

**Organized Crime Networks: Structure, Coordination Mechanisms, and Enforcement Challenges in Contemporary Criminal Enterprises**

**Akbar ali Dattoo**

[akbarali.dattoo@gmail.com](mailto:akbarali.dattoo@gmail.com)

Teaching Assistant, Department of Criminology, University of Karachi

**Syed Razi Hasnain**

[syedrazishah2001@gmail.com](mailto:syedrazishah2001@gmail.com)

Visiting lecturer of Criminology at University of Karachi.

**Hammad Kamal**

[hammad.kamalpk@gmail.com](mailto:hammad.kamalpk@gmail.com)

Deputy Director, National Accountability Bureau

**Aisar Ali**

[aisar.harri123@gmail.com](mailto:aisar.harri123@gmail.com)

Deputy Director, National Accountability Bureau

**Corresponding Author: \* Syed Razi Hasnain** [syedrazishah2001@gmail.com](mailto:syedrazishah2001@gmail.com)

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**ABSTRACT**

*In Pakistan organized crime has increasingly evolved as interdependent criminal networks that span cities, frontiers and cross borders. This paper uses a quantitative method to investigate the structural attributes, coordination patterns and enforcement risks of these networks by implementing a social network analysis (SNA) approach. Based on the principles of enterprise criminology and network theory, the study theorizes organized crime as a system constituted by relationally embedded actors, as opposed to hierarchical-oriented organizations. The investigations rely on secondary quantitative data which are the officially registered cases of law enforcement, court risks and records of publicly available investigations related to the organized criminal activities, such as narcotics trafficking, financial crimes, extortion and weapons smuggling, in the same time period of 2020-25. Network data is built through coding relational ties between offenders as a result of co-offending, communication, and transactional ties. The main network measures are degree centrality, betweenness centrality, density, clustering coefficients and modularity used to evaluate network patterns and coordination processes. Findings point to the fact that organized crime networks in Pakistan have a semi-decentralized, modular structure, and few brokers hold key coordination positions within loosely linked groups. A high score in modularity implies that there is a high degree of compartmentalization that increases resilience of a network towards arrests that are targeted. Network models based on regression also reveal that enforcement measures that centre on high central actors are only able to cause short term discontinuity yet do not create long term network fragmentation as a result of quick role replacement and tie reestablishment. These results indicate that there are considerable enforcement problems associated with jurisdictional fragmentation, the lack of integration of the data between agencies, and the adaptability of criminal networks. The research finds that network informed counter-organize crime policies- focusing on the interruption of the brokerage role, money connections, and inter-cluster relationship are needed to enhance the efficacy of efforts in Pakistan. Therefore, the study will be empirically relevant to the study of organized crime and will offer evidence-based ideas on how to enforce the use of data-driven crime-control policies.*

**Keywords:** Crime Networks, Enforcement

## INTRODUCTION

The dynamics of the operations of organized crime in South Asia have significantly changed in the post-2020 world and were due to a combination of geopolitical instability, economic instability, and technological acceleration. The traditional many-to-many middle-level criminals' perception as fixed, hierarchical and kinship-based structures is increasingly in conflict with the realities of empirical data of dynamic networks in the marketplace in Pakistan. After the international forces pulled out of the neighbouring Afghanistan in 2021 and with the repositioning of power dynamics in the region, Pakistan has been experiencing a reorganisation of the illicit supply chains. These developments have prompted a shift in the way that criminal organizations are structured, no longer the hard and fast gang formations of the past, but decentralized criminal enterprises more efficient than the best logistics companies to date. Although all this has been achieved through a considerable amount of state investment in the counter-terrorism and law enforcement, the tenacity of organized criminal groups (OCGs) has become a problematic issue, despite their underlying necessities of the Financial Action Task Force (FATF) (Butt & Hadi, 2025). The classical policing policy in Pakistan has long been focused on the kingpin approach, that is the identification and arrest of visible leadership elements. This strategy is based on the premise that criminal organizations are vertical structures in which dissolution of the head causes the demise of the body. Nevertheless, the enduring nature of narcotics trafficking and this business generates billions of dollars every year in the region, according to the estimates of the United Nations Office on Drugs and Crime (UNODC, 2023), indicates that such networks are much stronger than it was previously conceived. These networks cannot be permanently dismantled by leadership decapitation, which is indicative of a structural imbalance between enforcement policy and criminal reality. This gap is filled in this study by the use of Social Network Analysis (SNA) to the study of organized crime in Pakistan. As opposed to the conventional criminology theories that emphasize the characteristics of individual offenders (age, location, or motive), SNA puts the emphasis on the relationships and interactions among actors. This study gives a quantitative evaluation of network topology by mapping the relationships that criminals have with one another that can be either in the form of physical, financial or communicative. The research targets the timeframe of 2020-2025, which is a critical period, and incorporates the post-COVID digital speedup of crime and the geopolitical consequences of the Afghan transition. The main idea is to mathematically determine the structural vulnerability of these networks and go beyond anecdotal information to the rigorous data-driven analysis.

