# Understanding individual behaviors within covert networks: the interplay of individual qualities, psychological predispositions, and network effects

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**Abstract** This article theorizes about how individual factors and network effects interact with each other in ways relevant to the study of networks generally, but in particular of criminal networks. In modern network analysis, careful technical descriptions that involve important graph-theory measures are entirely sensible, but they often ignore specific details about the individuals within the network. For study of a human social system, to ignore qualities of the actors is to risk an incomplete, possibly spurious, explanation, so individual-level factors may be important for a more complete understanding of the system. In covert and criminal networks, actors have motivations to keep some activities from public view, so it is impossible to understand such networks without appreciating at least that individual-level intention. This article describes five different levels of effects, both individual and relational, relevant to network-based social systems, and explains how these effects may interact. Important implications for the study of criminal networks include the formation of trust within networks, the exercise of control, and the identification of network brokers. A richer description of individual action within a complex social system will require better knowledge about how personality, social identity and other psychological factors are distinct from, and yet may interact with, self organizing network processes.

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## Introduction

Criminal network studies have become more common in research on organized crime. This trend reflects a growing appreciation in social science more generally of

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the value of network-based approaches in understanding the outcomes and dynamics of human social systems. Recent network-based complex system science has been enhanced by an extraordinary growth in computing capabilities, substantial improvements in electronic data collection, a capacity to store huge and readily accessible electronic data repositories, and major innovations in the statistical modeling of systems involving complex interdependencies. With these technical advances, modern network methods open the possibility of new insights into complex social and organizational systems.

Organizations can be construed as network-based social systems (Borgatti and Foster 2003; Brass et al. 2004), and so it is expected that the activities of organized crime will be managed within networks of various types (Klerks 2001). Earlier work on criminal networks by, for instance, Sparrow (1991) and Baker and Faulkner (1993) has been followed by recent calls from a number of authors for a recognition of social network analysis in understanding illegal organizations (e.g., Chattoe and Hammill 2005; Coles 2001; Klerks 2001; Raab and Millward 2003). While this literature has debated which network-based theories and methods would be most appropriate for the study of organized crime, there is common agreement that organized crime activity can be usefully represented as a network. McIllwain (1999) perhaps goes further in making a strong theoretical assertion that networks are not just helpful but fundamental: that human relationships, and hence social networks, underpin the social systems that sustain organized criminal activity:

> "Human relationships form the least common denominator of organized crime. The actors composing these relationships engage in the process of social networking for the provision of illicit goods and services. They also protect, regulate and extort those engaged in the provision or consumption of these goods and services. The social networks created to achieve these goals create a social system of organized crime, a system which explains the remarkable consistency of the process of organizing crime across time and space. Social networks encompass underworld and upperworld actors who benefit from this social system of organized crime." (p.319).

It is this conceptualization of an organized crime network as a social system, and not an institutional entity, that we adopt in this article.

In organizational network theory, networks are seen not only as the means of transmission of tangible resources and information, but also as the skeleton of more intangible system-wide qualities such as hierarchies, status, trust, norms, and "social capital" (Borgatti and Foster 2003). Networks can thereby be interpreted as both a source of structure and a carrier of process. For instance, Morselli and Petit (2007) studied how police disruption of a criminal network led to changes in the way that the system operated, including in the particular individuals who took the leading roles. In this case, the network is seen as the underpinning structure and change to structure is the topic of study. In contrast, when Baker and Faulkner (1993) discussed the efficiency of information transmission in illegal networks, they were considering the network as a carrier of process, with information flow through network at the centre of attention. Of course, in practice the two dimensions of structure and process are not independent. It is relevant to ask, for instance, whether a particular structure is efficient or not for a given purpose or process. The trade-off

most frequently discussed for illegal networks is how the structure supports both of the dual purposes of covertness and collaboration (e.g. Baker and Faulkner 1993; Morselli et al. 2007).

Criminal network researchers, then, see a network representation as capturing major aspects of the social system in ways that enable them to address novel research questions. The natural focus of such studies is on what might be called the network *topology*: the general patterning of network connections, a patterning that may only become apparent through detailed analyses. For instance, will a particular criminal network operate in a centralized way with a core-periphery structure (Baker and Faulkner 1993), but become more decentralized in response to threat (Morselli and Petit 2007)? When criminal network researchers refer to structure, they are talking essentially about network topology.

In modern network analysis generally, interest is invested heavily in topology. We frequently see careful technical descriptions involving important graph-theory measures: for instance, degree distributions and geodesic lengths, and at a more localized level, the centrality of the actors or the density of ego-networks (for a recent review of these and other network analytic concepts, see Butts 2008.) These are entirely sensible approaches to describing network topology. Their appeal rests in an unambiguous mathematical formulation that can be applied to any network data, irrespective of the particular research context or network measurement. As a result, a temptation is to suppose a spurious universality about network features, independently of the specifics of the research question or of the relational context.

Yet a narrow focus on mathematical formulations and appeals to universality, without attention to the nuances of the research problem, may be problematic. The danger is that the social science of social networks may be ignored. Importantly, graph-theoretic approaches in themselves say nothing of the actors in a network, apart from the fact that they express and receive ties. If we take the network topology as a complete representation of the system, the implication is that any particular qualities of the actors—the individuals within the network—are irrelevant. The fundamental point underpinning this article is that such an extreme claim is untenable for human social systems, and thereby for criminal network studies.

We should not suppose that social systems are networks in the same way as transport systems or protein-protein interactions. We should be cautious about ascribing any "universal principle" of networks to account for social systems. Intentionality is part of the science of social networks that does not necessarily apply to other types of networks. It is expressed in networks through the formation and dissolution of network ties, and through how those ties are utilized. For criminal networks, as discussed further below, intentionality includes at the least the desire to be covert. Yet in any human social system, intentionality is at the level of the actor (Robins and Pattison 2001). To ignore qualities of the actors under all circumstances is to risk an incomplete, possibly spurious, explanation.

