Loose Structure and Trust Bias: Exploring Chinese Civil Illicit Drug Trafficking Networks and Organisational Relationships

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Abstract

Describing and navigating the organizational networks and relationships of drug trafficking can significantly enhance the scientific and efficient enforcement of the law. This study employs a Social Network Analysis (SNA) approach to compile and analyze 70 model trafficking cases published by the Supreme People's Court of China between 2016 and 2022, supplemented by validation from 450 cases in 2021 at China Judgements Online. This study explores the organizational dynamics and trust-based practices of civil illicit drug trafficking networks in China. Two predominant types of networks emerge among trade-type drug trafficking groups in China (excluding drug lords): star-shaped and polyhedral structures. The former primarily focuses on distribution and transportation links, while the latter encompasses both manufacturing and trafficking. An analysis of centrality, location, and directional variables reveals significant differences between these network types. However, both networks are still trapped in loose organizational structures, making them vulnerable to infiltration and confessions. As a potential answer integrating Chinese culture, *trust bias* interprets how leaders form high-risk networks while balancing efficiency and security. The typology and structural analysis of drug trafficking networks in this study aims to assist law enforcement agencies in devising more effective strategies for combating these networks.

INTRODUCTION

Controlling drug manufacturing and trafficking is a critical component of global drug policy and national governance strategies. Drug trafficking, as a critical focus of crime control, drives both legislative initiatives and law enforcement efforts (Rosen, 2019). Internationally, these efforts often involve bilateral agreements, such as mutual legal assistance treaties, and concerted actions by individual states to combat the activities of significant traffickers or drug lords. This process invariably intersects with political and transactional dynamics within drug trafficking networks. For example, in the United States, political patronage is linked with commercial racketeering (Didin, 1987), and specific segments of the drug market are heavily influenced by organised crime and corruption. In contrast, the British drug market exhibits a higher degree of disorganised crime (Reuter, 1983). Thus, drug trafficking manifests through diverse organisational structures, particularly within small and medium-sized drug operations (Durán-Martínez, 2015). However, research on drug trafficking groups in China remains limited. China has long adhered to a strict "drug prohibition" policy (Song & Liu, 2022), with intensive crackdowns on drug-related crimes. The number of criminal cases related to drug smuggling, trafficking, and manufacturing remains relatively high, with 112,417 cases recorded on the China Judgements Online in 2020. Nevertheless, the network structures of China's civil illicit drug trafficking organisations (DTOs)—distinct from those led by drug lords—have yet to receive adequate interpretation and analysis, as well as what insights the Chinese stories might add to the literature on illicit drug organisations.

While research on DTOs adopts diverse analytical perspectives, studies focusing on small and medium-sized operations have most often emphasized two interrelated approaches: social network analysis (SNA) and attention to personal or situational dynamics within networks. Both approaches provide

insights into how these organisations operate, evolve, and bind individuals together. Social Network Analysis (SNA) of DTOs probe the mechanisms through which traffickers engage in the trade of specific drugs, such as heroin (Bright et al., 2012; Kenney, 2007). This entails exploring intra-network indicators like role, location, clique, and centrality within drug trafficking networks to forecast criminal activities and determine the residence locations of individuals involved. For instance, Jones' (2020) research team investigated the Fernando Sanchez Organization involved in cross-border drug trafficking between 2008 and 2010, identifying core roles and location relationships through network centrality and centrality metrics. Specifically, they explored the influence of leadership roles (Hofmann & Gallupe, 2015) and human resources (Basu & Sen, 2019) on organisational dynamics.

Criminologists using SNA, have highlighted that criminal organisations are not monolithic entities. Breuer and Varese (2023) classified organised crime groups into trade-type and governance-type categories based on variations in organisational behaviour and purpose, revealing differences in centralisation, pathways, and homogeneity. This classification underscores the inherent uncertainty and fluidity within organisational structures. Thus, while leveraging network analysis enables scholars to delineate the roles of participants, identify central figures, and ascertain the existence of cliques, it may also need to capture the nuanced dimensions of relationships among actors, such as the direction of instructions (called valued-directed graph in SNA literature), the level of cohesion, and the frequency and intensity of interactions (O'Malley & Marsden, 2008). Beyond Western contexts, studies of drug trafficking networks in Asia, particularly Southeast Asia, highlight organizational patterns shaped by intense prohibition regimes and fragmented enforcement environments. Research on cross-border trafficking in the Golden Triangle and surrounding regions suggests that drug trafficking organizations tend to adopt loosely coupled, trust-based networks rather than stable hierarchical structures (Zhang & Chin, 2003 ; Ganapathy & Broadhurst, 2008).

The second major line of research focuses on individual issues that influence drug trafficking behaviour, often framed within the context of social psychology of crime. These issues range from personal characteristics, such as gender, race, and kindships, which influence hierarchical arrangements within DTOs. For example, Li and Liu (2017) revealed that smaller drug cartels and male-dominated groups tend to display more hierarchical structures. Campana and Varese (2013) compared the Camorra clan and the Russian Mafia group, highlighting that kindships and violence-sharing narratives enhance their inner cooperation. Other studies, including those conducted in Mexico, the United States, Australia, and Canada, have also explored how individual characteristics shape the networks of DTOs (Desroches, 2007; Altschuler & Brounstein, 1991; Reyes-Sosa et al., 2020). Despite being presented as individual problems, many of these factors can be internalised structurally, affecting the entire network. Therefore, integrating these individual-level findings into network-based analyses can provide a more comprehensive view of how DTOs operate and evolve.

The literature, thus, ultimately navigates the nexus between efficiency and security by examining networks and organisational methods (Baradel & Breuer, 2024). A common strategy among DTO leaders is maintaining geographic and communicative distance from production and distribution sites to reduce

detection risks. By positioning themselves on the organisation's periphery (Malm et al., 2008), leaders minimise their visibility to the Criminal Justice System, exposing lower-level members to apprehension. This tactic underscores a key organisational challenge for DTOs: sustaining efficient trade operations while reducing exposure to law enforcement. This study will explore the networks of DTOs within the Chinese context and investigate how these organisations balance security and efficiency concerns.

This paper first provides an overview of drug trafficking organisations, including prior research on their structures as criminal networks and the current status of drug control in China. Then, we introduce the research methods and data collection processes used to examine Chinese DTOs' organisational models and behavioural logic. Analysis of the empirical data reveals that DTOs are generally trade-oriented and perform as two primary structures: star-shaped and polyhedral networks, distributed across different stages of preparation, manufacturing, and trafficking, with distinct differences in centrality, location, and directionality. We further highlight the structural similarities between these two types, particularly in terms of looseness, and explore how *Trust Bias*—integrating concepts from criminal psychology and network relations—helps explain this loose structure. Finally, the study concludes with a discussion of the implications of examining Chinese DTOs' network structures and internal relationships.