## LITERATURE REVIEW AND THEORETICAL FRAMEWORK

### Evolution from Hierarchy to Network

This study has a theoretical basis in the Enterprise Criminology and Network Theory. Enterprise criminology is a concept that posits that organized crime exists in a continuum of legitimacy and resembles legal business organization in its quest to maximize profit, market share and risk in management (Global Initiative Against Transnational Organized Crime [GI-TOC], 2023). The unlawfulness of the traded goods, however, drugs, arms, illegal finance, and such, makes it such that this so-called business must have certain structural defences. In modern research dating to 2020-2025 it is stressed that criminal groups are becoming more like scale free networks, where a few well linked hubs would form the core of the system, and the entire structure would be decentralized to prevent catastrophic collapse. Recent analysis questions the effectiveness of the conventional composite of organized crime based on the traditional bureaucratic model which assumes a distinct chain of command; alternatively, there is a suggestion of a model of disorganised crime where the actors are independent entrepreneurs tied together by functional need, but not loyalty. This paradigm is especially relevant to the Pakistani context, where the GI-TOC (2021) reports that the criminal actors often act as the service provider, namely: in the role of transporters, money launderers, and forgers,

and also serve several different criminal networks at the same time. As such, this service-based economy creates a mesh type of network that is more resilient in nature than a traditional pyramid.

### **Crime-Terror Nexus in Pakistan**

The peculiarity of the Pakistani criminal environment is the Crime-Terror Nexus, when the line between ideological militancy and profit-making criminality is becoming more and more blurred. Ahmad et al. (2025) argue that, in the frontier districts of Khyber Pakhtunkhwa and Balochistan, criminal syndicates and militant groups have developed the relationship of mutual support. Criminal participants provide the logistics such as smuggling routes, safe hotels and identity-forging offers and militant groups provide security or charge a tax on the illegal trade. This overlap impedes categorization as well as enforcement. Social network analysis is particularly useful, since it is capable of identifying the so-called brokers between the criminal and militant worlds. Such multi-purpose intermediaries will be the most critical nodes in the network, yet they are consistently overlooked by counter-terrorist efforts that focus only on ideological actors.

### **Network Resilience and Brokerage**

The concept of resilience in illicit networks refers to the ability of the system to recover after being perturbed by some external factors, like the arrest of key players. Over the last five years, recent scholarship has given increasing attention to the concept of modularity as a key factor in resilience determinism. Modularity measures how well a network can be separated into independent and self-sufficient clusters or cells. The particularly modularized design can be compared to the submarine that has watertight compartments; in case one of these cells was damaged (i.e., flooded), the other cells still can operate independently to maintain the integrity of the network on a larger scale. Also, the role of the brokering has overtaken that of blatant leadership in strategic importance. The authors of the article by Ficara et al. (2023) present facts that the elimination of actors with high betweenness centrality (those who close structural holes between otherwise completely disconnected subgroups) causes more harm to the network cohesion than the elimination of actors with high degree centrality (those actors ensuring the highest number of direct connections). Such a difference has critical significance in terms of the policy design: a local gang leader is often the most connected person in a criminal organization, and an elusive financier is often the most strategic person who connects the gang to the international markets (FATF, 2024).

## **METHODOLOGY**

### **Data Sources and Sampling Strategy**

This research has taken a quantitative research approach that is based on secondary data analysis. The data collection occurred by using Open-Source Intelligence (OSINT) methods, which is a relatively modern approach that has already acquired many academic credibility due to the ongoing computerization of legal documents. The information was retrieved based on formal records in the period between 1 January 2020 and 1 January 2025.

*The initial sources were:*

**Judicial Records:** Published decisions of Special Courts (Control of Narcotic Substances), Anti-Terrorism Courts and Supreme Court of Pakistan.

