmer	-0.0358 [-0.0856; 0.0201]
Same Village	0.0103 [-0.0343; 0.0541]
Military	-0.0028 [-0.0236; 0.0198]
Administrative	0.0156 [-0.0019; 0.0343]
Labor	0.0002 [-0.0233; 0.0270]
Political	0.0075 [-0.0240; 0.0393]
Same Social Group	-0.0432 [-0.1495; 0.0269]
Degree	-0.3165 [-0.4180; -0.2170]*
Closure	0.5240 [0.5101; 0.5366]*
Memory Term	3.8096 [2.9394; 4.5281]*
Num. obs.	2833591

* 0 outside the confidence interval

5.6.2. Cohesion

Interestingly, cohesion appears to be driven by decentralized clustering and network closure rather than homophily. None of the effects for homophily return as statistically significant when considered across the forty-eight months of Khmer Rouge rule. The results, therefore, fail to offer support for hypotheses 2 and 3. Individuals are unlikely to form ties with

one another due to shared attributes, whether physical characteristics or similar roles in the organization. This means that while homophily might be influential in the formation of the initial network, it does not appear instrumental to sustaining relationships over time within the Khmer Rouge.

As expected, degree centrality is negative and statistically significant. Offering support for hypothesis 4, the results indicate that there is a tendency toward decentralization within the network over time. Although individuals form clusters, these clusters remain scattered throughout the largest connected component joined together by brokerage positions. This configuration offers at least two potential benefits for a revolutionary organization like the Khmer Rouge. First, a decentralized structure gives members of the organization a relative degree of security through the limited connectivity that is created by this overall structure. A decentralized structure compliments the presence of brokerage roles (Ouellet et al. 2018). Second, the findings for degree centrality lend support to the argument that even within the Southwest Zone, patron-client relations continued to persist despite efforts on the part of the Party Center to eliminate such forms of relationships (Hinton 2005). The presence of numerous small to medium sized clusters created by this process reflects the widespread nature of patron-client relations in which individuals sought protection and access to resources in exchange for loyalty (Scott 1972; Hinton 2005; Hicken 2011).

Triadic closure, also referred to as transitivity, is similarly positive and significant, which supports hypothesis 5. Triadic closure indicates that cohesion is driven by a tendency to form strong within-group relationships among members of the Southwest Zone. Strong ties offer better security as a result of the trust that becomes possible through regular interaction with individuals whose behavior and reputations are known, reducing transaction, opportunity, and

reputation costs associated with forming and maintaining such relationships within the organization (Granovetter 1985; DellaPosta 2016). In return, individuals who build relationships with insiders can anticipate a higher return on their investment of time and energy due to these lower social costs (DellaPosta 2016). Network closure also supports the argument that the internal dynamics of the Khmer Rouge were characterized by patron-client networks in which loyalty was expected and demanded from members (DellaPosta 2016).

Lastly, the memory term is also positive and significant, which indicates that previous network ties have an effect on existing ties at each time step. This suggests that ties indeed remain relatively stable across time despite the chaotic nature of life under the Khmer Rouge. Overall, the results for mechanisms of embeddedness and cohesion provide evidence in support of hypotheses 1, 4, and 5, which focus on endogenous self-organizing processes as network effects. The model fails to confirm hypotheses 2 and 3, which predict an effect for homophily.

5.7. Discussion

This paper examines the mechanisms of network formation across time in order to better understand the sources of organizational resilience. The social networks within the Southwest Zone of the Khmer Rouge show an ability to withstand the shock of internal purges, maintaining a distinct, large connected component throughout the organization's forty-eight months in power. Despite losing nearly half of its members, the largest connected component persists because losses do not approach the critical threshold at which the network would collapse.

The results of the temporal exponential random graph model indicate that social networks within the Southwest Zone of the Khmer Rouge are the product of mechanisms related to embeddedness and cohesion. In line with theoretical expectations, I find that organizational resilience is built on network structures that emerge from the development of brokerage, degree

centrality, and closure. Interestingly, while homophily might be important for the initial formation of networks, it does not appear to play a role in sustaining relationships within the Khmer Rouge over time.

Embeddedness, which can be seen in the tendency for brokerage to play a role in network formation, allows revolutionary organizations to develop a great deal of connectivity at low cost to the network itself. Brokerage positions join disconnected parts of the network increasing the reach of leaders like Zone Secretary Mok. This phenomenon has important consequences for militant organizations engaged in conflict and state formation. Brokers can enable more effective communication and improve coordination of collective action between different parts of the network (Granovetter 1973; Parkinson 2013). Moreover, these open lines of communication can also facilitate flexibility and adaptation needed to remain resilient in the face of both internal and external shocks (Parkinson 2013).

The results also demonstrate that cohesion, which is driven by degree centrality and triadic closure, pushes revolutionary organizations to favor security over efficiency. Security concerns mean that clusters are distributed throughout the network and characterized by strong within-group ties that foster trust and loyalty (DellaPosta 2016). The security that results from closure also brings costs to organizational performance. Network closure limits the flow of information and inhibits coordination between different parts of the network by encouraging interactions to take place within small, well-defined clusters (della Porta 2013; DellaPosta 2016).

Even during chaotic periods of internal conflict and regime change, networks can provide stable social structures on which to build party and state. Brokerage, decentralized clusters, and triadic closure can enable revolutionary organizations to maintain a viable core of members despite operating under conditions of extreme hardship. The findings of this paper suggest that

the ability to balance efficiency and security as complementary mechanisms of network formation is the key to creating organizational resilience (Bakker et al. 2012; Ouellet et al. 2018).

5.8. Conclusion

This paper presents new insight into the way that social networks provide a source of organizational resilience for militant organizations in the context of internal conflict and state formation. The results of a temporal exponential random graph model indicate that network formation is the product of self-organizing, endogenous processes that attempt to find a balance between embeddedness and cohesion. The findings support the argument that resilient organizations are built on social networks that display a tendency to create structures that enable a degree of both security and efficiency at the same time.

Networks form the backbone of revolutionary organizations. The social structures examined in this paper appear to have facilitated the ability of the Khmer Rouge to withstand severe losses without losing its capability to continue to operate as a governing institution. Through a combination of both embeddedness and cohesion, the social networks within the Khmer Rouge held the organization together during its forty-eight months in power even as its own security forces forcefully removed nearly half its members.

The results of this paper also highlight the need for continued research on how social networks influence organizational behavior. First, how do the findings hold up in comparison with other bad actor organizations? We should test the validity of the findings presented here across a more diverse range of organizations, including other militant organizations, terrorist groups, gangs, mafia, and drug trafficking networks to pinpoint the exact effect that networks have on organizational resilience. Second, how might different network configurations, such as either very decentralized or highly centralized, influence the ability to balance efficiency and

security in a way that enables organizational resilience? Third, how does network formation differ across different types of ties, such as kinship, recruitment, and friendship? Answering these questions would add to our understanding of the internal dynamics of militant organizations as well as other non-state actors engaged in conflict and state formation.

Chapter 6: Conclusion

6.1. Introduction

This dissertation began by asking the question, how do social networks influence the development and trajectory of militant organizations and revolutionary parties engaged in the process of establishing political order through violence? What leads to the emergence of informal institutions? Why are some individuals purged while others survive during times of revolution? Why are some organizations resilient while others are not?

In answer to these questions, I have presented four articles connected by the theme of networks within revolutionary organizations. In the four articles, I have argued that social networks matter a great deal to the development and trajectory of militant organizations as they transition into governing roles. Sometimes, as seen in the example of the Khmer Rouge presented in this dissertation, the configuration underlying social networks works against the objectives of formal institutional structures in an attempt to balance security and efficiency.