The Eliminating Drug Trafficking Organizations in China

The issue of drugs—including their production, use, distribution, and trafficking—has been both morally and politically charged since the founding of the People's Republic of China (Jiang & Song, 2024). In the early 1950s, due to the lingering effects of the Opium War on Chinese society and a moral panic around "drug users," drugs were deemed "social evils", necessitating strict control (Li, Liu, and Zhao, 2006). Given that the drug issue was entwined with foreign colonisation in Chinese independence, the political response to drugs became part of the government's broader quest to end semi-colonialism and establish sovereignty (Rogaski, 2004). Accordingly, prohibition and eradication discourses were promoted to reflect the government's determination to build a modern socialist nation. As Chinese society underwent profound transformations and social disorganisation from the late 1970s to the early 1990s, drug-related issues became particularly criminalised due to perceived links to rising criminality and adverse impacts on family stability and community cohesion (Song & Liu, 2022). Individuals involved with drugs were constructed as "potential criminals" deemed "dangerous" or, at the very least, "troublesome," warranting strict control or exclusion (Tibke, 2017).

Since the onset of modernization, the Chinese government has intensified the criminalization of drug-related offenses, establishing a comprehensive and stringent legal system focused on eradication. In 1979, the Criminal Law first explicitly outlined crimes related to drug manufacturing, trafficking, and transport, although penalties during this period were primarily limited to fixed-term imprisonment (over or under five years), detention, and property fines. After 1982, statutory penalties for drug offenses were expanded to include prison terms exceeding ten years, life imprisonment, and the death penalty. In 1988, the criminal classification of drug smuggling was further specified. The revised Criminal Law of 1997 introduced more standardized and detailed sentencing guidelines based on drug quantities, categorized

into thresholds of 10 grams, 10–50 grams, and over 50 grams, resulting in a significant escalation in sentencing severity (Wu et al., 2023). With the completion of these legal frameworks, the number of drug-related cases handled in China from 2016 to 2019 remained consistently high, exceeding 130,000 cases annually (China Judgments Online, 2024).

In alignment with elimination efforts, criminologists have sought to analyse criminal networks' organisational structures from the perspective of scientific knowledge production. As early as 2000, during the "Fight crime and eliminate evil" campaign (*Dahei Chue Yundong*), scholars widely characterised triad organisations as large in size, led by manipulative leaders, and marked by tight organisational structures, stable membership, strict discipline, hierarchical arrangements, and a clear division of labour, all of which facilitated criminal cooperation and operational efficiency (Li & Tian, 2001; Nan, 2003). These attributes are central to analyses of transnational drug trafficking groups and drug lords (Shao, 1994; Li et al., 2015). Criminal organisations, including DTOs, have long been regarded as having common group networks and relationships, consistent with law enforcement practices that view organised crime as illicit enterprises of illicit goods and services (Campana & Varese, 2018).

Recently, some Chinese criminologists shifted their lenses to differences to DTOs, and then gradually recognised their "flexible and diverse" nature (He, 2009; Ma, 2012). For instance, Xia (2008), drawing on contemporary Chinese criminal organisations' textual data, identified four social network structures: multipolar, cobweb, linear, and spoke. By analysing actors' roles, relationships, and connectivity, Xia highlighted the *linear(xiaoxing)* structure, resembling a chain where criminals are linked through production, supply, and demand lines, as the typical model of drug trafficking. Conversely, Huang (2010), in studying cross-border drug trafficking in China's border, characterised drug trafficking as a "small world" network and identified two structural types. One is the core model, comprising a core leader, middle-level cadres, and subordinates (known as *Majia*), with decreasing centrality. The *Majia* have high flexibility, autonomically either remaining or temporarily absorbed due to their familiarity with terrain and contacts or the advantages of established transportation channels. The other type is the "partner model," involving multiple partners, often co-principals. While some partners may bring *Majia*, the primary objective is to form a complete criminal network with other partners. The critical distinction between these types lies in the composition of the participants.

While Chinese studies on DTOs have explored typologies and structural descriptions, limited understanding of drug trafficking dynamics and social network tools has constrained the *accuracy* and *differences* of these typologies. For example, the linear chain structure often overlooks the central figure who exercises overall control, conflicting with key role assignments. Similarly, core-partner models primarily address member composition without accounting for security, efficiency, and intra-member relationships (Xia, 2008; Huang, 2010). Importantly, these models fail to recognise that *governance* is as crucial as *profitability* in constructing criminal organisations, with profitability serving immediate economic goals and governance establishing rules and order to sustain long-term success (van Waarden, 2012; Campana & Varese, 2018).

Thus, within the context of China's prohibitionist policies, it is essential to explore drug-related organised crime at the typological level to gain a more comprehensive, dynamic, and interactive understanding. Further, we engage with the literature on how trade-oriented criminal organisations balance security and efficiency and how their efforts to develop their governance extend longevity. This approach can illuminate how civilian DTOs form temporary, ad hoc networks under the intense pressure of elimination policies. It also offers strategic insights into how loosely organised networks “strive to” sustain operations while pursuing profit.

The Current Study

Previous scholarship on drug trafficking organisations in China, while emphasising a strict attitude and illegal position to eliminate organised crime legitimately, has often overlooked the diversity in organisational purposes and structures. This has led law enforcement to focus primarily on large-scale drug lords and transnational trade cases, supported by increasingly stringent sentencing and punishment. However, there remains an insufficient understanding of smaller, grassroots DTOs operating in everyday contexts. To address this gap, we draw on existing research on criminal networks—specifically the security-efficiency debate, typological Social Network Analysis, and insights into loose organisational characteristics—to explore the structure and dynamics of Chinese DTOs.

Criminal networks involved in illicit activities constantly navigate a tension between efficiency and security, balancing the need for confidentiality with the demand for effective communication (Baker & Faulkner, 1993; Morselli et al., 2007). This trade-off, while critical in criminal networks, is less emphasised in legitimate networks, which are often more loosely structured and less focused on secrecy (Duijn et al., 2014). Bright and Delaney (2013) argue that as drug networks become more profitable, they tend to shift towards efficiency-oriented structures, with increasing centralisation aimed at improving operational capacity, even at the expense of security. Similarly, Morselli et al. (2007) highlight how intensified law enforcement pressures lead criminal networks to adopt more secure, denser structures to mitigate risks. These studies underscore the dynamic nature of criminal networks, where efficiency and security are in constant negotiation.

Research on individual roles and their embedding within these criminal networks has further elucidated the internal dynamics of such organisations. Leaders in criminal networks, particularly in drug trafficking, maintain a delicate balance between occupying central roles and distancing themselves from day-to-day operations to avoid law enforcement scrutiny (Morselli, 2009; 2013). From a core-periphery perspective (Baker & Faulkner, 1993), leaders positioned at the core enjoy the greatest benefits while deliberately limiting direct involvement in operational activities. This strategy allows them to maintain control without exposing themselves to unnecessary risk.