Of course, we expect some level of incomplete explanation in social science because it is futile to attempt to observe every possibly relevant variable. For that reason, an examination of the network topology may prove highly insightful and should not be discounted. But when there are good theoretical reasons to suppose that individual-level variables may be relevant, it is incumbent to examine them as possibly operating alongside *and in interaction with* network effects. The question

then becomes essentially empirical: do the individual-level and network-based effects have independent explanatory capacity, do they interact in important ways, or can one be subsumed parsimoniously by the other?

The argument is perhaps more obvious for covert networks. By a covert network, I mean a network of actors with broadly shared incentives to dissemble about their activities and connections, and to keep at least some of them not publicly visible (see also Raab and Milward's 2003, discussion of what constitutes a "dark network"). In a covert network, when certain cooperative actions become visible there may be serious negative consequences for the actors. So we must suppose a motivation for some or all of the actors in such a network to operate partly or wholly covertly, else we do not have a covert network. It is impossible to understand the operation of the system without at least passing appreciation of this motivation. Yet, a motivation constitutes an individual-level variable. It follows that, theoretically, a description that is based exclusively on network topology has to be incomplete. Once we recognize that at least one individual-level factor is an essential feature of criminal networks, we cannot ignore the possibility that other individual qualities or predispositions may be relevant. Accordingly, we need theory and methods that permit the simultaneous analysis of individual and network processes.

To take the point further, theoretically, a motivation to covertness has to be at the level of the actor and cannot be a construct of the network itself. Networks do not have intentions; actors within them do. Like all attitudes and predispositions, an intention has its source in the psychology and predispositions of individuals. Attitudes, intentions and motivations may be discussed among a group of people, coordinated, shared and expressed within a dynamic of cooperative teamwork, or alternatively may be in disagreement and result in contested outcomes. But such constructs are not fundamentally a property of the group, although the extent to which they are shared or more generally distributed may be. While we might wish to attribute some collective psychologically-based properties to a group of individuals– for instance, organizational climate or culture, or group norms–to do so is to engage in complex multi-level theorizing in a way that cannot exclude the individual-level attitudes and behaviours that are the building blocks of the collective property (Gonzalez-Roma et al. 1999; Kozlowski and Klein 2000; Lusher and Robins in press). Ultimately, covertness within a social system requires individual action.

Of course, in practice no-one claims that the actions and intentions of individual criminals should be ignored. Criminal justice sanctions are applied at the level of the individual in most court cases. If you act in a criminal way, your sentence is your own. At this very basic level, there seems little conceptual room to exclude individual effects from a criminal network perspective. Of course, to say so is not to prescribe which individual aspects may be the purpose of research. Rather, it is to highlight that, for criminal networks, a claim that network topology may be the sole explanation for outcomes should be treated with some skepticism.

Current criminal network research implicitly recognizes this point. Despite a natural focus on structure, there is often discussion of certain personal qualities or predispositions of network actors. Milward and Raab (2006) certainly concentrate on the structure of "dark networks", in particular how these networks can be resilient in the face of external efforts to eradicate them. Their claim that "…resilience is dependent on the (structural) characteristics of the network as a whole …"(p. 351) is

a theoretical statement about the importance of topology. Yet, they add that "In order to be resilient, dark networks therefore have to strengthen their efforts to create more meaning and integrate through cognitive cultural mechanisms…."(p.354). Such "cognitive cultural mechanisms" explicitly invoke psychological predispositions of the network actors. (I shall return to this idea later.) So, individual effects are recognized, albeit sometimes in passing. What is not available from the current criminal network literature is a systematic theorization about the possible interactions between individual and network. This article is directed towards that gap.

What these considerations make clear is that in a network study there are (at least, potentially) multiple levels of analysis. We might be interested in the behavior of individuals within the network, relationships between pairs of individuals (*dyads*), the structures of small subgroups within the network, or effects on the network as a whole. Of interest to us in this article are the possible interaction effects between some of these levels, in particular interaction effects involving individuals. By this, I mean how individuals for instance may influence or be influenced by network relationships: more generally, how the network provides constraints and opportunities for the individuals within it, and how those individuals attempt to shape the network to maximize the opportunities and limit the constraints. I describe different levels of analysis more fully below, but the basic units of analyses throughout this article are individual factors and network ties, and the focus of attention is the interaction effect between the two. Although it is beyond the scope of this article, each of the interaction effects described below can be formulated precisely in network statistical models as formal statistical interactions (e.g. Robins et al. 2007.)

There is another side to the coin. Sometimes, social science has been too individualistic, ignoring the relational network-based features that provide the systemic qualities of a social system. Just as explanations based solely on network topology may be inadequate, accounts that rely on conceptualizations of individuals as separated islands of activity within a wider social "soup" may prove too primitive. Yet every time we as social scientists conduct a regression or other general linear model analysis we discount the systemic elements that may be present. We implicitly invoke independent observations to justify our analyses, and hence assume away any dependencies in the data (Robins and Kashima 2008). In such analysis, network effects disappear by assumption.

This article does not argue that we should do away with examinations of network topology or indeed of linear regressions. Rather, the argument is that we need to think carefully about how to represent the systemic, "organized" elements of a social system. If a network representation is appropriate, then we need to consider how the relational and individual components of the system may affect each other. In this article I discuss the general types of individual level variables and network effects that might be relevant in general, and then go on to explain some ways in which these effects may interact in meaningful ways. Having covered this ground generally, I discuss particular implications that might be relevant to covert networks. As I have a focus on the psychological aspects of individual behavior within networks, I conclude with a discussion about the integration of psychological and social network theories within the context of studies of organized crime.