Moreover, while explanations that point to individual attributes such as gender, ethnicity, occupational background, official positions, or length of time in an organization to understand the behavior and performance of militant organizations and revolutionary parties offer insight, they fail to consider the interdependent nature of the revolutionary experience. Given the fact that individuals do not exist in isolation but are embedded in a broader social context, the topology of social networks becomes key to understanding how the complex web of interpersonal relationships shapes identities, interests, and collective action. As a result, I have argued that networks are the result of mechanisms of attraction based on shared attributes, also referred to as homophily, and self-organization that relate to the network topology itself. These

mechanisms influence the formation of networks on which informal institutions are built, violence spreads, and organizational resilience emerges.

6.2. Summary of the Main Findings

Chapter 2 presented a detailed description of the social networks present in the Southwest Zone. The results revealed a map of the topological features of the network that enabled an analysis of the social structures that existed beneath the formal institutional structures of the Khmer Rouge. The social networks on which the regime was built were found to display a tendency for strong within-group ties that led to the formation of distinct communities throughout the network. Network closure suggests that members of the Khmer Rouge had a preference for building strong relationships with individuals through repeated interactions in an effort to create a sense of security. These communities, however, are not isolated, but instead, they are joined at strategic points by brokerage positions that connect an otherwise sparse network.

Chapter 3 focused on the emergence of informal institutions, such as patron-client relations, using a relational approach that relied on social network analysis to explain how endogenous dependencies influence the formation of networks within revolutionary organizations. Using an exponential random graph model, I examined the entangled nature of exogenous and endogenous factors behind the formation of networks, which precede the development of informal institutions. The model results reveal that personnel in the Southwest Zone sought out relationships with other individuals on the basis of shared attributes such as shared ethnicity, geographic co-location, similar occupational background as professionals and peasants, and serving in similar roles as military or political personnel. At the same time, the

models also demonstrated that networks within the Khmer Rouge were the product of endogenous forces related to limited connectivity and triadic closure.

In Chapter 4, I turned to the consequences of individual network position during violent political purges, such as those that tore through the ranks of the Khmer Rouge, resulting in the arrest and execution of nearly 63% of the personnel in the Southwest Zone. With the help of a network autocorrelation model, I examined the influence of network position and exposure to violence on an individual's likelihood of becoming a victim of a purge. The results of the model indicate that in addition to individual characteristics, there is a strong correlation between the likelihood of becoming a purge victim and network position, defined in terms of degree, betweenness, and structural similarity, and exposure to violence up to a distance of two handshakes away from an individual. This lends credence to the claim that violence moves across networks in contagion-like fashion similar to a virus, spreading from person to person through personal contacts.

Chapter 5 investigated the sources of organizational resilience in the Khmer Rouge with a longitudinal network that tracked the evolution of relationships in the Southwest Zone during the forty-eight months of communist rule. After conducting a series of checks, I demonstrated that the networks beneath the Khmer Rouge display characteristics of robustness, which means that they are able to withstand shocks and persist. I then used a temporal exponential random graph model to examine how the mechanisms of embeddedness and cohesion each contribute to the development of resilient networks within the organization, demonstrating the stability of ties over time. I find that organizational resilience is built on networks that emerge from the development of strong within-group ties formed through closure and clustering but connected through key brokerage positions.

6.3. Significance of the Study

The articles submitted as part of this dissertation represent a significant advance in our understanding of the internal dynamics of militant organizations and revolutionary parties. In providing a rare look inside the Khmer Rouge, these articles examine the social networks within the organization in detail. Moving beyond a longstanding recognition that networks play an important function for organizations engaged in insurgency, terrorism, crime, and state building, this study offers the first known mapping of interpersonal relationships among personnel inside a militant organization turned revolutionary party. Going even further, the articles in this dissertation extend the analysis of social networks to include tests of hypothesis related to network formation and contagion in order to draw causal inferences related to the emergence of informal institutions, the spread of violence, and organizational resilience.

Moreover, the findings presented in this dissertation highlight the dilemma facing organizations engaged in the process of state formation through violent contestation. Given the inherently high-risk environment, non-state violent actors must guard against internal and external threats, which results in social structures that often undermine the goal of establishing formal institutions. The example of the Khmer Rouge suggests that underlying social structures often remain relatively unchanged as militant organizations transition into governing roles. This means that social networks designed for the purpose of overthrowing the government often become the backbone of the new regime, which produce an unstable system characterized by rivalry, suspicion, and institutional weakness.

When placed in the context of studies of state formation, conflict, and revolution, the findings of this dissertation appear robust and not limited to the Southwest Zone under the Khmer Rouge. Most particularly, the collective findings of the four articles presented here are

consistent with Kalyvas's (2003) call for greater attention to the micro-foundations of conflict as a product of "interactions between various central and local actors with distinct, identities, motivations, and interests" (476). Kalyvas (2006) emphasizes the central place of interaction at the local level as the source of complex identities and uncertainties found in conflict and state building. Local cleavages, which are often defined by well-established patterns of interaction such as patron-client networks, give rise to a number of motivations and causes of individual and group behaviors, including suspicion, intrigue, and violence.

Where the articles in this dissertation complement Kalyvas (2003; 2006) and other scholars is by taking a closer look at the underlying social structures beneath a militant organization turned revolutionary party and moving beyond description. While Kalyvas (2006), Fujii (2009), Parkinson (2013), Staniland (2014), Straus (2015), and Finkel (2017) address the importance of interpersonal networks, this study examines these webs of connections in greater detail using methods that provide insight into the formation and consequences of the social context in which individuals decided to participate in and found themselves victims of betrayal, torture, and mass killing in the name of creating a new political order.

In focusing on a specific example of how social networks influence the development and trajectory of a militant organization turned revolutionary party, this dissertation adds a layer of complexity to Kalyvas's (2006) argument that interaction is key in two ways. First, the adoption of a network perspective and specific tools from social network analysis creates a more nuanced theory of interpersonal relationships as the ontologically prior source of identities, interests, and instrumentality. While Kalyvas (2006) points out the importance of interaction in defining cleavages, this dissertation highlights the fact that instrumentality is based on interests, which are

shaped by identity. Identities, in turn, emerge from interactions (McLean 2011; Padgett and Powell 2012).

Second, the micro-level approach taken in this dissertation adds to our understanding of the mechanisms that drive the formation of networks, which are the invisible backbone of militant organizations and revolutionary parties. The findings indicate that networks are the product of both attractions based on similar attributes as well as endogenous processes related to the topology of the network itself. These mechanisms provide the social structure on which informal institutions are built, violence spreads, and organizational resilience emerges.

The insight that informal institutions, such as patron-client systems, are the product of interactions based on shared attributes and endogenous network processes is consistent with other work on informal institutions (Helmke and Levitsky 2006; Tsai 2006; Tsai 2007). The formation and self-organization of social networks within the formal organizational structures of militant groups and revolutionary parties reflect the relational nature of endogenous institutional development that leads to the emergence of informal institutions (Tsai 2006). As the findings of this dissertation demonstrate, however, the social structures that characterize informal ways of accomplishing objectives sometimes work against the creation of robust formal institutions needed for effective governance and long-term regime stability.