Additionally, Canter (2004) sought to develop a typology of criminal organisations, focusing on the organisational structures that enable illicit operations. His research identified two primary factors: group size and leader centrality. Centralised leadership, often measured through network centrality metrics,

plays a key role in determining criminal groups' stability and operational efficiency. Canter's work classified these organisations into three types: temporary organisations, oligarchic organisations, and organised criminal groups, with the latter being the most centralised and structured. Drug trafficking networks, in particular, have been found to exhibit higher centralisation than other types of criminal networks, such as terrorist groups or mock networks (Calderoni, 2014; Malm & Bichler, 2011). Recently, based on organisational behaviour and goals, criminal networks could be re-categorised into trade and governance types (Breuer & Varese, 2023), with different levels of centralisation, communication pathways, and degrees of homogeneity.

In contrast to other forms of criminal organisations, drug trafficking networks often exhibit a more fragmented and flexible structure, allowing for rapid adaptation to changing conditions. Adler's (1985) seminal research compared drug trafficking networks to legitimate business operations, noting their loose structures and reliance on informal agreements. Studies by Eck and Gersh (2000) further supported these results, revealing that most drug trafficking cases in the Washington-Baltimore area involved loosely organised conspiracies. These findings align with Reuter and Haaga's (1989) research, which depicted drug trafficking networks as dynamic alliances of dealers, with roles and relationships that shift based on market demands and enforcement pressures. Kenney (2007) argued that such flexibility allows networks to scale their operations up or down as needed, making them more resilient to law enforcement disruptions. This flexibility prevented the monopolisation of drug markets and contributed to the network's ability to evade detection (Spapens, 2010, 2011). Notably, identifying core roles within these loosely connected networks is crucial to understanding their operation. Studies by Natarajan and Hough (2000) and later by Bichler et al. (2017) emphasised the importance of clarifying role differentiation within DTOs, distinguishing between leaders, key personnel, and replaceable subordinates.

Therefore, we contend that probing the Chinese DTOs in this vein is scholarly promising in two ways. On the one hand, this study sheds light on DTO structures by examining centrality, location, and directional variables, providing a more nuanced, ground-level understanding of DTO models beyond Western jurisdictions. On the other hand, given the focus in existing research on factors shaping these models, this study offers a comprehensive interpretation of how DTOs balance security and efficiency and navigate trade and governance goals within the Chinese context. We address these DTO types and interpretations in China by employing qualitative text coding and quantitative validation through adjudication documents.

METHOD AND DATA

Approach: Social Network Analysis

Positioning Social Network Analysis (SNA) in drug trafficking research is dedicated to characterising the structure and processes from the network perspective (Borgatti & Everett,1992). It focuses on social networks operating in the criminal environment, revealing specific interactions and relational features

within and outside the networks (Morselli, 2009). By utilizing SNA tools and networks generated from law enforcement and surveillance data, it is possible to identify central roles/leaders and features of organisational networks within a drug market or criminal group (Berlusconi, 2013; Hutchins & Benham-Hutchins, 2010). The significant concern of SNA is thus the location in the network, which also denotes relevant connections. Location aids in understanding the network and its participants - identifying connectors, experts, leaders, bridges, and isolators, as well as determining clique membership, core network positions, and peripheral members. Additionally, the location or interconnectedness of network participants is often referred to as a "cohesion" measure. There are two standard measures of cohesion: “distance” refers to the length of the shortest path connecting two participants. Meanwhile, “density” refers to the total number of relational ties divided by the total number of possible relational ties.

Clique analysis is another crucial element in understanding networks (Falzon, 2000). Cliques typically denote subgroups of actors that are directly connected, while other network members are not linked. It is the most common technique to identify dense subgroups within a network. Centrality is a measure that reflects the importance of nodes within the entire network (Das et al., 2018). Centrality metrics identify the most prominent roles in the network and can be categorised as local or global. Local centrality pertains to the direct relationships a specific node possesses, while global centrality encompasses both direct and indirect relationships of a node. Centrality is often measured using metrics such as Betweenness or Degrees. Betweenness Centrality quantifies how often participants connect various network subgroups, highlighting the attention given to peripheral actors bridging disconnected subgroups (Goh et al., 2003). Degree centrality, on the other hand, measures the prominence of a node by summing up all the participants directly linked to it.

Thus, the core characteristics of the network that SNA focuses on include the location of participants, the properties of subgroups (cliques), and the characteristics of the whole network. Describing these three discoveries will be an important empirical task using the SNA approach.

Additionally, this study, based on a valued-directed graph (Iacobucci, 1994), extends the attribute of "direction" (who signals action to whom) to the portrayal of drug trafficking networks. Direction is represented by "→" in the legend, which focuses not only on whether there is a relationship between members but also on the direction and intensity of interaction (instruction, requirement, communication, and other behaviours) between members, which is represented by →, ←, and □; and the intensity increases from > to > > >.

Directionality in network analysis offers a deeper insight into the interplay between roles and relationships among organisational members. Metrics such as location, density, and centrality shed light on the level of trust within the network (See Cohen et al., 1981; Coleman, 1988), rendering the network highly resilient to risks. The organisation's continued development remains unaffected even if certain individuals withdraw from participation. However, while high interconnectedness signifies robust resistance, it also presents new challenges for crime control efforts. Controlling core members becomes crucial to fully understanding the network's dynamics and acquiring comprehensive information, as

peripheral figures may offer limited assistance. Thus, aside from discerning the types of organisations and pinpointing the locations of core leaders, it is imperative to map out relationships accurately and identify the sources of behavioural instructions and communications.

Data Information and Analysis

We draw on two types of data to examine organisational patterns in civil drug trafficking. The firsthand collative information is significant, but its collection poses challenges due to the covert and clandestine nature of most drug trafficking activities (Reinhardt, 2015). This nature is also supported by the literature on loose structures, which has underscored that loose organising relations offer relatively safe and flexible conditions for engaging in illicit trafficking. Therefore, while anthropological-style observations are optimal for classifying organisational relationships, it is equally important to understand DTOs from an external perspective, which involves combining textual records and statistical data.

The study's data encompass the top ten annual model cases released by the Supreme People's Court of China for drug trafficking cases spanning from 2016 to 2022, totalling 70 cases. Additionally, we recorded and included a collection of 450 drug trafficking cases in the China Judgements Online in 2021. The Supreme People’s Court cases, distinguished by their unique and representative attributes, could serve as the foundational text for constructing the standard typology of drug trafficking networks. Subsequently, the 450 cases are utilized to validate the typology we set.

It is important to note that we selected data in 2021 because, after that year, case data on the China Judgements Online began undergoing screening before being uploaded, which compromised the comprehensiveness and richness of the information. As a result, the 450 drug trafficking cases from 2021 represent the most recent and heterogeneous dataset available. As of 2023, the Chinese government no longer mandates that every judgment be publicly accessible online, leading to a sharp decline in the number of cases disclosed on the China Judgements Online. The number of recorded and publicized drug trafficking-related cases that year saw a 91.7% decrease from 2016 and a 75.9% decrease from 2021 (China Judgements Online, 2024). Moreover, in February 2024, the government launched the People's Court Case Library, which focuses on guiding cases and reference cases for judges to use when searching for similar cases. This development is intended to replace the China Judgements Online gradually. Consequently, the case information we recorded and collected—including case narratives, suspect statements, and the reasoning and outcomes of judgments—has become the most comprehensive data available in the current Chinese context for studying this issue. Judicial data do not represent complete criminal networks but rather enforcement-shaped snapshots, reflecting policing priorities, evidentiary thresholds, and institutional routines (Berlusconi, 2013).