**Some network terminology**

Although some network concepts are specifically introduced in the text below, this article presupposes knowledge of a certain amount of network terminology. A *network* comprises a set of *actors* (individuals) and a set of *relational ties* among them. A relational tie is a property of a pair of actors. A network is often drawn as a *graph* with *nodes* or *vertices* representing actors, and *edges* (lines) representing ties. A network may be *directed* in that an actor expresses (or *sends*) a tie towards another actor (who *receives* it), or *nondirected* where there is no directionality in the tie.

Certain other network terms used in this article are briefly defined in the glossary in the Appendix.

**Factors relevant to a network-based social system**

In this section, I describe five different levels of effects, both individual and relational, that in general might be relevant to research into a network-based social system. This is not to say that studies need to address all such factors; rather that it is within such a multilevel network framework that the network perspective comes into its own, and that researchers need to bear in mind the possibilities in designing their research. Of the five levels, the first relates explicitly to individual factors that are not conceptually related to network constructs, whereas the remaining four are different levels of relational effects, from the dyadic to the global. In the following section, I will consider how some of these individual and relational factors may interact with each other.

Individual level factors

There are various types of individual factors that may be theoretically relevant for a network study. An important distinction is whether the factors under study are liable to change, or are to be regarded as fixed within individuals while varying across individuals. This distinction may be important in determining whether certain factors may be explanatory to, or outcomes of, social behaviours.

Some basic *demographic* factors (e.g. age, sex) are typically measured in network studies. Demographic factors are unchanging for a single individual but vary across network actors. Beyond simple demographics, individuals may also possess certain *capacities*—e.g. skills, expertise, information or knowledge— forms of "individual capital" that may bear on social actions. Capacities vary across individuals and may obviously change as individuals *learn*. The time period of a research study, however, may be insufficient for a major variation in capacities within individuals, in which case they then resemble demographic variables. The dark side of a capacity is a *disease* which in the most abstract terms may be construed as a negative capacity that disadvantages an individual. An actor may obtain capacities and diseases exogenously (i.e. other than from network processes), and may even be born with them, but many types of capacities and diseases may also diffuse through the network (information may be spread, diseases may be contagious).

A broad range of *psychological* factors may also be relevant to understanding individual behavior within networks. Some of these can be seen as the cognitive precursors of social action, such as attitudes, motivations and beliefs. These may conceivably change within individuals over time, perhaps through social influence processes described below. There are more abiding psychological factors—e.g., personality traits and certain types of identity formation—that may predispose individuals to different forms of social action, but if they vary at all within an individual they do so over longer time periods. Accordingly, they may be more likely valid as explanatory factors rather than outcomes. As well, there are somewhat transitory emotional and mood states that may be the outcomes of situations but may also provide motivation for further social action, for instance, as an individual attempts to improve a negative mood state.

The term *psychology* here should be understood broadly. I include quite general aspects of human behavior with a cognitive or emotional component. Such cognitions may include rational and goal-directed plans, attitudes of various types, biases and misperceptions of which an individual may be only vaguely aware, and irrational emotional responses. Because I include rational goals under this heading, the personal *interests* of an individual may also be considered as part of that person's psychology. Interests constitute one type of motivation towards action. This conceptualization supposes that an interest is something known to an individual and possibly acted upon. Of course, it is the case that outsiders (e.g. a researcher) may view individuals as acting "against their own interests", but an external assessment of interest not shared by the individual will not be a motivator for action and so is not considered here.

Individuals also have *possessions* that can be given away or exchanged, i.e. forms of economic capital. There is an important difference between a possession and a capacity or disease, in that the possession, once relinquished, is no longer retained, whereas when individuals spread information or influenza, they still remain knowledgeable or infected. Finally, individuals engage in *behaviors* that may in part be in response to the opportunities or constraints presented by network structures.

## Dyadic level factors

A *dyad* is a pair of actors and the social relationships (which may be non-existent) between them. Networks are typically measured at the dyadic level in that relationships of certain types are observed between pairs of actors. Accordingly, what we list here as "dyadic level factors" may also be embodied in the design and method of data collection of a network study. Some of the considerations that may be taken into account include:

- *Multiplexity*: What is the content of the network tie? Is a single or multiple network relational content measured (e.g. communication *and* trust)? If there are multiple relational contents, then do these associate in various ways?
- *Positive vs negative ties*: Similarly, are relations valenced by positive and negative affect (e.g. trust/distrust)?
- *Strong vs weak ties*: Can relations be represented as strong and weak ties? In the network literature, there is a long theoretical and empirical discussion of the

different outcomes for strong and weak ties, starting from Granovetter (1973) who argued that strong ties would tend to form into dense, clique-like structures, while weak ties would tend to connect between those structures.

- *Short-term vs longstanding ties*: Is the data cross-sectional or longitudinal? If longitudinal, is it panel network data, or is each network tie time-stamped? Does the network tie represent a transaction of a given duration, or a longstanding and indefinite relational tie?

Node positioning network effects

An important and longstanding theme in social network analysis has been based on the idea that some nodes might occupy certain distinctive positions within networks. (What a researcher counts as "distinctive" is determined by the research question and informs the method of analysis.) The idea is expressed in the graph-theoretic notion of the *centrality* of a node. There are various types of centrality (Freeman 1979). *Degree centrality* simply refers to the number of ties in which a node is engaged (which, for directed networks, may be interpreted as a node's *popularity*, for indegrees, and *activity*, for outdegrees.) *Betweenness centrality*, on the other hand, measures the extent to which a node sits on network geodesics and thereby refers to a node's involvement in the connectivity of the network, and hence implicitly in the efficiency of the network. *Structural holes* (Burt 1992) are "gaps" in the network. Burt (1992) famously argued that people who occupied *structural holes* (i.e. who provided bridging ties between otherwise separated denser regions of the network) were in a position of entrepreneurial advantage, a form of *social capital*. A node occupying many structural holes will have high betweenness centrality. Such an actor is often referred to as a *network broker* or *network entrepreneur*.