Moreover, the finding that the likelihood of victimization and survival is related to network position and exposure to violence underscores the role that social structure plays in the spread of political violence (Fujii 2009; Su 2011; Finkel 2017). The logic of seeking individual level security that is observed within the networks of clandestine organizations often translates into explosive outbreaks of violence marked by overkill as perpetrators seek to wipe out entire chains of potential threats. Understanding violence as a socially embedded phenomenon helps

explain how the topology of social networks both constrains and facilitates the spread of violence, leading to uneven patterns of distribution among survivors and victims.

Lastly, the finding that social networks contribute to the resilience of militant organizations and revolutionary parties emphasizes the significance of endogenous factors in determining organizational performance, adding a level of detail to previous studies that focus on the importance of interpersonal relationships within these types of groups (Parkinson 2013; Staniland 2014). Organizational longevity is the result of a balance between security and efficiency that often leans heavily in favor of the former in militant organizations and revolutionary parties. In the case of the Khmer Rouge, this explanation runs counter to the historical consensus that the organizations maintained a tight grip on power. The networks examined in this dissertation challenge this view, presenting a much different picture of an organization that favored the protection of factions, rivalry, and competition in the interest of individual security at the expense of collective communication, coordination, and efficiency. As a result, when faced with the challenge of a foreign invasion after forty-eight months in power, the Khmer Rouge was unable to mount an effective resistance, instead relinquishing their rule and retreating to their mountain strongholds to become insurgents once again.

6.4. Recommendations for Future Research

The next step in expanding the research agenda started here involves at least two tasks. First, building on the findings in the four articles, the natural progression of this study is to collect additional biographical data on Khmer Rouge personnel in the remaining five administrative zones in order to create an unprecedented view of the social networks beneath the Khmer Rouge throughout the entire country. This research will benefit from ongoing efforts to update the Documentation Center of Cambodia's archives with new information about victims,

survivors, and perpetrators associated with the Khmer Rouge. Such work, when finished, will provide a better understanding of the mechanisms of network formation and the contagion of violence that occur as part of the process of state formation.

Second, the Cambodian case is not the only instance in which social networks have mattered for militant organizations and revolutionary parties. The topic of political purges has potential for cross-national comparison between Cambodia and other instances of state formation characterized by violence. Possible candidates for additional cases include party elites, such as members of the Central Committees of China, the USSR, and other Eastern Bloc countries during the Cold War. Using the approach demonstrated in this dissertation, additional cases can rely on publicly available, digitized archival records containing the biographical information of party elites.

Other possible studies involving a natural extension of the cross-national comparison of revolutionary organizations is the study of how social networks influence the development and trajectory of authoritarian political parties, organized crime, and terrorist organizations as well as how militant organizations forge political order through conflict and become ruling parties. Of particular interest, overlapping roles in multiple networks and brokerage positions could provide new insights into the fragility and resilience of different kinds of 'bad actor' organizations.

Finally, the study social networks in the context of conflict and state formation has the potential to expand into the study of institutional design, the emergence of new forms of political organization, and policy variation. Along these lines, a possible path forward is to examine the overlap of political, military, bureaucratic, and economic networks in different countries and how these networks have influenced institutional development as part of the process of state formation. Do different network configurations produce different types of formal institutions?

How do networks shape policy preferences of elites? Do networks play a role in the emergence of new forms of political organization? What role do patron-client networks play in the modern state? These questions offer several lines of valuable research, and much of this initial research can be accomplished by leveraging publicly available information to map the networks of elites followed by statistical analysis of the subsequent social networks.

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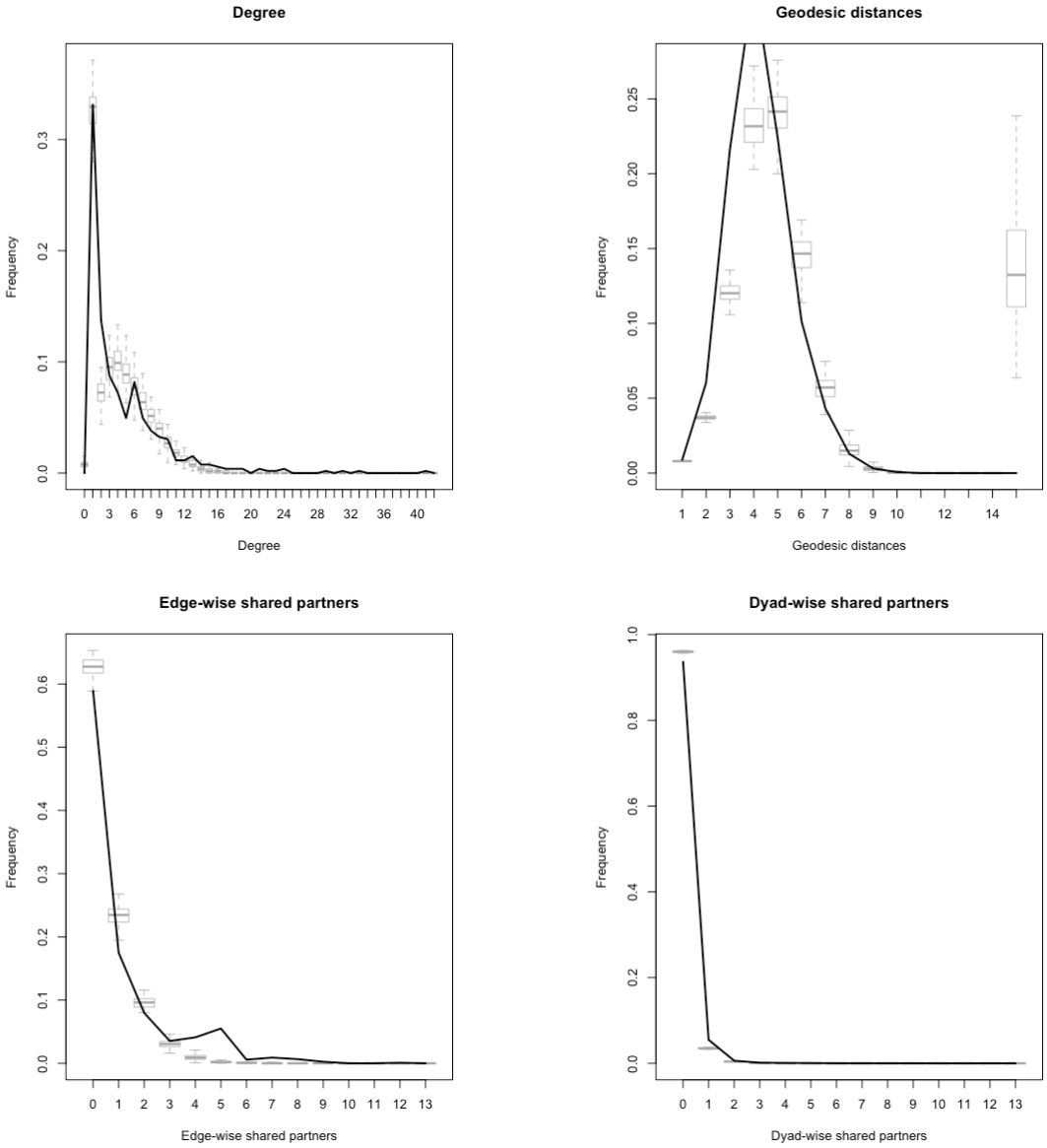
Appendices

Appendix A

Goodness of Fit for ERGM

The goodness of fit for Model 3 is shown in Figure A.1 below. Model 3 provides the best fitting model when accounting for both homophily and structural effects. The boxplots represent distributions of network statistics for degree, minimum geodesic distances, edgewise shared partners, and dyad shared partners simulated from the specified model as part of the MCMC maximum likelihood estimation. The solid line shows the same statistics for the observed network (Leifeld 2018).