We first reviewed 70 model drug trafficking cases and then cleaned and coded these textual documents. Specifically, we sequentially numbered and organized the cases from "2016-1" to "2022-10" according to the "year-case order". Subsequently, we coded the cases based on various aspects such as case information, crime details, case descriptions (including roles, behaviours, relationships, etc.),

adjudication outcomes, and relational network diagrams (see Table 1 for example). Finally, we based on the intrinsicality of the case (Baxter & Jack, 2008), including its completeness, alignment with the structural background, and the richness of its intrinsic meaning, selected 49 cases for ideal analysing types based on the description of the drug trafficking process in the adjudication documents. Other cases primarily focused on aspects such as the violent attributes associated with drug trafficking, the facilitation of drug use by others, theft, and cultivation.

The presentation of these 49 model cases offers valuable data to support the analysis in three key aspects: 1) Interrelationship Presentation. The case presentations elucidate the interconnections among different members, particularly highlighting the clarity in the direction of instructions and task assignments within the network. 2) Detailed Member Information. Each document contains clear information about individual members, accompanied by detailed descriptions of how the drug trafficking network was established and evolved over time. 3) Legal Clarifications. The content of the court decisions provides clarity on the definition and sentencing of various roles within the network, aiding in understanding the legal implications of the illicit actions and their consequences.

Moreover, in the validation phase, we read and reviewed 450 adjudication documents in a case of the first instance of drug trafficking in 2021 and extracted the following core variables for analysis: The number of leaders; The number of sub-roles; The number of network ends; The number of relationships; Density (L/n(n-1)); The number of groups with strong interaction relationships (multiple interactions considered as strong relationships); The number of cliques (small circles of at least 3 people); The leader's centrality(C/(n-1)); The number of strong relationships (relationships with the leader as a relative/spouse/friend/hometown friend, etc.); The number of organizational relationships (non-strong); Arrested Scenario (transport = 1; selling = 2); Network forms. Subsequently, we recorded these variables in Excel and conducted a validation analysis of organizational forms using SPSS following Social Network Analysis (SNA) principles and statistical approaches.

FINDINGS: STAR-SHAPED AND POLYHEDRAL TYPES OF DTOs

After analyzing 49 drug trafficking social network maps, two primary structural types emerged for small and medium-sized civil drug trafficking networks: star-shaped structures (as depicted in Fig. 1(a)) and polyhedral structures (as illustrated in Fig. 1(b)). These classifications comprehensively considered multiple dimensions, such as morphology, member relationships, role functions, directions, and interactions. Out of the 49 cases examined, 35 exhibited characteristics of the star-shaped structure, constituting 71% of the sample, while 14 demonstrated features akin to the conical polyhedral structure, making up 29% of the cases. This indicates that the predominant organizational model for DTOs uncovered in China each year follows the star-shaped structure and abides by its' membership and sales pathways.

Star-shaped structures

The star-shaped structure represents a common network pattern identified in current criminal research. It is characterized by a relatively simplistic arrangement, wherein a single core figure (or leader) occupies the central position within the network, maintaining direct contact with almost all other members. Other members typically possess limited direct connections, are often introduced to each other by the core figure, and maintain primary ties with the leader. Despite the prominence of the core figure, other members maintain an equal status within the network, adhering to the arrangements and instructions set forth by the core role. This pattern is frequently observed in the underground drug market proximate to the consumption end: the core figure engages with various suppliers and subsequently distributes the purchased drugs to disparate individuals who use drugs, often unknown to each other.

While the star-shaped structure is simple and efficient, it is also associated with inherent risks, particularly regarding the vulnerability posed by the central figure. Controlling the core individual affords access to information regarding all network members (Ma, 2012). In the cases we have collected, members of criminal networks characterized by star-shaped structures are often apprehended relatively quickly, sometimes even in the initial stages of trafficking. We have selected two representative cases of star-shaped networks to provide detailed insights into the formation and characteristics of such networks.

The star-shaped structure often encapsulates the process of drug acquisition and distribution. For instance, in one case, Liang-one, an employee of a company, began purchasing marijuana online from individuals outside the state in March 2021. These purchases, ranging from 50 to 70 yuan per gram, were then sent into the country via international mail packages. Upon receipt, Liang-one sold the marijuana to drug users Zhu, He, Liang-two, Zheng, and others, at prices ranging from 150 to 180 yuan per gram. Liang-one's arrest on August 11 of the same year occurred just as he was preparing to sell marijuana to users Zhu and others. The role relationships and sales network are depicted in Fig. 2(a).

In another case, Li-mou, unemployed at the time, procured methamphetamine tablets in Myanmar in January 2017. He then enlisted Lin and Deng, who are his fellow villagers to collectively conceal the drugs, hired Qin for transportation, and arranged for fellow villager Liu to continue transporting them to Canyuan city in Yunnan. Additionally, Li-mou instructed Lin to accompany Qin to the designated stopping place, where Qin proceeded to transport the drugs to Hunan province. The role relationships and sales network are illustrated in Fig. 2(b).

The network pattern of the star-shaped structure reveals two primary role types: core figures such as Liang-one and Li-mou, who possess the capability and authority to govern the network, and sub-level roles, where relationships are equitable. When considering directional variables, we must encompass sub-level roles, delineating members' behaviour, authority, and roles as recipients within the relationships. The simplicity of the star-shaped structure typically involves two levels and unidirectional interaction, with the core individual issuing instructions unilaterally and the sub-level roles receiving and acting upon them. Clear directionality of interaction between sub-levels is typically absent.

Polyhedral structures

The network dynamics of the polyhedral structure, depicted in Fig. 1(b), tend to be more intricate compared to the star-shaped structure. This structure often features multiple central figures/roles, each assuming distinct role divisions within the network, such as organizers, producers, drug traffickers, transporters, suppliers, and buyers. Notably, there exists a notable variance in Centrality, with the leader (the core role) being closely linked to nearly all actors and exhibiting the highest degree of Centrality, which is pivotal for the network's functionality. Producers/drug dealers also demonstrate a strong degree of Centrality, engaging extensively with the leader, adhering to their directives, and having less frequent interactions with other actors. Situated at the network's periphery are the purchasers and suppliers, typically involved at the onset and conclusion of the drug production and distribution process. Furthermore, the interaction direction among members is more diverse and interconnected compared to the singular direction of instruction observed in a star-shaped structure. Consequently, the polyhedron structure tends to be more organized, with distinct labour divisions resembling the characteristics of a small business (Eck & Gersh, 2000). In the dataset, 29% of the cases showcased the network features of a conical polyhedral structure, as depicted in Figs. 3(a) and (b).