**Law Enforcement Reports:** Press releases, Red Book (lists of most wanted), and investigation reports of the Federal Investigation Agency (FIA), Anti-Narcotics Force (ANF), and National Accountability Bureau (NAB).

**International Surveillance:** FATF and UNODC are reports on particular Pakistani syndicates.

**Inclusion Criteria:** The study included all high-impact organised crime, which consisted of three or more co-offenders involved in an ongoing criminal activity. The Narcotics Trafficking, Money laundering/terror financing, Extortion and Arms smuggling crime types were the specific categories of crime coded.

**Network Construction**

This data was coded in the form of an adjacency matrix where NN represented the actors (nodes), and EE represented the relationships (edges). The network that was obtained contained N=512 actors and E=1,450 validated relational ties. Three modalities of interaction were used to classify ties:

**Co-offending:** The actors are simultaneously mentioned either in a First Information Report (FIR) or in a charge sheet.

**Transactional:** Relationships are defined by substantiated monetary transfer, evident in the form of bank records or ledger accounts mentioned in court.

**Logistical:** Actor connected through common property, such as a car owned by Person A and used by Person B to deliver contraband to deliver it to Person B.

The structure topology analysis assumed the network was undirected and unweighted.

**Analytical Metrics**

The data of the network were analysed in Gephi 0.10 and UCINET 6 software. The measures of the network science analysis (SNA) were calculated in order to answer the research questions:

**Degree Centrality:** The degree of direct ties that a node has. This is evidence of local activity and visibility.

**Betweenness Centrality:** The number of times that a node is used as a middle node in the shortest paths involving two different node pairs. This takes the control over information flow and brokerage.

**Clustering Coefficient:** These measures how much the nodes tend to be highly clustered into tight knit groups. Large scores represent dense cliques which are trust based.

**Modularity:** This is the degree to which a network can be divided into modules (clusters or groups). High modularity implies the high level of community structure.

**Network Density:** This is the ratio of the number of realized ties to a set of possible ties. The fact of high density implies a large number of interconnections.

**RESULTS**

**World Wide Network Topology: The Silo Effect**

The analysis of the aggregate criminal network shows that there is a clear topology of the network with low density and high modularity. Compared to a small-world network, where some few degrees of separation connect entities, compartmentalization is high in the Pakistani criminal terrain.

**Table 1: Global Network Statistics (2020-2025)**

Metric	Value	Interpretation
<b>Nodes (N)</b>	512	Total identified active offenders in the sample.
<b>Edges (E)</b>	1,450	Total verified relationships.
<b>Network Density</b>	0.011	Extremely sparse connections (1.1%), indicating high operational security.

<b>Modularity Class</b>	0.78	Very high; indicates the network is fractured into distinct, self-contained subgroups.
<b>Avg. Clustering Coefficient</b>	0.65	High local trust; offenders operate in tight-knit cliques ("friends of friends").
<b>Average Path Length</b>	4.6	Despite fragmentation, contraband moves across the network efficiently.

The salient observation consists of the low edge density (0.011). This means that criminal actors in Pakistan are mostly left unconnected with each other even though their number is great. This sparsity can serve as a sort of defensive measure, as it guarantees that, in case law enforcement agencies infiltrate one point in the network, the infiltration will not easily spread to the other parts of the network. On the other hand, the large value of the clustering coefficient (0.65) demonstrates that there is a high degree of local cohesion, e.g. in neighbourhood gangs in Lyari or smuggling clans in Chaman, where interconnections are significantly thick. This trend forms a cellular structure, where strong intra-cellular connections are contrasted by weak inter-cellular connections.

### Centrality and the "Hidden" Brokers

Comparative analysis of Degree Centrality and Betweenness centrality reveals a strong dichotomy in structure. The nodes with the most Degree Centrality, those with the most direct ties, were largely found to be operational commanders or gang leaders, whose high degree of visibility predisposed them to being mentioned in the police reports more often because of the oversight role they hold over the lower-level foot soldiers.

On the other hand, the Betweenness Centrality of these very interconnected hubs was usually relatively low. Peripheral individuals are more frequently those actors who achieved the highest Betweenness scores, although less prominently represented in the arrest records, who were generally brokers and helped connect clusters.