Figure A.1. Goodness of Fit for ERGM Model 3



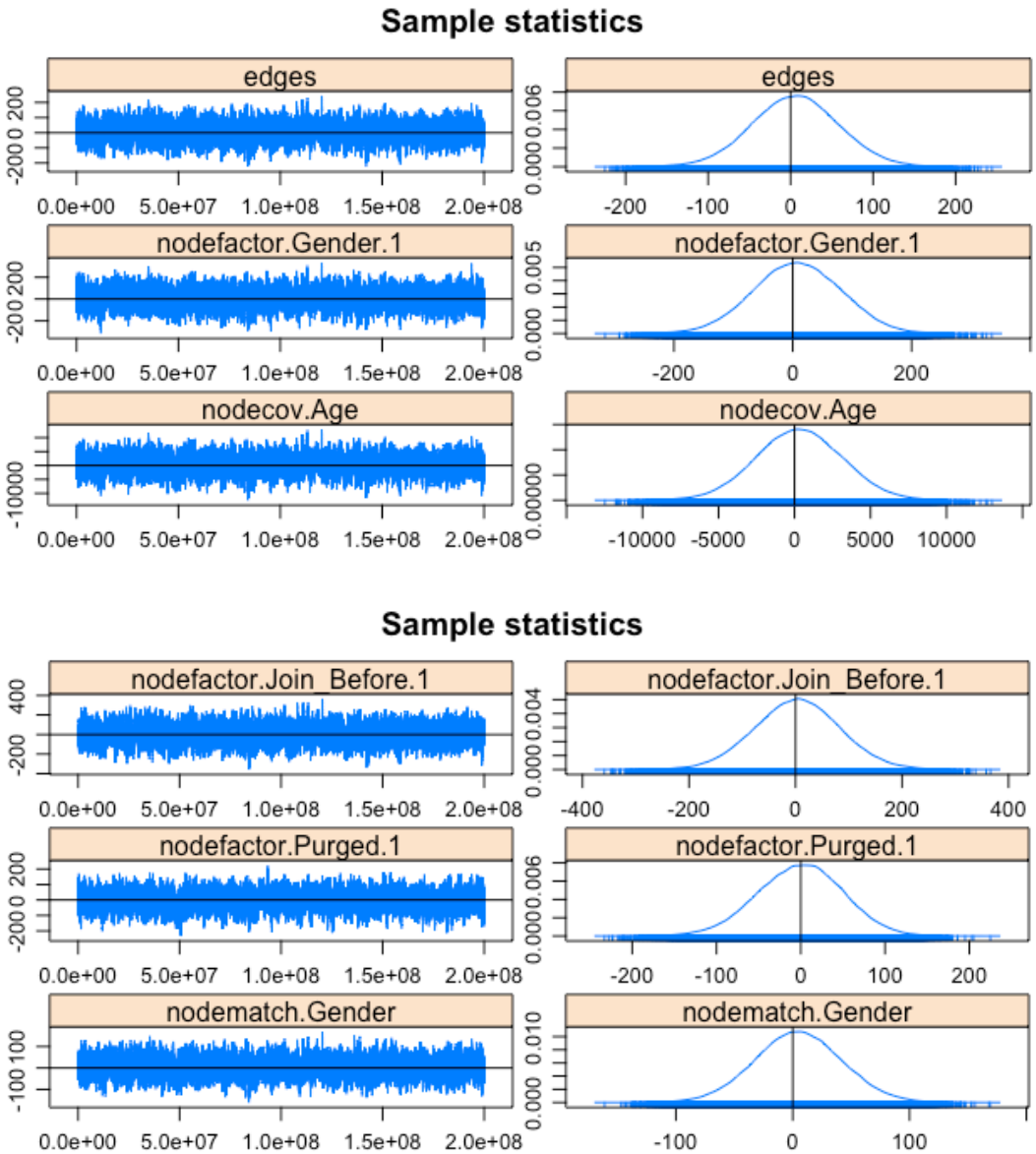
As can be seen from visual inspection, Model 3 fits reasonably well with the observed network. Overall, the model does a good job of creating networks that resemble the degree distribution, geodesic distances, edge-wise shared partners, and dyad-wise shared partners of the

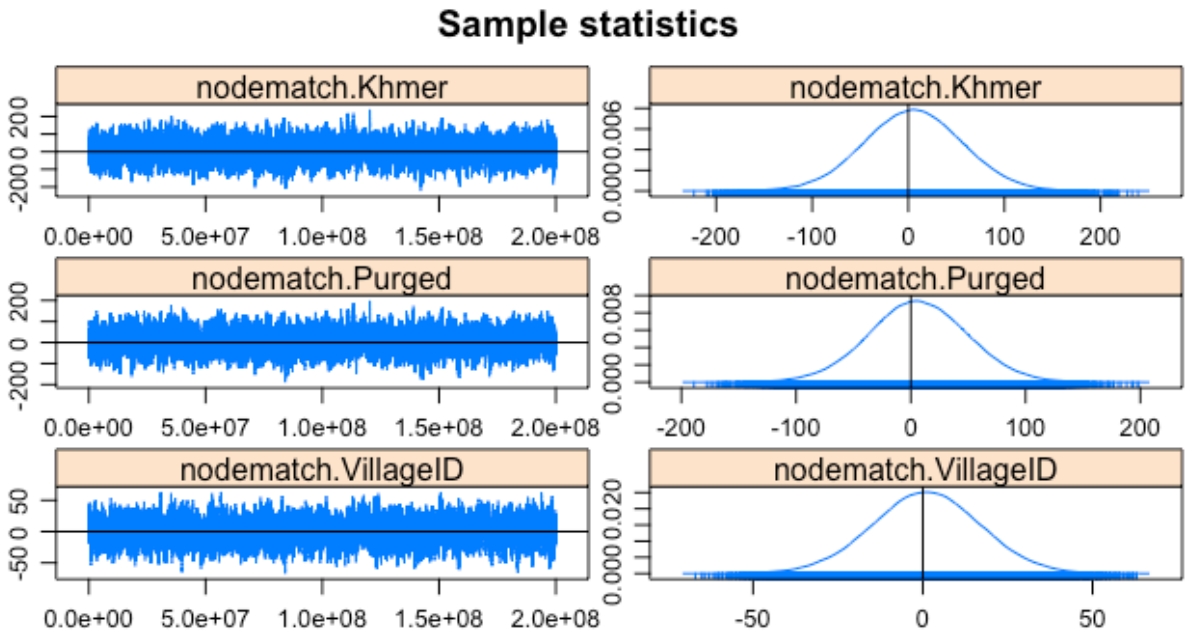
observed network. When examining goodness of fit, it is also important to remember that individual plots represent different aspects of fit for a model and must be considered as a whole to assess how well the model captures the network formation process (Leifeld 2018).