Localized network structural features

Network ties may tend to pattern themselves in certain ways, processes referred to as *network self-organization*. There are some well-known social processes that can lead to these patterns. For instance, in many directed networks based on positive affect, *reciprocation* is usually a very common feature and suggests that processes of mutuality and exchange are strong in human social systems. Similarly, *triangle formation* is a commonly observed feature of human social networks, and there are good empirical and theoretical reasons to expect triangles to emerge (Cartwright and Harary 1956; Davis 1970; Simmel 1908; Snijders et al. 2006b). When triangles build upon one another, the precursors of cohesion and teamwork may be created, and a build-up of triangles into denser regions of the network can lead to what Newman and Park (2003) termed *community structure*. The important point about network self-organization is that the processes leading to particular patterns of ties are postulated to occur irrespective of any individual qualities of the nodes. In other words, the processes are best seen as operating on the ties. This is not to say that they are not the result of (combined) individual action; rather, processes such as reciprocity are so universal among humans that they have a tendency to occur within social networks, irrespective of whom the actors are and

the individual motivations or intentions they may have. The fact that these processes are *tendencies* and not necessarily deterministic implies an inherent stochasticism in human social systems. Of course, it is always an empirical issue whether such tendencies are to be observed in a particular network, but it is risky for a researcher to ignore such possibilities.

Global network features

Finally, there are some features of the network that are *global* in the sense that they are inherently properties of the network as a whole. The density of a network is perhaps the simplest example. *Network centralization*, the extent to which network ties are concentrated on a small number of high degree nodes, is often of interest. We may also include the degree distribution and the geodesic distribution of the network as important global features. For the most part, global features can be seen as the structural outcomes of the various processes that may create the network, perhaps as a side effect, although in some cases the processes themselves may be directly implicated in producing the specific feature. For instance, the presence of highly skewed degree distributions may be a direct result of a *preferential attachment* type process whereby popular nodes attract more popularity (Barabási and Albert 1999). Another interesting global representation is that of the *role structures* of a network as captured by a *structural equivalence* partition of nodes (Doreian et al. 2005; White et al. 1976). Under structural equivalence, nodes are assigned to different categories based on similarities in the patterns of their ties, to produce a simplification of the network in terms of an underlying structure among the categories. This structure is interpreted in terms of different roles adopted by categories of individual actors in expressing and receiving ties.

It is also possible that exogenous factors may produce global features that are important in shaping the network. For instance, for formal organizations, an imposed organizational hierarchy and reporting structure may be an important influence on network outcomes, in which case a multiplex analysis involving simultaneously formal and informal relational ties may be warranted.

It is worth noting that, as is typical of analysis based on multiple levels, effects at some of these five levels have implications for other levels. For instance, node positioning effects obviously relate to the global structures, in that identification of certain node-level network effects requires knowledge of the entire network. Degree centralities of individual nodes obviously combine to produce the global degree distribution; a node's position can also be interpreted in terms of a structural equivalence categorization. In addition, certain node positioning may relate to localized structures. For instance, when individuals occupy structural holes, they are *not* engaging in tendencies for triangulation that would otherwise *close* the structural hole. Accordingly, there is not a strict hierarchy of one of the five levels being necessarily contained within another. The point about node positioning effects is that, although they may relate to other levels, the focus is on the relevance of the position for the node; whereas the focus for global effects is not on one or the other particular node, but the pattern or distribution across all nodes. Finally, tendencies at one level–for instance, localized network self-organization–may produce certain types of outcomes at other levels–particularly, certain types of global network

structure. For instance, Cartwright and Harary (1956) showed that certain local network processes of triangulation among positive and negative ties–which they termed *structural balance*–would result in a global structure of cliques of nodes with positive ties within cliques and negative ties between cliques.

## The interaction of individual-level and relational effects

Having specified five different levels of effects that might be relevant to consider in a network study, I proceed to describe ways in which individual effects (i above) may interact with some of the relational factors. I focus attention on the dyadic level (ii above) and node positioning effects (iii above), and draw an important distinction about whether the individual-level effects are to be seen as explanatory of or outcomes of network processes, that is, whether they are cause or consequence of network structures (Borgatti and Foster 2003). When individual factors are explanatory of network features, the description is one of *social selection* (where individuals select certain partners or position based on individual factors); on the other hand, when individual factors are outcomes, the description is one of *social influence,* or *social contagion*, whereby individuals are influenced by their network partners or position (Leenders 1997; Pattison et al. 2008).

Accordingly, at the dyadic and node positioning levels, I identify four broad classes of possible interactions with individual-level factors, based on selection and influence respectively.

> Social selection

a.) Certain individual-level variables may result in dyadic relationship formation (*dyadic selection)*. In criminal networks, for instance, two criminal may form an alliance based on shared interests.
b.) Certain individual-level variables may result in individuals seeking to take particular network positions (*generalized selection*). In criminal networks, for instance, a criminal may seek to take a leadership position based on his or her special expertise.