Figure 3(a) illustrates a significant family-oriented drug offence in Guangxi, with the official description of the case scenario outlined as follows (real names have been anonymized).

At the conclusion of 2016, defendants Liang and Li mutually agreed to engage in the production of methamphetamine. Subsequently, Li and Zheng leased a facility for drug manufacturing and collaborated with Zheng and Chen to complete preliminary preparations for drug production. Liang procured raw materials necessary for drug production and coordinated with Huang to conduct maintenance on the drug-making equipment reactor. From late April to early May 2017, Liang directed Li to collect financial contributions for drug production, with Li contributing 700,000 yuan, Chen, A, and B contributing 900,000 yuan, and Zero contributing 150,000 yuan. X, Cheng, and others, guided by Liang and Li, traveled to Dongguan City, Guangdong Province, to deliver drug proceeds to Liang, drug production auxiliary materials to Nanning City, Guangxi Zhuang Autonomous Region, and chlorohydrin, purchased by Liang from Meizhou City, Guangdong Province, to Nanning City, with Chen driving the materials to the drug production site. On May 28 of the same year, Liang arranged for Nong and Gui to join Li, Chen, and Zheng at the drug manufacturing site in Gusi Village, Nahong Street, Jingkai District, Nanning City, to produce methamphetamine collectively.

Figure 3(a) elucidates the prominent central role within the drug trafficking network. Liang and Li exhibit the highest degree of Centrality and Betweenness Centrality scores, indicating their extensive connections with other network members. They served as key intermediaries, facilitating introductions among network participants such as the Huang family, the AB family, the Zero family, and others, who rely on Liang or Li for network access. Furthermore, Liang and Li functioned as organizers and leaders in the drug manufacturing and trafficking operations. Liang financed the procurement of raw materials and coordinates fundraising and transportation activities, while Li overseed the operational aspects of drug

production and fundraising, contributing significantly to the financial resources. Chen, an essential sub-level member, was deeply involved in technical aspects of drug manufacturing and holds a close relationship with the central figures. Other members, including Zheng, Nong, Huang, AB, Zero, X, and Chen, played auxiliary roles in drug production, finance, and transportation. They followed instructions from Liang and Li and had limited direct interactions with other network members, primarily adhering to predefined tasks.

In addition, Fig. 3(b) presents a case without familial memberships with the following specific officially published:

In March 2019, defendants Ma-mou and Hu conspired to finance the production of the drug substance Hydroxylamine hydrochloride. Ma-mou, a self-employed male, entrusted Lee with finding a production site and overseeing production operations, while hiring Xu as a technician to provide guidance. Hu, on the other hand, provided drawings detailing the production process. Subsequently, Lee secured a company in J City, S Province, as the production site and organized workers, including Xu, to engage in the production of hydroxylamine hydrochloride. In December of the same year, Ma-mou and Hu purchased 5,010 kg of the chemical bromine and 12,000 kg of toluene from Liu, a male who serves as the legal representative of a company. These chemicals were transported to the production site in J City. Ma-mou and the others successfully produced 2,723.67 kg of hydroxylamine hydrochloride, of which 1,470 kg were sold. Ma-mou participated in the sale of 1,470 kg on 15 occasions, while Hu participated in selling 630 kg on six occasions. Lee sold 900 kg over seven transactions, Zhou sold 615 kg over four transactions, Wang sold 300 kg over four transactions, and Qi sold 100 kg over two transactions. Additionally, Ma-mou, Hu, Lee, Zhou, and Wang were involved in the transportation of hydroxylamine hydrochloride.

Ma-mou and Hu occupied central roles within this network, demonstrating significant involvement in various aspects of the drug trafficking operation. They provided financial backing and strategic planning and actively participated in every stage of the trafficking process. Ma-mou, in particular, played a pivotal role by delegating responsibilities to Lee for site procurement and hiring Xu for technical guidance, thus establishing the foundational components of the production chain. Ma-mou and Hu collaborated in the acquisition of chemical raw materials and took the lead in manufacturing and trafficking activities, overseeing transportation and sales. The division of labour among other network members was also clearly defined, with Lee managing site construction and production, Xu offering technical expertise, Liu facilitating the sale of raw materials, and Qi, Wang, and Zhou solely focused on drug distribution. Through the collaborative efforts of Ma-mou and Hu, the production expertise of Lee and Xu, and the transportation coordination of Ma-mou, Hu, Zhou, and others, the drug trafficking network operated smoothly, facilitating multiple production and distribution cycles.

The case illustrating the polyhedral structure underscores the intricate dynamics surrounding the positioning and roles of core and sub-level members within the drug trafficking network. Drug production necessitates various resources such as funding, facilities, equipment, and expertise. Core members

(leaders) must possess the capacity to recruit individuals with the requisite technical skills. However, given the illicit nature of drug production, organizers often enlist collaborators from within their trusted social circles, such as relatives and friends. In Case (a), Liang and Li, acting as core organizers, leverage their familial and peer connections to recruit participants, fostering a network built on mutual trust. They meticulously assign roles to shareholders, equipment procurers, technicians, raw material purchasers, and transporters, delineating specific responsibilities within the network. Another approach to cultivating trust involves exerting complete control over the operation. In Case (b), Ma-mou and Hu assume central roles, exercising authority over all aspects of capital investment, production, procurement, and sales. Through delegation and recruitment, they systematically introduce additional members into the network, subsequently establishing a clear division of labour and cooperative framework across production, transportation, and distribution channels. Other participants within the network operate under the directives of the core organizers, contributing to the collective effort in pursuit of their illicit objectives.

Despite the apparent centralization of roles within the polyhedral structure, the organization itself does not adhere to a rigid hierarchical model. Instead, it maintains a flexibility characteristic of a loosely structured criminal network, as elaborated upon in subsequent analysis. Core members (mostly leaders) frequently engage across multiple stages of the drug production and trafficking process, assuming various roles to enhance operational efficiency and foster trust among participants. However, this multifaceted involvement also exposes individuals to heightened risks, given their increased exposure and responsibilities within the illicit network. Moreover, the reliance on interpersonal acquaintanceships for organizational cohesion is more prevalent within the polyhedral structure, particularly in the upstream and midstream segments of the drug production and distribution continuum. Compared to the star-shaped structure, criminal activities within this framework are often more intricate and challenging to detect, but the polyhedral structure facilitates medium-scale drug offences that yield substantial profits.

Comparison and features of the two models

The star-shaped and polyhedral structures serve as abstract representations of the relationships within the two distinct types of drug trafficking networks. Utilizing social network analysis (SNA), variations in location (including distance and density), clique formation, centrality, and relational interactions (directionality) between the two structures are identified. These disparities are synthesized and presented in Table 2, facilitating a comparative examination of the two types of drug trafficking networks from a social network perspective.