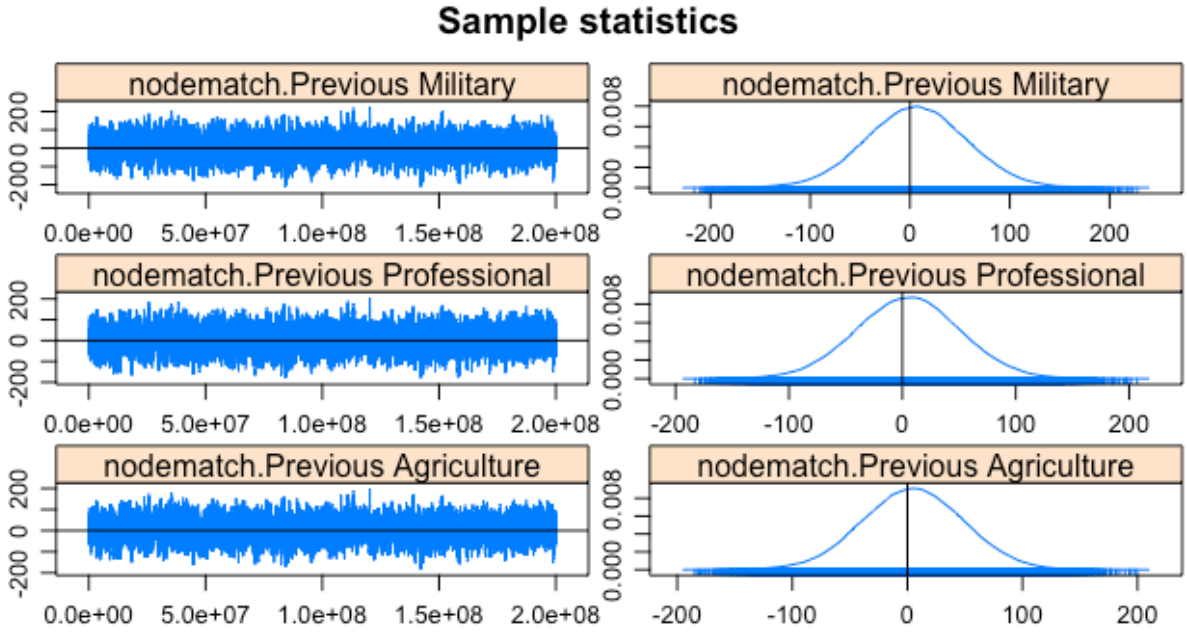
MCMC Diagnostics

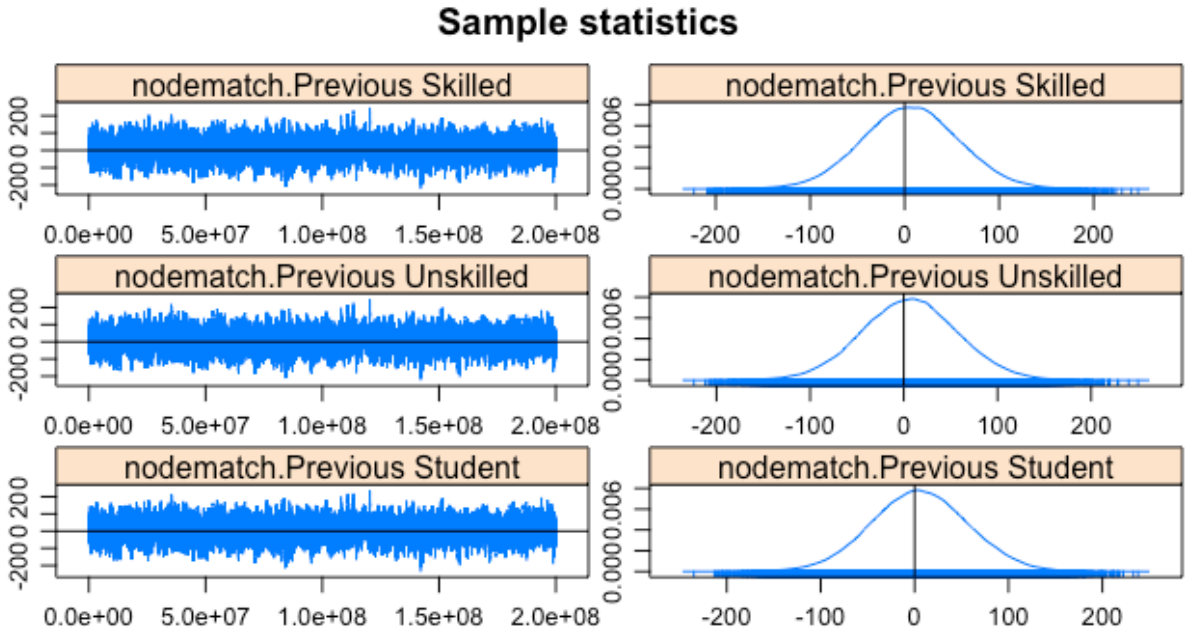
Diagnostics for the Markov Chain Monte Carlo simulations are shown below. A good fitting model will appear as a relatively stable line on the left and be normally distributed around zero on the right. The model appears to fit relatively well with the observed data.

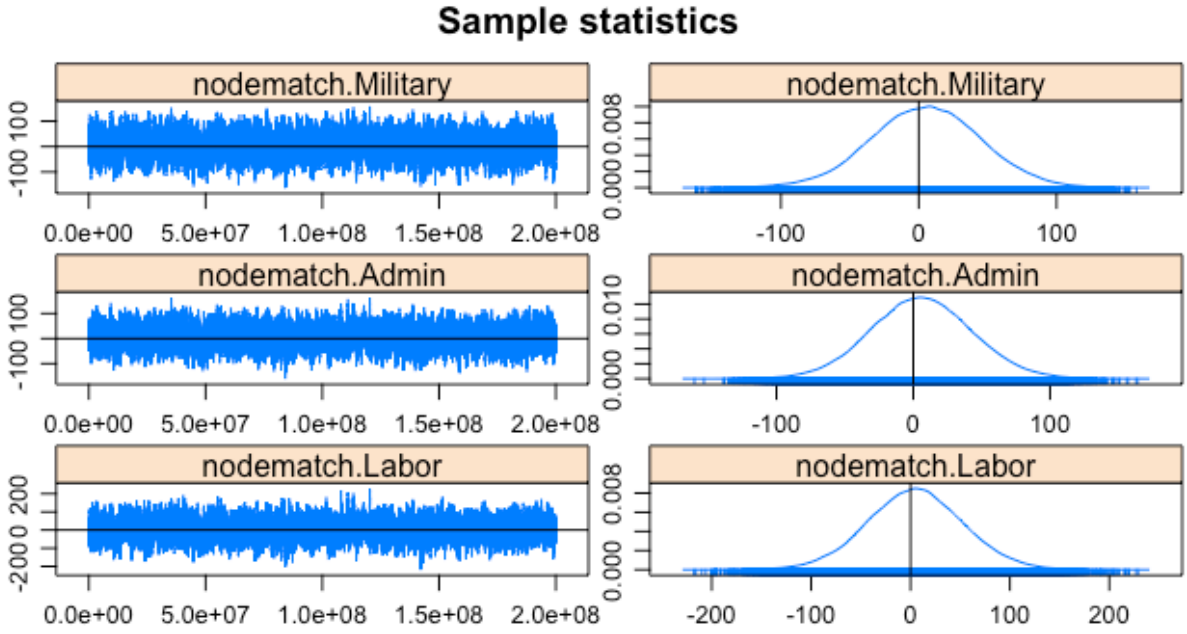
Figure A.2. MCMC Diagnostics for Model 3