> Social Influence

c.) Certain individual-level variables may be changed for some individuals because of the influence of dyadic network partners (*dyadic influence*). In criminal networks, for instance, a criminal may alter his or her attitude towards certain activities in response to pressure from network associates.
d.) Certain individual-level variables may be affected because of the network position the individual occupies (*generalized influence*). In criminal networks, for instance, intermediaries between competing groups (network brokers) may adopt additional security measures if their brokerage position leaves them vulnerable to betrayal by either group.

As noted below, dyadic selection and influence processes have been well-studied in social network theory. The generalized versions, however, are not so commonly examined. They represent situations where individuals may seek or be affected by

network positions that are more than just the sum of dyadic relationships. The generalized form of selection and influence thereby goes beyond research based on simple exchange and utility maximization for individuals within dyads (Jackson 2005; see also Pattison et al. 2008, for a discussion).

I now discuss each of these four interaction effects in terms of possible processes that might be relevant, drawing on the different types of individual factors: demographic, capacities, psychological, possessions and behaviors. This is not intended as an exhaustive review, but rather to provide some ideas about how individual factors may interact with network-based effects, and to indicate some interesting lines of current research.

Dyadic selection processes

*Homophily and social identity* In social network research, the most commonly mentioned dyadic selection mechanism is *homophily*. Individuals form a social connection through sharing certain qualities (McPherson et al. 2001), often taken as demographic or other non-psychological attributes.

The motivations for tie formation, however, are often unclear. If the shared quality is a social category (e.g. sex, race, profession, education), the processes described by social identity and self categorization theories (Tajfel et al 1971; Turner et al 1987) may take effect. When a possible social category becomes salient for a person, a shift occurs in the perception of self as an exemplar of the category rather than as a unique person. This is accompanied by cognitive biases in favor of others from the category, and such biases presumably can motivate tie formation (at least in network relationships implicating positive affect). This simple example shows how a well-established psychological theory can help explain an observed social network phenomenon of tie formation.

*Homophily and attitudes* However, there are also good grounds for believing that attitudes towards certain issues may be a basis for the formation of social ties. Early arguments to this effect include Balance Theory (Heider 1946) whereby individuals seek relationships consistent with shared likes or dislikes. Similarity-attraction hypotheses (e.g. Byrne 1997) are also relevant. (As explained above, balance theory was subsequently adapted by social network researchers into structural balance theory by Cartwright and Harary 1956, becoming a theory of network self-organization with its psychological origins largely ignored–see Robins and Kashima 2008, for a discussion).

*Heterophily* But it cannot be supposed that similarity is the only driver of relationship formation. Often there are circumstances when difference is important. Individuals, for instance, may seek out others because they have certain expertise or other capacities. This may lead to status hierarchies. Exchange within dyads presupposes difference in the types of possessions each actor has. In more abstract terms, heterophily opens possibilities of examining interesting dyadic multiplex ties, where for instance a certain type of individual might give allegiance to a different type of individual and receive rewards in return, a form of *multiplex network exchange*.

Generalized social selection processes

The term *generalized social selection* is intended to describe situations where individuals may seek to select for themselves network positions of a certain type.

*Structural holes, boundary crossing and motivations* One of the most interesting examples of generalized social selection relates to the motivations and predispositions for crossing social boundaries or for choosing social positions that bridge between different regions of the network. The motivations and advantages of network brokerage have been of longstanding interest in the network literature (see, e.g., Boissevain 1974, who provides some interesting examples of brokerage within mafia networks). According to Burt (1992) a main advantage in occupying a structural hole is to extract entrepreneurial advantage: that is, to increase capacities or possessions. But it may be that individuals of certain types are more amenable to being network brokers, for it has been argued that occupying structural holes can be quite stressful for the entrepreneur (Krackhardt 1992).

Burt et al. (1998) found that respondents with networks rich in structural holes were inclined to be independent outsiders in search of change and authority; whereas those with few structural holes tended to seek conformity, obedience, security and stability. Kalish and Robins (2006) examined these issues with better established psychological instruments and found that personal networks could reasonably be described by three components, for each of which psychological predispositions explained a significant proportion of the variance. Their results suggested that people who saw themselves as vulnerable to external forces tended to inhabit closed networks of weak connections; whereas people who sought to keep strong tie partners apart, and so to bridge structural holes, tended to be individualists, to believe that they controlled events, and to have higher levels of neuroticism. Finally, people with strong network closure and "weak" structural holes tended to categorize themselves and others in terms of group memberships, akin to the social identity effects discussed above; and they were more extraverted and less individualistic.

The effect of psychological factors on a preparedness to adopt bridging network positions is intriguing. Kadushin (2002) provides a theoretical rationale how individual psychology might be relevant in shaping network structure. Further to the results above, Mehra et al (2001) found that high self-monitors tended to bridge more effectively in organizations; and Robins et al. (2001a) provided evidence that non-depressed adolescent girls were the ones more likely to bridge between groups of depressed girls. These results strengthen claims that various psychological traits and factors may be relevant to understand the motivations for network brokerage.

Kalish (2008) argued for the existence of (at least) two separate motivations for bridging structural holes: entrepreneurial and relationship-building motivations. In a small network of Jewish, Arab and Druze Israeli students he found evidence for two psychologically distinct network orientations. The first type bridged structural holes within the three religious groups, while the second type spanned between religious groups. The first type tended to have entrepreneurial motivations, to value power, to have an internal locus of control, to view themselves as individuals (as opposed to group members) and seemed to be more neurotic. In comparison, the second

type–who had a relationship-building motivation and bridged between different religious groups–valued universalism, tended to view themselves as less independent of the whole, and seemed to value achievement more.