Table 2 is here

The star-shaped network typically displays a configuration akin to the depiction in Fig. 1(a) and Fig. 2, characterized by a straightforward and diffused structure. This network typically features a singular centre and core role, fostering homogeneous connections. For instance, in Fig. 2, Liang and Li are depicted as being closely connected to others within the network. Overall, the density of connections within the star-shaped structure is relatively sparse. Apart from the core roles, other members tend to

possess relatively equal standing and primarily adhere to the instructions and directives set forth by figures like Liang and Li (as indicated by the value of direction). According to available materials, members of the star-shaped structure generally exhibit limited operational success prior to their apprehension, often having achieved success only once or not at all.

The polyhedral structure resembles the configurations depicted in Figs. 1(b) and 3. This network framework is characterized by multiple roles and centres of activity. In addition to the core roles, sub-level clique relationships emerge, such as the production group involving Xu and Lee in Fig. 3, and the shareholder group comprising Liang, Li, Chen, AB, Zero, among others. Compared to the star-shaped structure, the polyhedron exhibits a polycentric arrangement, featuring distinct core and sub-level division centres. This multiplicity is also reflected in the diversity of roles and labour divisions, encompassing shareholders, site equipment purchasers, technicians, raw material purchasers, and transporters, among others. Overall, the density among network members is higher than that observed in the star-shaped structure, and the strength of connections between members varies from the core to the periphery. Relationships surrounding the core role tend to be stronger and more interconnected (from a directional perspective), while connections among peripheral members are looser, with the central role predominantly dictating task assignments and instructions.

The emergence of the two networks is intricately linked to the strategies employed by core members, such as Liang and Li in Figure (2) and Ma-mou and Hu in Figure (3), to structure the drug trafficking network. An essential determinant of organizational capacity and leadership is the human and social capital possessed by these core roles (Subramony et al., 2018). Specifically, the human capital within star-shaped networks primarily involves leveraging close relationships or friendships for mobilization and association. On the other hand, conical structures encompass connections beyond just family, clan, hometown, and friends. While it is conceivable for organizations with relatively strong and broad relationships to adopt conical networks, they typically revolve around organizational relationships established through financing, production, technology outsourcing, and similar avenues, which are absent in star-shaped structures. Furthermore, the disparity in social capital is evident in the relatively higher social experience and economic capacity of conical structure leaders, with networks formed through financing often exhibiting greater economic prowess.

Validation

Through the analysis and classification of typical adjudication cases from the Chinese Supreme People's Court, we identified two patterns of drug trafficking networks: star-shaped and polyhedral structures. In the preceding sections, we explained the features and differences between these two types using case studies. However, further validation of these ideal types, as represented by the cases, is necessary.

Therefore, we collected 450 drug trafficking-related cases from the China Judgements Online in 2021. We then reviewed, mapped, coded, and organized data for all adjudication documents, as outlined in the Methods section. Among them, the key dependent variable "network forms" was designed as a binary

variable, indicating whether it is star-shaped or polyhedral. Subsequently, through regression analysis (presented in Table 3), we examined the relationship between the characteristics of the two types of networks and the formation of specific network patterns.

The data verification points out several key results. The presence of more leaders in the network significantly reduces the probability of a star-shaped organizational structure by 79.34%, while it markedly increases the probability of a polyhedral network by 384.04%. Conversely, an increase in the number of individuals at the end of the network considerably raises the probability of the organizational structure being a star-shaped one by 157.28%, while it notably decreases the probability of it being a polyhedral structure by 61.13%.

Moreover, Changes in the number, type, and intensity of relationships within the network can also have a significant impact. A higher number of relationships leads to a substantial decrease in the probability of a star-shaped structure by 56.96%, while it results in a significant increase in the probability of a polyhedral network by 132.33%. Similarly, an increase in the number of sub-groups within the network decreases the probability of a star-shaped model by 42.02%, while it enhances the probability of a polyhedron by 72.46%. Lastly, a greater number of organizational relationships decreases the probability of the organizational structure being a star-shaped one by 25.11%, whereas it increases the probability of it being a multi-faceted structure by 20.07%.

In addition, the non-significant variables, the number of groups with strong interaction relationships and the number of strong relationships raise a reflection as to why there is no mathematical disparity in the integration of solid types of relationships, such as those rooted in family, hometown, friendships, and relatives, between conical networks and star networks. Essentially, considering the maturity of conical networks, the query emerges: Why do they persist depending on robust relationships, and what function do these relationships serve in the "security and efficiency" equation? We will discuss it in the next discussion section.

Table 3 is here.

DISCUSSION: REVISITING LOOSE STRUCTURE VIA TRUST BIAS

After classifying, analyzing, and validating the two types of social networks observed in Chinese drug trafficking cases, two key findings emerge that merit further discussion. First, Chinese civilian drug trafficking networks (excluding drug lords) display a loosely organized structure, consistent with international findings on drug trafficking networks. However, our study deepens this understanding by presenting organizational models that are not tightly controlled, top-down hierarchies, illustrating instead trade-type DTOs characterized by a nuanced form of structural looseness at lower levels. Second, we explore why both types of DTOs, even those organized in polyhedral structures, remain highly susceptible to arrest or disruption and how they attempt to incorporate governance within trade-oriented groups to balance efficiency and security. We propose "trust bias" as a potential explanation for this tendency.

Looseness in these networks is assessed based on several factors, including structural composition, the roles and task specialization of members, the level of communication within and between cliques, the network's sustainability over time, and the geographic dispersion of its participants (Natarajan, 2006). Breuer and Varese (2023) supplement the organizational purpose in influences. Our study contributes to this discourse by exploring the factors that shape loose networks and the variations within trade-type organizations.

Our empirical findings pictured the structure of DTOs primarily exhibiting two configurations: the "star-shaped" and the "polyhedron." They all belong to trade-type groups, each reflecting distinct forms of looseness. The star-shaped structure is typical in drug distribution and transportation chains, featuring a central figure who directs relationships across a dispersed network. The simplicity of this structure—where most interactions are coordinated by one central role—makes it highly susceptible to disruption if that leader is apprehended. Members of star-shaped networks are often geographically dispersed, with buyers and sellers interacting only during drug transactions, resembling the concept of "small partnership" proposed by Reuter & Haaga (1989). This configuration represents the quintessential form of a loosely organized network.

The polyhedral structure demonstrates greater resilience due to its governance elements and operates similarly to a small legal business, though it is not restricted to familial or shareholding models. Positioned in the upstream and midstream segments of the drug “manufacturing-trafficking-distribution” chain, this structure requires distinct task divisions and collaboration among members with varied human and social capital. Despite these features, polyhedral types retain notable characteristics of organizational looseness compared to hierarchically structured organizations. First, core roles manage production and distribution through an association-style conspiracy, favoring small-scale operations and temporary member involvement rather than a merit-based recruitment process. Second, the absence of a strict hierarchical system allows core figures—acting as organizers and leaders—to maintain direct connections with each clique or even with the network’s peripheral members. Network cohesion relies not on formal contracts, as seen in corporate structures, or the stringent reward and punishment mechanisms typical of traditional triad organizations, but rather on profit motives and individual financial ambitions (Breuer & Varese, 2023). Members are not bound to the organization in the same way as corporate employees; instead, they are inclined to respond to invitations from close acquaintances or kinship connections (Campana & Varese, 2013), motivated by opportunities for personal gain. Notably, Central individuals engage in varied and overlapping activities, including command, coordination, and frontline involvement in drug production and transportation. In this sense, they resemble a small entrepreneurial team with a flat structure and a relatively fluid division of labour (Lechner & Leyronas, 2009). These observations underscore the inherent looseness of conical polyhedral networks.