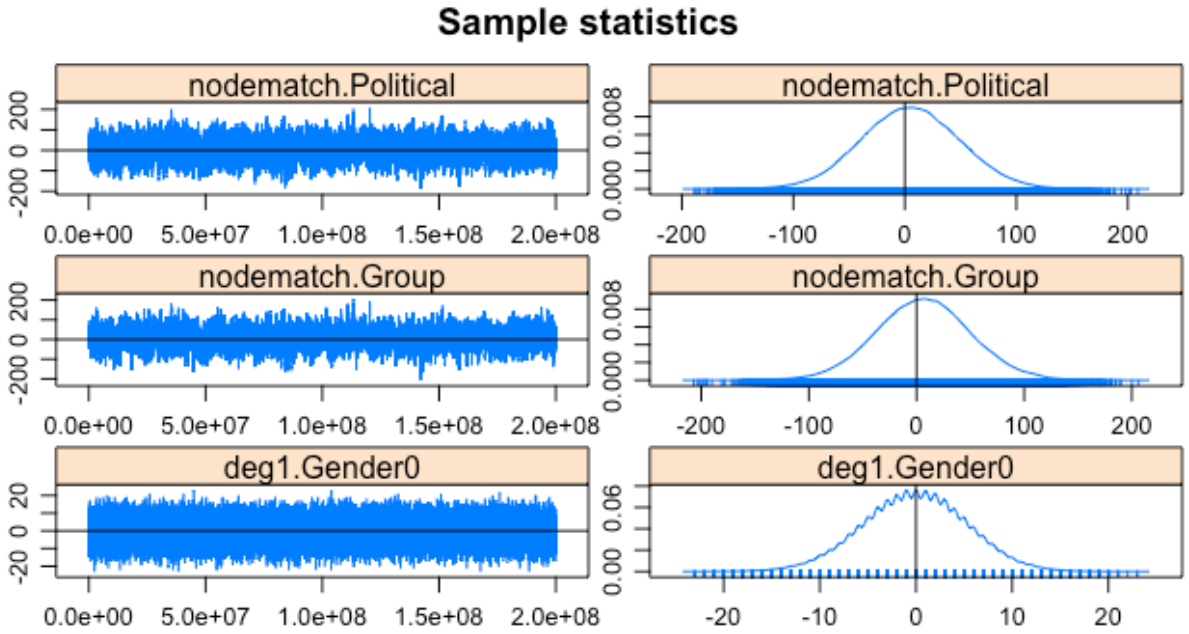


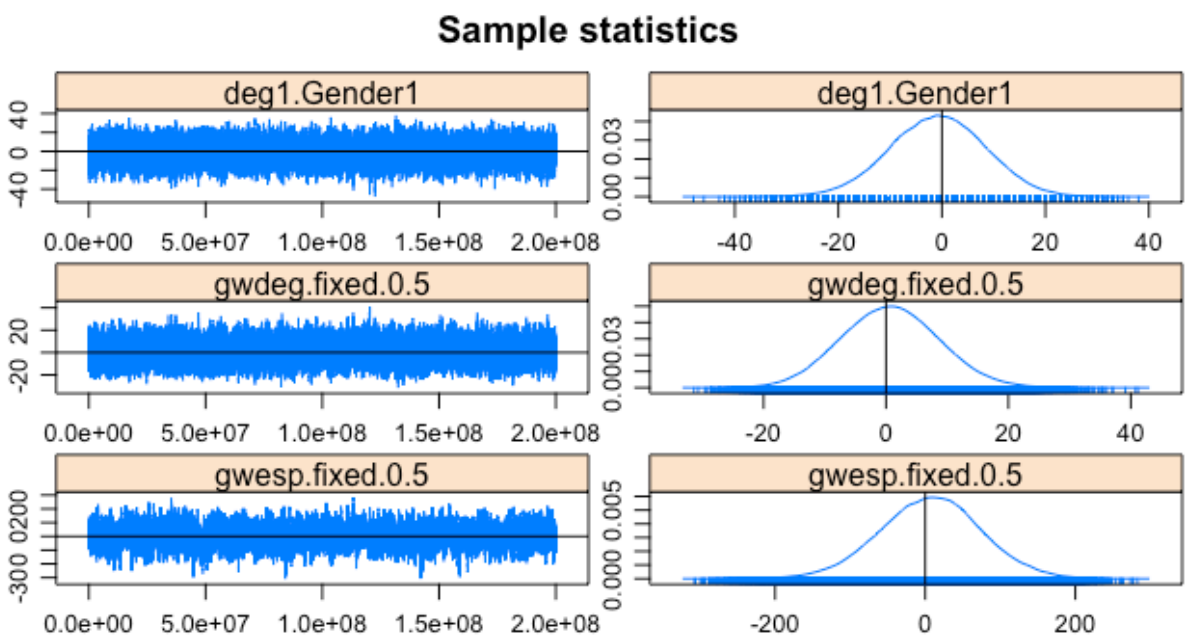

Sample statistics
nodematch.Khmer
nodematch.Purged
nodematch.VillageID
0.0e+00
5.0e+07
1.0e+08
1.5e+08
2.0e+08
-200
-100
0
100
200
-50
50


Sample statistics
nodematch.Previous Military
nodematch.Previous Professional
nodematch.Previous Agriculture
0.0e+00
5.0e+07
1.0e+08
1.5e+08
2.0e+08
-200
-100
0
100
200


Sample statistics
nodematch.Previous Skilled
nodematch.Previous Unskilled
nodematch.Previous Student
0.0e+00
5.0e+07
1.0e+08
1.5e+08
2.0e+08
-200
-100
0
100
200


Sample statistics
nodematch.Military
nodematch.Admin
nodematch.Labor
0.0e+00
5.0e+07
1.0e+08
1.5e+08
2.0e+08
-100
0
100
-200
-100
0
100
200


Sample statistics
nodematch.Political
nodematch.Group
deg1.Gender0
0.0e+00
5.0e+07
1.0e+08
1.5e+08
2.0e+08


Sample statistics
deg1.Gender1
gwdeg.fixed.0.5
gwesp.fixed.0.5
0.0e+00
5.0e+07
1.0e+08
1.5e+08
2.0e+08