Specifically in the area of criminal networks, Morselli and Tremblay (2004) provided a fascinating analysis of how occupying structural holes may have impact on criminal earnings, but also how certain types of individuals are better able to extract those gains from their enhanced social capital. They showed that criminal earnings were greater for criminals (especially those involved in market-based crimes) whose personal networks had more structural holes, but that this effect was diminished for criminals who had lower self control. In other words, there was a clear interaction effect between network positioning (bridging structural holes) and individual psychological qualities (self control) in a way that affected a separate individual-level outcome (earnings).

*Personal attitudes and norms: network popularity and activity* Network position of course may include features other than spanning structural holes. Lusher and Robins (in press) argued that within particular social contexts, it can be expected that attitudes may contribute to network activity (propensity to send network ties) and popularity (propensity to receive ties). Drawing on social identity theory, they argued that individuals may become popular because they exemplified certain qualities favored within the local culture of the group. Holding personal attitudes that express those qualities may then result in popularity. Network activity, on the other hand, may be the result of perceiving that others in the group do tend to value just those qualities, that is, perceiving accurately the norms of the group. Extensions of this work have shown that network activity and popularity effects can also be used to help explain boundary-crossing effects in organizations. Lomi et al. (2007) have shown how a more inclusive social identity may encourage individuals to engage in more communication across formal organizational boundaries.

Dyadic influence processes

*Attitude and behavioral contagion* Influence processes have been researched in terms of attitude and behavior change whereby individuals may be affected by those around them (Friedkin 1998; Robins et al. 2001b). There has been much work in particular on health behaviors and whether there are network-based influence effects (e.g. smoking—Ennett and Bauman 1993; alcohol usage–Skog 1986; more recently, obesity–Christakis and Fowler 2007.) Of course, the paradigm case of health-based diffusion processes occurs with contagious diseases that may be spread through networks based on various types of human contact (e.g. Morris 2004). More generally, attitudes within organizations have been shown to align in various ways with network structures (e.g. Rentsch 1990), and this conclusion extends to wider organizational fields (e.g. public policy–Lewis 2005). Mason et al. (2007) review many of the current approaches and ideas in dyadic-based social influence.

I noted above the potential importance of various identity effects in shaping network relations and structure. It is also possible that identity change may be the outcome of influence processes. McFarland and Pals (2005) found that adolescents

changed their social identities to make them consistent with others within their personal social networks. The possibility that identity may be both an antecedent and an outcome of network structure raises the difficult question of disentangling dyadic selection from influence. Snijders et al. (2006a) described recent methods for such an analysis when one has longitudinal data.

Generalized social influence

Burt (1987) showed that influence need not just be dyadic but that people could change their attitudes or behaviors based on social position, in this case, membership of structural equivalence blocks. In particular, innovations may be spread through structural equivalence positions, in that people in similar network roles may come to identify similar opportunities. A further interesting possibility is that being in certain positions may be difficult and result in stress, especially if through some constraint an individual cannot change their network position. Krackhardt (1992) provides a compelling case study whereby the stresses on one individual due to competing network relationships were central to explanation of an organizational outcome. In this case, the stresses were sufficient for the individual to leave the organization.

## Implications for studies of covert networks

In this section, I draw some implications of the interaction of individual attributes and network relational processes specifically for covert networks. The point of this section is to show that covert networks are likely to have structures that can be theorized and analyzed but cannot be fully explained without invoking individual level factors.

The important feature that distinguishes covert networks from other networks is that effective organisation and collaboration within the network demands some level of invisibility. Public observation of some important cooperative actions is likely to lead to serious negative consequences for network actors. Hence, there are two competing motivations: the need for collaboration and cooperation which requires multiple links and actions, each of which increases the potential for visibility; and the need for secrecy, control and security (Baker and Faulkner 1993; Morselli et al. 2007).

So, individuals in covert networks need network ties that elicit sufficient cooperation to achieve shared goals, but ties with network partners that they can trust sufficiently. Trust that a particular tie will remain covert may be achieved by way of sanction, possibly the implicit use of violence. But a network that is too dependent on violence to sustain its operations is likely to be one that involves contested hierarchies (see Lusher and Robins in press) and consequent uncertainties and inefficiencies. Violence is an effective exemplar when used with discretion.

Trust in criminal networks has been discussed by von Lampe and Johansen (2004). They theorized that different types of trust existed at multiple levels, and argued that the bases of trust may be quite diverse. They describe various forms of trust: *individualized trust* where an individual is trusted because of their personal qualities or past behaviour; *reputational trust* where an individual may develop a reputation as someone to be trusted; and *trust based on generalizations* where

individuals are trusted because they are members of a trusted group. They contrast these forms of trust with *abstract trust* which constitutes trust in social institutions or in people more generally. The last form of trust bears similarity to *generalized trust* as discussed in parts of the social capital literature (e.g. Putnam 2000), although of course in a criminal context it would likely have different manifestations.

von Lampe and Johansen (2004) recognize that trust involves two parties, a trustor and a trustee, but the types of trust categorized above focus principally on one or the other of these: the trustee for individualized, reputational and generalization-based trust, and to some extent the trustor in relation to abstract trust. I wish to consider the ways in which strong *dyadic* trust ties, necessarily involving two partners, may come into being. A dyadic social selection process based on homophily is obviously a candidate hypothesis. Trust is likely to be stronger the more the individual qualities that are the source of the homophily invoke a sense of self and identity. Examples might include shared family, ideology or religion. These are described by von Lampe and Johansen (2004) as *trust producing social settings.* An extended long history of cooperation may operate similarly (von Lampe and Johansen include past business activities in their trust producing social settings). Rituals around "group membership" may strengthen the sense of common social identity. What we know from Granovetter (1973) about such strong ties, however, is that they tend to cluster together into clique-like structures. These cliques have advantages in terms of control, for group members can then exercise scrutiny over each other, and so seek to reinforce norms, including norms of covertness and loyalty. They can also be the sources of reputational trust, where certain individuals come to be recognized as being reliable. But cliques involve many ties and hence increase the risks of visibility. Accordingly, there may be sense to a hierarchical structure that has strong clique-like structures (cells), linked by fewer, weaker ties between cells. There are two problems: identity processes may be focussed too locally on the cliques, so trust ties may not extend across the network, and the weaker ties between cliques, if revealed, are fewer and easier to disrupt.