Loose organizational structures, while potentially less efficient than corporate frameworks, provide advantages for illicit networks like drug trafficking organizations by balancing efficiency and security. On one hand, the absence of rigid hierarchies enables these groups to adapt flexibly to the constantly shifting dynamics of the drug market, which presents both opportunities and constraints (Bichler et al.,

2017). On the other hand, leaders within these networks often enhance security by fostering indirect connections, reducing the likelihood that the apprehension of a single member will dismantle the entire organization (Bright et al., 2019).

This point is important because it reflects the strategies on how to address the significant risks of organizational collapse and personal security threats. To mitigate such risks, leaders in criminal organizations in other countries often adopt strategies to evade law enforcement by maintaining geographical distance and limiting direct involvement in production and distribution (Morselli, 2009, 2013; Malm et al., 2008). In contrast, leaders within Chinese polyhedral networks frequently establish direct connections with nearly all members and cliques, remaining actively involved in drug production and transport—actions that significantly increase their risk of arrest and asset seizure. This vulnerability is especially pronounced in conical polyhedral networks, where core figures like Ma-mou and Ai engage in large-scale drug operations, yielding substantial profits but often facing arrest within months of initiating activities. This raises a critical question: why do leaders in Chinese drug trafficking networks, unlike their counterparts elsewhere, not utilize indirect relationships and space distances to fortify their network's resilience against law enforcement? This practice may reflect an evolution in governance within these networks, where efficiency and security are becoming a *drag*.

To respond to this issue, we introduce a concept that can help elucidate the unique dynamics of the Chinese context: "*Trust Bias*," drawing upon insights from criminological psychology and organisational sociology. Trust Bias represents a cultural phenomenon that underpins the rationale behind how central roles orchestrate drug trafficking operations. Unlike conventional organizations, criminal networks operating in illicit environments prioritize *trust (trustworthiness) and confidentiality* among their members (Bruinsma & Bernasco, 2004; Von Lampe & Johansen, 2004; Breuer& Varese, 2023).

However, leaders (core roles) in Chinese DTOs face a dilemma in fully entrusting middle-level managers (who often serve as intermediaries between cliques and leaders). Consequently, core roles exhibit a bias towards maintaining direct connections with middle-level and end members, relying on kinship, established friendships, investment relations, or other forms of direct ties. This predisposition leads to a security paradox: while the flat organizational structure appears to ensure leader control and internal network manageability, leaders find themselves exposed to criminal activities and confessions due to their central role within both the network and its geographical operations. Although they cultivate trust among members and oversee secrecy, this trust often results in more audacious production and distribution practices, leading to frequent arrests and network dismantling during large-scale shipments or production runs.

Trust bias operates through leaders' selective perceptions and evaluations of relationships among members, shaping how organizational risk is managed. Unlike adopting a strategy of maintaining distance, Chinese small and medium-sized drug trafficking organizations rely on pre-existing trusted relationships, such as kinship and geographical connections, to form the basis of their organization. Consequently, trusted relationships are integrated into the organizational development process rather

than being gradually cultivated over time. The cognitive trap of trust bias emerges when leaders prioritize the loyalty and reliability of internal members. Although this may appear to be a solid strategy for achieving "efficiency and security," it fosters a relatively flat organizational structure, wherein leaders and members at all levels believe the organization to be under control and demonstrate high levels of activity in production, transportation, and sales. While trust may mitigate internal depletion and information leakage, it does not shield the organization from external law enforcement detection. Instead, the concentration of information leads to bold trafficking practices, and once marginal members are apprehended, core members are more likely to confess due to the trust relationships established prior to the organization's formation.

CONCLUSION

Based on the analysis of drug trafficking cases spanning from 2016 to 2022, the study identified two distinct networks within China's civilian drug trafficking operations: the star-shaped and the polyhedral structure. Although they are all trade-type organised crime groups (Breuer & Varese, 2023), the former is typically observed in the distribution and transportation links of the chain, while the latter is more prevalent in the middle and upper tiers of the sequence. Through social network analysis, considering variables such as Centrality, Clique, Location, and direction, disparities between the two network types emerge regarding centralization (polycentric vs. single-centric), role distribution (multiple roles vs. core-centric), and tie strength (heterogeneous vs. homogeneous connectivity). The relations of these variables with the two types were validated by examining 450 drug trafficking cases in 2021 via regression analyses. Nonetheless, both structures exhibit loose organizational characteristics and pose high-security risks, making members susceptible to arrests and confessing their leaders. The inherent logic of trust bias significantly influences the governance of these trade models.

The study makes two key contributions. Firstly, it introduces the valued-directed graph in SNA simplified to a direction indicator into drug area analysis, enhancing theoretical understanding by elucidating the nature of relationships within the network. This indicator delineates the flow of instructions, identifying senders and recipients and shedding light on the frequency and nature of their interactions. The inclusion of direction imbues the analysis with dynamic characteristics, enriching our comprehension of network dynamics. Secondly, the study holds empirical significance for law enforcement efforts. By categorizing drug trafficking networks into two distinct types, it offers valuable insights that can aid public security departments in their interdiction endeavours. This epistemological assistance enables law enforcement agencies to swiftly ascertain membership information, activity trajectories, and case modalities, thereby facilitating the determination of network structures. This insight proves particularly beneficial in facilitating arrests, especially in light of the presence of *Trust Bias* logic, which heightens the risk of network roles confessing their leaders under pressure.

The study recognises several limitations stemming from its research methodology. First, the reliance on drug trafficking information from official documents poses a challenge. While these documents provide valuable insights into the common characteristics of apprehended criminal structures, they mainly offer

retrospective data, which may not sufficiently capture the dynamic and future orientations. Additionally, although this study was conducted in a Chinese context, the findings related to drug trafficking networks and non-drug kingpin typologies have broader applicability. In future research, we will explore how these findings resonate globally.

Declarations

Author Contribution

Song., Wu. and Liu., Ren. wrote the main manuscript text. Song. and Wu. prepared tables 1-3. All authors reviewed the manuscript.

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Tables

Table 1 to 3 are available in the Supplementary Files section.