Appendix B

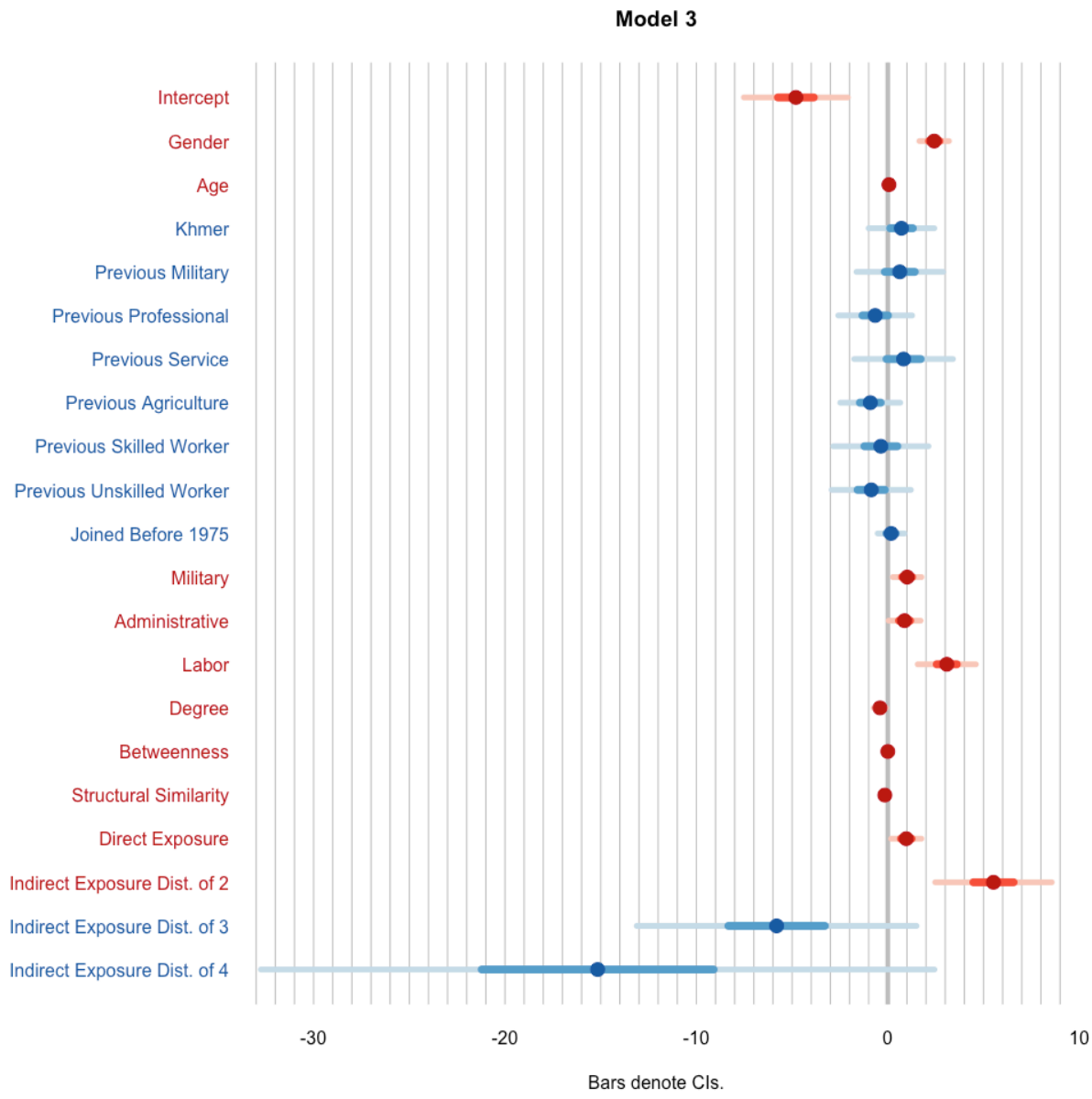
Significant Results of Network Autocorrelation Models

Table B.1. Significant Results of Network Autocorrelation Models

	Model 1	**Model 2**	**Model 3**
(Intercept)	-4.3341 (1.2673)***	-4.6127 (1.2892)***	-4.8031 (1.3857)***
Gender	2.4105 (0.3485)***	2.3541 (0.3553)***	2.4231 (0.3943)***
Age	0.0570 (0.0170)***	0.0593 (0.0177)***	0.0588 (0.0186)**
Official Role			
Military	1.4041 (0.3472)***	1.1923 (0.3556)***	1.0096 (0.3834)**
Administrative	0.9842 (0.3889)*	0.7408 (0.4003)	0.8756 (0.4278)*
Labor	2.8695 (0.6609)***	2.8703 (0.7041)***	3.0807 (0.7747)***
Network Position			
Degree		-0.3532 (0.1477)*	-0.4088 (0.1664)*
Betweenness		0.0001 (0.0001)	0.0002 (0.0001)*
Structural Similarity		-0.1221 (0.0619)*	-0.1575 (0.0698)*
Network Exposure			
Direct Exposure			0.9636 (0.4052)*
Indirect Exposure (Path dist. of 2)			5.5209 (1.5541)***
AIC	484.9022	472.6571	425.0603
BIC	544.5897	545.1349	514.5916
Log Likelihood	-228.4511	-219.3286	-191.5301
Deviance	456.9022	438.6571	383.0603
Num. obs.	525	525	525

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Figure B.1. Results of Network Autocorrelation Models



The Impact of Network Position

Although the log-likelihoods produced by the models are useful as indicators of significance and positive or negative effects, odds ratios offer an alternative metric of the impact of network position and exposure on the risk of becoming a purge victim. Table A.2 shows the odds ratios (OR) and 95% confidence intervals (CI) for Model 3 of the network autocorrelation models, which includes a test of the network variables using the largest connected component.

Table B.2. Odds Ratio Estimates with 95% Confidence Intervals.

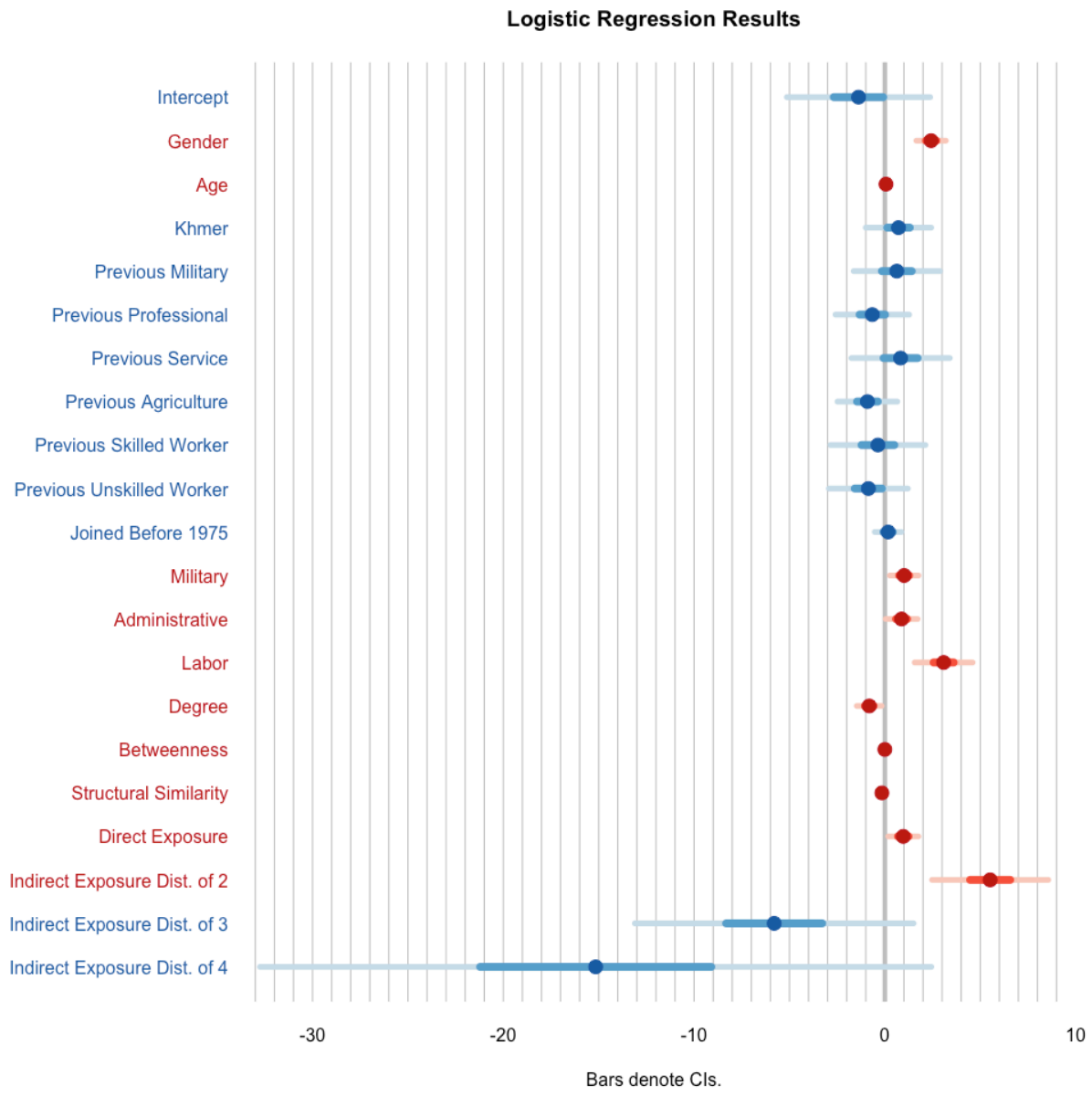
	OR	2.50% (CI)	97.50% (CI)
Gender	11.281	5.393	25.537
Age	1.061	1.023	1.101
Khmer	2.041	0.372	11.915
Previous Military	1.871	0.216	21.693
Professional	0.518	0.077	3.715
Service	2.281	0.190	34.893
Agriculture	0.401	0.087	2.033
Skilled Worker	0.695	0.060	9.663
Unskilled Worker	0.421	0.053	3.448
Joined Before 1975	1.188	0.595	2.422
Military	2.745	1.312	5.932
Administrative	2.400	1.050	5.646
Labor	21.773	5.195	111.676
Degree	0.664	0.471	0.898
Betweenness	1.000	1.000	1.000
Structural Similarity	0.854	0.740	0.969
Direct Exposure	2.621	1.188	5.844
Indirect Exposure (Path Dist. Of 2)	249.852	12.645	5720.604
Indirect Exposure (Path Dist. Of 3)	0.003	0.000	5.476
Indirect Exposure (Path Dist. Of 4)	0.000	0.000	10.281