Covertness arising from social identity based processes can be powerful because to the extent that the individual adopts the ideology or the meaning implicit in the identity, control is exercised psychologically. This is a psychological basis for the "cognitive-cultural mechanisms" described by Milward and Raab (2006) as preserving meaning for dark networks in the face of disruption. But there can also be multiple levels of identification, some broader and more inclusive than others, whereby individuals identify and trust within cliques because of more localised sources of homophily, and identify between cliques due to a broader shared ideology, religion or shared meaning. This is comparable to the finding of Lomi et al. (2007) that individual managers within a multinational business identified to greater or lesser extents with both their individual companies and the multinational group; and that the broader level of identification was associated with network ties that extended more widely across the multinational.

Ideological identification is not so typical a source of trust within criminal networks if the shared intent is strongly focussed on illegal material gain. So, individual interests and goals are relevant to this discussion. In the absence of ideological identification, there can be recourse to family links–or surrogates thereof–or shared histories, but the network may be based on a more pragmatic

coalition involving different types of expertise and capacities. Balance-type processes may be important: trust may be strengthened by shared distrust (e.g. of law enforcement authorities or competitors). Loose alliances of terrorist groups may form networks centred around grievances, where subgroups of actors have differing perspectives but act collaboratively against a common adversary. So, both psychological motivation and network self organization may operate simultaneously.

When social and psychological identification is not an effective means to develop trust, violence may be more commonly used as a method of internal control. One motivation for the use of violence as an exemplar is that knowledge of the act will diffuse within the network (but perhaps not widely outside it), building social influence processes for the maintenance of norms and established hierarchies. But even without violence as a possible response (see von Lampe and Johansen 2004, for a discussion), balance processes can be effective in sustaining trust. It is harder for ties to be severed when they are embedded in a clique-like structure of other ties, where the various individuals can exercise scrutiny over one another.

But balance leads to cliques, and the issue remains of how the network can remain connected. Network brokerage then becomes a prominent issue. Brokers are vulnerable in that they can be betrayed from both sides of any structural hole they occupy. It is indeed a position of stress (Krackhardt 1992). Accordingly, brokers in covert networks have an even greater motivation to be secretive (and such a position may indeed suit more neurotic individuals–Kalish and Robins 2006). If they have an entrepreneurial orientation (to use the terminology of Kalish 2008), their position may arise because of certain capacities they possess, so they are less likely to buy into the social and psychological identifications that may apply to others in the network. Yet they are crucial to the effectiveness of the global network structure, as they are the vehicle of connectivity (and also of economic and resource exchange). Morselli and Roy (2008) showed that removing key brokers can disrupt networks.

The problem for law enforcement authorities seeking to locate network entrepreneurs is that brokers differ from others in the network, both in terms of their structural position and of their likely motivations and psychological identification. We cannot necessarily uncover the activity of brokers by extrapolating from the behaviours and linkages of other network members. To develop a profile of a typical network member, and then to assume that this will apply to the crucial network brokers who provide the "glue" that connects the network, is likely to be an incorrect inference from the average to the distinctive.

As a result, network entrepreneurs present particular challenges to law enforcement agencies which may not readily identify them. More needs to be learnt about the profiles that might be specific to network brokers in covert networks. Stronger theoretical and empirical knowledge will give law enforcement agencies more options in intelligence gathering activities in regard to network brokers. An interesting possibility may be the "testing" of a criminal network in situations where existing intelligence is not sufficient for confidence that brokerage is operating between two disparate groups within the network. The "testing" would be somewhat akin to the disruption studied by Morselli and Roy (2008–see also Chattoe and Hamill 2005). If the network were a carrier of process–for instance, information flow–salient information (correct or otherwise) could be fed through one part of the network, and intelligence gathered about whether it emerged in another,

possibly disconnected, group. This might indicate the presence of unseen connections, presumably in the form of brokerage. The speed of information spread may indicate the efficiency of the network, and perhaps the amount of brokerage. If such structural intelligence can be combined with relevant psychological and demographic information that will narrow the pool of possible candidates as brokers, the parameters for the search for network entrepreneurs may become more limited and tractable.

## Conclusions: psychology and networks in criminal groups

Much of the discussion of covert networks in the preceding section involved individual factors that were overtly psychological: motivations, ideologies, identifications. Despite some recent attempts at integration (Mason et al 2007; Robins and Kashima 2008), psychological and social network theories typically talk past each other. The divergence is often stark when individual psychological differences are considered. Social network researchers seldom consider the possible effect of individual differences on network structure (Mehra et al 2001); while individual difference researchers are often wedded to conceptualizations of individuals as independent entities, rather than the relational approach of network analysis. For studies in organized crime, this divergence plays out as a contrast between studies that focus on criminal psychology and studies that focus on criminal networks.

Surprisingly, even social psychological and social network approaches often have too little in common, concentrating on different aspects of human sociality (Robins and Kashima 2008). Studies in social cognition, for instance, deal with individual perceptions of and behaviors by social actors, without consideration of how these individual-level effects may cumulate to a social system. The social cognition of criminals, for instance, involves individual responses to perceived threats in the social environment. On the other hand, social network research typically neglects the motivated social cognition of individuals, and so under-theorizes a system of human social actors (Robins and Kashima 2008). This leads to a focus on network topology to the neglect of individual motivations. Network theorists themselves have pointed to such gaps (Emirbayer and Goodwin 1994).