Figures

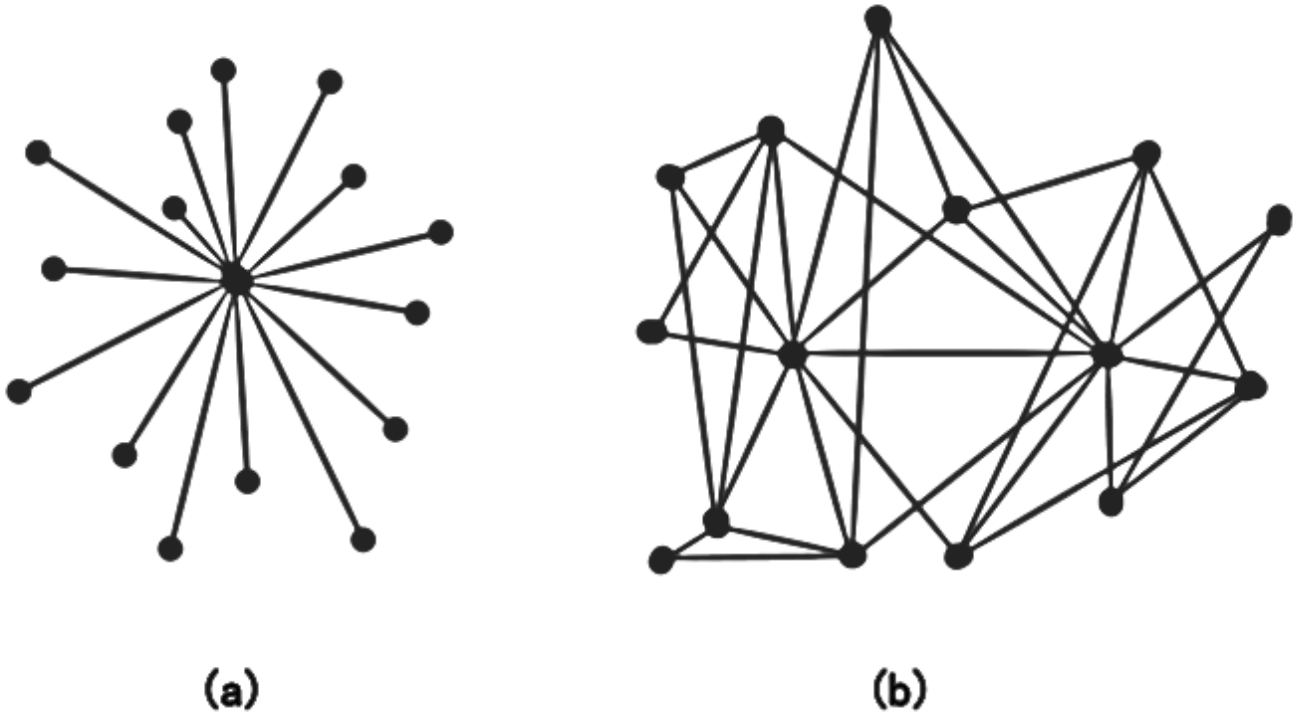
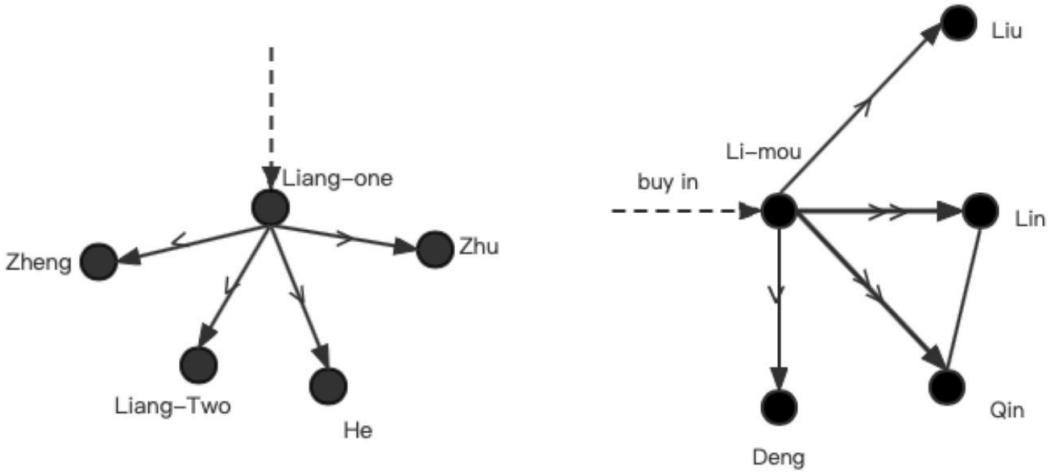


Figure 1

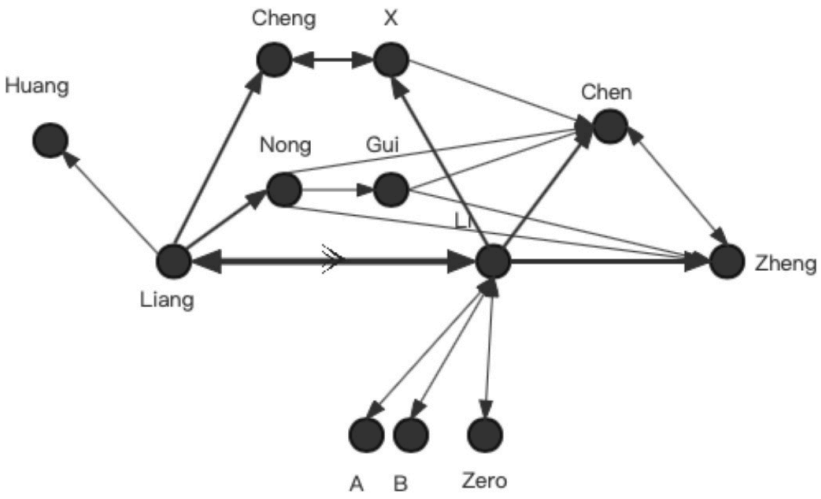
Two types of civilian drug trafficking organizations in China



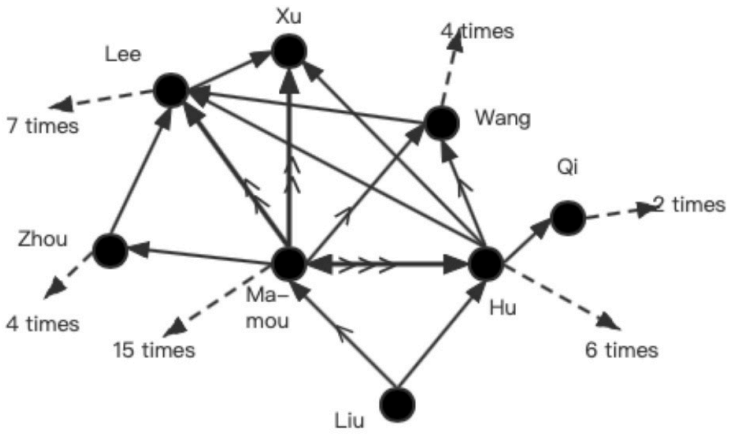
(a) b

Figure 2

Illustration of the star-shaped structures



(a)



(b)

Figure 3

Illustration of the polyhedral structures for two cases

Supplementary Files

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- TABLES.docx