**Table 2: Top 5 Actors by Betweenness Centrality**

Rank	Role Description	Location	Function	Betweenness Score
1	Financial Facilitator (Hawala)	Peshawar/Dubai	Clears payments for 3 distinct drug syndicates.	0.210
2	Customs Clearing Agent	Karachi Port	Falsifies documents for arms and drug smugglers.	0.195
3	Real Estate Developer	Lahore	Launders cash proceeds into high-value property.	0.188
4	Transport Fleet Owner	Quetta	Manages trucking logistics for cross-border trade.	0.176
5	Cyber-Specialist	Remote	Manages encrypted comms apps for multiple gangs.	0.165

As can be seen in Table 2, service providers ensure the connective structure of the Pakistani organized crime ecosystem. An example is actor 1, which has high betweenness centrality due to its role in transferring financial resources between a drug supplier in Afghanistan, distributor in Punjab and a money-laundering transaction in Dubai. Without this actor, then the three separate entities cannot transact. These intermediaries form the weak ties as defined by Granovetter (1973), which is vital in the dissemination of

resources but often go undetected by the observing parties which focuses more on more obvious, violent associations.

**Resilience Simulation**

In order to assess the strength of the network, we applied two distinct policies of going through the nodes sequentially and removing them one by one, and then measuring the fragmentation of the biggest connected subgraph of the network, the Giant Component.

Strategy A (Kingpin Model): Deleting the first 5 percent of the nodes sorted by Degree Centrality.

*Result:* The Giant Component had decreased by a relatively modest 8 percent. The network was 92 percent functional. The large clustering coefficient implied that removal of a leader did not affect them as the subordinates merely rerouted via other connections by way of local ties.

Strategy B (Network Disruption): Deletion of the top 5% nodes in terms of Betweenness Centrality.

*Result:* The Giant Component broke down and disintegrated into 15 separate non-functional islands. The dimension of the biggest part was reduced by 45 percent.

The present simulation has presented quantitative data that the network is very resilient to the decapitation of leadership but very weak at its structural points of weakness that act as bridges.

**Table 3: Breakdown of Relational Ties by Interaction Type**

Interaction Type	Count (Edges)	Percentage	Nature of Tie	Key Data Source
Co-offending	798	55.0%	Joint mention in FIRs, charge sheets, or arrest records.	Police/Court Records
Transactional	391	27.0%	Verified monetary transfers (Hawala, bank ledgers).	FIA/NAB/Bank Records
Logistical	261	18.0%	Shared assets (vehicles, safe houses) or communication channels.	Surveillance/Intelligence
<b>Total</b>	1,450	100%		

This table describes the structure of network edges and it is found that although co-offending ties dominate the police records, almost half of the network is based on transactional and logistical relationships. These grey zone relationships are vital to infrastructure but can be difficult to detect and this is why networks continue to survive even when individual offenders are convicted on conventional police reports.

**Table 4: Comparative Network Resilience Simulation Results**

Intervention Strategy	Target Selection Criteria	% Of Nodes Removed	Reduction in Giant Component	Network Status Post-Intervention
Strategy A (Kingpin)	Top 5% by Degree Centrality (Visible Leaders)	5%	-8%	Functional: Network remains 92% intact; rapid role replacement via kinship ties.

<b>Strategy B (Disruption)</b>	Top by Betweenness Centrality (Brokers)	5%	5%	-45%	Fragmented: Network collapses into 15 isolated, non-functional subgroups.
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The main thesis of the paper, according to this simulation, is quantitatively proven: the "Kingpin Strategy" does not work. By eliminating high-visibility leaders, network functionality is reduced by only 8 per cent through redundancy. In contrast, attacking brokers (high betweenness) leads to a disastrous 45% crash, which demonstrates that the structural vulnerability of the network is not in its visible commanders, but in its invisible ones.

**Table 5: Primary Criminal Activity Distribution (N=512)**

Crime Category	Node Count	% Of Network	Structural Characteristics
<b>Narcotics Trafficking</b>	245	47.9%	High density clusters; relies heavily on cross-border logistics.
<b>Money Laundering/Terror Finance</b>	133	26.0%	High betweenness centrality; connects disparate crime groups.
<b>Arms Smuggling</b>	77	15.0%	Strong overlap with militant groups (Crime-Terror Nexus).
<b>Extortion/Kidnapping</b>	57	11.1%	Localized cliques; lower integration with the wider network.
<b>Total</b>	512	100%	

This disaggregation makes it possible to consider narcotics trafficking as the main economic driver, which comprises about half of the network. Nonetheless, the large rate of money laundering participants (26) is structurally crucial. These actors do not just participate in financial crime; they are the, so-called, glue that connects different components of crime and allows the passage of value throughout the enterprise.