While recent research still requires further development before we can be sure of major effects, there are many indications that a fuller understanding of human action within social structures will require consideration of both network and individual psychological variables and their possible interaction. In examining several of these factors together, Copeland et al. (2008) concluded that an exclusively group psychological or network structural approach may not adequately explain organizational behaviour. They argued for a more unified theoretical approach linking, in particular, identity and network perspectives. For criminal networks, this means paying theoretical and empirical attention to the interplay of, for instance, the sources of identification or interests among criminal groups and how these relate to collaboration and trust ties. More generally, a richer description of individual action within a complex social system will require better knowledge about how personality, social identity and other psychological factors are distinct from, and yet may interact with, self organizing network processes. We may also need to consider cultural

effects (Emirbayer and Goodwin 1994), as the various processes of selection and influence can potentially be influenced by culture, including culture understood as norm formation within groups. Patterns of selection and influence will need to be studied–and carefully disentangled–to reap these rewards. The new methods developed by Snijders et al. (2006b) are relevant to this task. Varese (2008) is pioneering this approach in relation to criminal networks with his studies of Russian mafia networks in Italy.

So, empirically, we know surprisingly little about how the psychology of social actors interacts with network structure, and perhaps even less so in the case of criminal networks. There is a need for sustained research. Psychologists have to step forward from assumptions about independent entities and enter into analyses of individuals within networked social systems. Network researchers have to step forward from assumptions that structure explains everything and incorporate a richer construal of the motivations of social actors. Robins and Kashima (2008) emphasized that this was not a contest: there is plenty of theoretical and empirical room for both psychological and structural processes to occur simultaneously and, indeed, to interact with one another. Whenever we look for such effects in data, more often than not we find them. Social processes implicating individual-level variables typically operate simultaneously with network self-organizing processes, and individual-level and network effects typically interact with each other in ways that help explain the processes and structure of the social system. Because criminal organization so clearly implicates both individual and network effects, researchers into criminal networks could be at the forefront of such an integration.

## Appendix: Glossary of some common network terms used in this article

**Actor**: typically, an individual who "acts" within a social environment; more generally, a social entity that comprises the nodes of a network. In a criminal network, the actors typically are the criminals.

**Broker**: A network broker connects otherwise disconnected parts of the network. In a criminal communication network, an intermediary between two groups who do not otherwise communicate is a network broker. Brokers occupy **structural holes**, the "gaps" in the network where certain parts of the network are disconnected.

**Centrality of an actor**: The "importance" of an actor to a network. There are various types of centralities, two of which are **degree centrality** (with the most central actors being those with the highest degrees) and **betweenness** centrality (where the most central actors are those who keep the network connected). In a criminal communication network, criminals with the highest degree centrality are those who have the most communication partners, whereas those who have the highest betweenness centrality are those whose absence would most likely disconnect communications across the network.

**Clique**: a subset of actors, all of whom are tied to each other.

**Connected**: Two actors are connected if there is a path from one to the other. A network is disconnected when some actors are not connected to other actors.

**Degree**: In a nondirected network, the *degree* of an actor is the number of ties in which that actor is involved; in a directed network, the **indegree** of the actor is the number of ties received, and the **outdegree**, the number of ties sent. In a nondirected criminal network relating to communication, the degree of an actor is the number of other criminals with whom the actor communicates. In a criminal trust network, the indegree of an actor represents **popularity** in terms of how many others trust that actor, whereas the outdegree represents **activity** (sometimes, termed **expansiveness**) in the sense of how many others the actor trusts.

**Degree distribution**: The distribution across the whole network of the number of actors with given degrees. In a criminal communication network that was highly centralized, with some criminals having many communication partners and many with few communication partners, the distribution would be both skewed and bimodal, with a few high degree nodes, and many low degree nodes. For directed networks, there are both **indegree** and **outdegree distributions**.

**Density** of a network is the proportion of observed ties to possible ties.

**Directed/nondirected network**: A network may be directed in that an actor expresses (or sends) a tie towards another actor (who receives it), or nondirected (or undirected) where there is no directionality in the tie. In criminal network studies, examples of nondirected networks might include alliance (i.e. two criminals might be allied to *each other*); examples of directed networks might include threat (i.e. one criminal might threaten another.)

**Dyad**: a pair of actors and the relations between them.

**Geodesic**: The shortest path between two actors is a geodesic, the length of which is the **geodesic distance** (taken to be infinite if the pair of actors is **disconnected**, i.e. without a path between them.) In a criminal communication network, the geodesic distance between two criminals $i$ and $j$ is the smallest number of communications by which $i$ can communicate with $j$. If $i$ and $j$ are tied, then this distance is 1; if not, but they can communicate through one intermediary $k$, then the geodesic distance is 2.

**Geodesic distribution**: The distribution across the whole network of geodesic distances.

**Graph**: a mathematical object used to represent a network, comprising a set of **nodes** or **vertices**, representing actors, and **edges** (lines) representing ties. A graph can be drawn as a network visualization.

**Network**: comprises a set of *actors* (individuals) and a set of *relational ties* among them.

**Path** is a sequence of connected ties from one actor to another; the **length** of the path is the number of ties in it.

**Reciprocity**: In a directed network, a reciprocated (or **mutual**) tie occurs when ties both from $i$ to $j$ and from $j$ to $i$ are present in the network.

**Relational tie**: a social connection between actors. Different types of relational ties express different types of social connections (e.g. advice, communication, trust, acquaintanceship, friendship, hatred.)

**Structural hole**: See **broker**.

**Triangle**: a clique of three actors.

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