N = 525

For every connection a person adds within the organization, the odds of getting purged are reduced by 33.6% (OR=0.664, CI, 0.471 to 0.898). On the other hand, the odds ratios for direct and indirect exposure reveal a much different story. Having direct contacts that become victims puts an individual at risk of being purged, increasing the odds of being arrested and executed by 162% (OR=2.62, CI, 1.19 to 5.84). Additionally, friends of friends who are purged create additional risk for an individual, increasing the likelihood of becoming a victim. For each additional indirect connection at a distance of 2 that is victimized, the odds of becoming a victim increase dramatically by 24,910% (OR=249.852, CI, 12.645 to 5720.604). Beyond this distance, the risk of being purged declines by 99.7% (OR=0.003, CI, 0 to 5.48).

Additionally, I also compared the results of the network autocorrelation model to a logistic regression model similar to those commonly used in Papachristos, Braga, and Hureau (2012) and Papachristos and Wildeman (2014), who find a similar effect in the contagion of gang violence. Although a generalized linear model fails properly to account for the complex interdependence present in relational data, it can help indicate whether or not the results of the network correlation models are on the right track. Even with biased estimates, the logistic regression produces similar results as the network autocorrelation model, suggesting that the network models used in this study can be viewed with a degree of confidence. Like the network autocorrelation model, the logistic regression points to the significance of direct and indirect exposure as a key factor in determining the likelihood of purge victimization or survival. The results of the logistic regression can be seen in Figure B.2.

Figure B.2. Logistic Regression Results

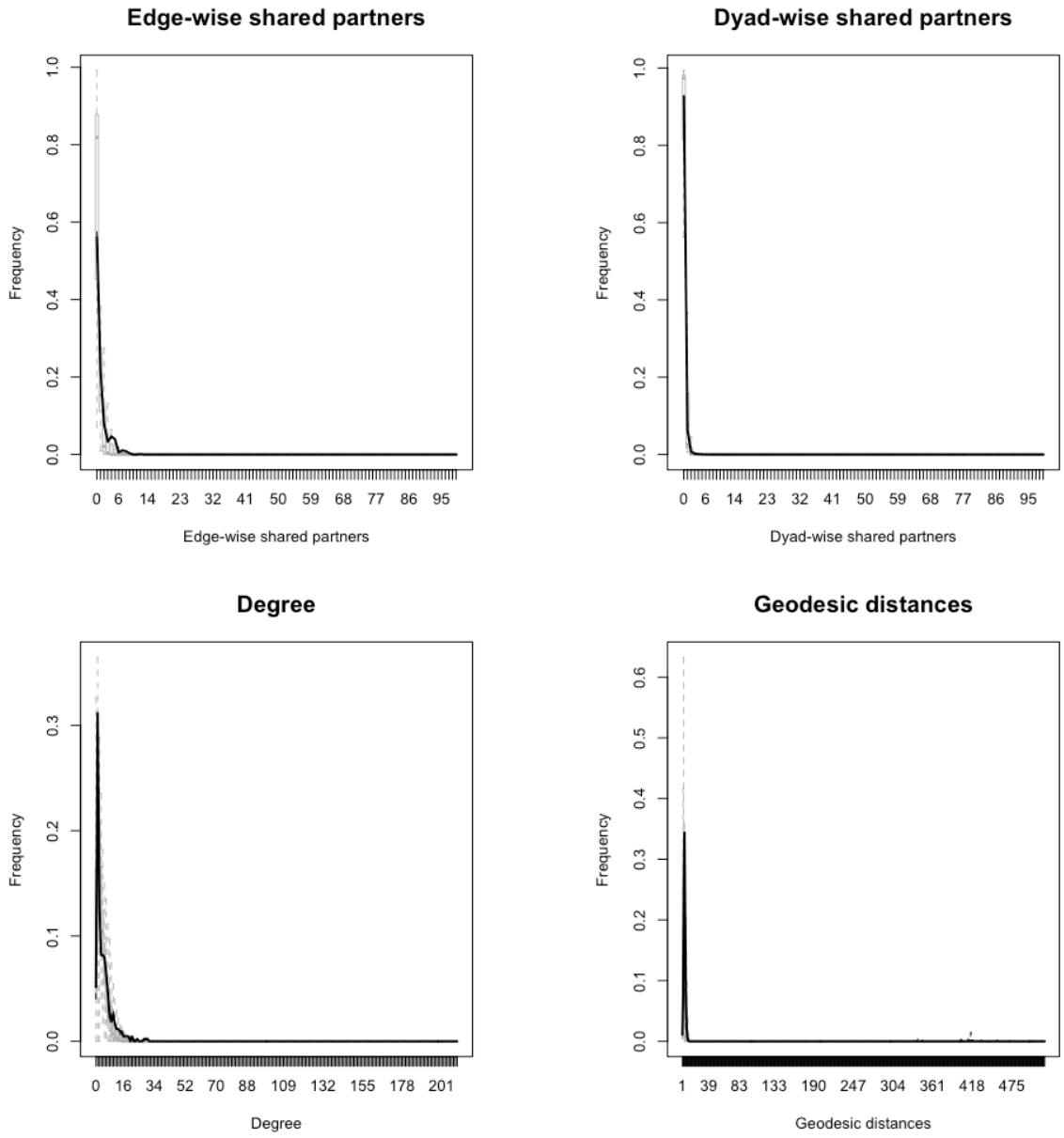


Appendix C

Goodness of Fit for TERGM

The goodness of fit for Model 3 is shown in Figure C.1 below. Model 3 provides the best fitting model when accounting for both homophily and structural effects. The boxplots represent distributions of network statistics for degree, minimum geodesic distances, edgewise shared partners, and dyad shared partners simulated from the specified model as part of the MCMC maximum likelihood estimation. The solid line shows the same statistics for the observed network (Leifeld 2018).

Figure C.1. Goodness of Fit for TERGM



As can be seen from visual inspection, the model fits reasonably well with the observed network. Overall, the model does a good job of creating networks that resemble the degree distribution, geodesic distances, edge-wise shared partners, and dyad-wise shared partners of the observed network. When examining goodness of fit, it is also important to remember that individual plots represent different aspects of fit for a model and must be considered as a whole to assess how well the model captures the network formation process (Leifeld 2018).