**Table 6: The Crime-Terror Nexus Exchange Matrix**

Direction of Support	Service/Resource Provided	Operational Impact
<b>Criminals Militants</b>	Logistics & Routes	Provision of established smuggling paths for movement of personnel.
<b>Criminals Militants</b>	Documentation	Forged identities (CNICs, Passports) provided by criminal specialists.
<b>Militants Criminals</b>	Physical Security	Protection of convoys in volatile zones (e.g., Balochistan).
<b>Militants Criminals</b>	"Taxation"	Levy charged on illicit trade in exchange for safe passage.

This matrix is based on the "Crime-Terror Nexus" framework, which combines the symbiosis between insurgents and criminals in frontier areas at the functional level. It explains a barter economy in which ideology is subservient to utility: criminals offer the logistics and paperwork needed, and militants offer the physical security, making enforcement difficult since traditionally these groups are considered distinct entities.

**Table 7: Centrality Metrics Comparison by Functional Role**

Functional Role	Avg. Degree Centrality	Avg. Betweenness Centrality	Avg. Clustering Coefficient	Network Function
<b>Gang Leaders (Commanders)</b>	High (18.4)	Low (0.04)	High (0.82)	Command and control within a specific cell; high visibility.
<b>Financial Facilitators</b>	Low (4.2)	High (0.19)	Low (0.15)	Bridging structural holes between disconnected cells; low visibility.
<b>Logistics Providers</b>	Medium (8.1)	Medium (0.12)	Medium (0.45)	Moving physical goods across jurisdictional boundaries.
<b>Foot Soldiers</b>	Low (2.1)	Low (0.00)	High (0.90)	Executing specific tasks; highly replaceable.

This analogy points out a paradoxical structure: Commanders are well-connected locally, but with less network-wide connectivity, whereas Financial Facilitators are highly betweenness central, and they reach the information flowing in and out of clusters. This information supports the fact that leaders are the front of the crime, but the facilitators are the strategic support that assures network integration and strength.

## DISCUSSION

### Failure of Leadership Decapitation

The results of the research will offer a convincing answer to the limitations on modern policing strategies in Pakistan. The so-called Kingpin Strategy focusing on the fact that high-degree nodes (gang leaders) are apprehended is not effective because of the redundancy inherent in the criminal network. Murravat et al. (2025) posit that the socio-cultural environment of Pakistan (commonly typified by biraderi, or kinship) structures creates a vast pool of credible recruits. In the case of a hub removed, local clustering becomes high (0.65) to make role exchange quick. The vacant position can be filled immediately by a brother, cousin, or a trusted lieutenant and this ensures that the network regains within a short time. This is often referred to as the Hydra effect as this phenomenon makes high-profile arrests symbolically salient but structurally irrelevant.

### The Strategic Importance of the "Grey" Zone

The prominence of financial and logistical facilitators in the "Betweenness" rankings (Table 2) underscores the critical role of the "grey" economy. Organized crime in Pakistan does not exist in a vacuum; it relies on the infrastructure of legitimate commerce. The Hawala/Hundi dealers, real estate agents, and transport owners operate in the intersection of the legal and illegal worlds. Butt & Hadi (2025) and the FATF (2024) have highlighted the vulnerability of Designated Non-Financial Businesses and Professions (DNFBPs) in Pakistan. Our network data confirms that these actors are not merely accessories; they are the primary structural bridges. By connecting a drug cartel in Balochistan with a money laundering operation in Lahore, they enable the "scale" of organized crime. Without them, criminal groups would remain localized and unable to move value or contraband across provinces.

### **Modularity as a Defense Mechanism**

The fact that the financial and logistical facilitators are the top of the Betweenness rankings (Table 2) highlights the importance of the grey economy. Pakistan organized crime is not a vacuum but is dependent on the framework of legitimate business. The Hawala/Hundi dealers, real-estate agents and owners of transport are at the fringes of the legal and illegal world. FATF (2024) and Butt and Hadi (2025) have shown the weaknesses of Designated Non-Financial Businesses and Professions (DNFBs) in Pakistan. Our network analysis supports the opinion that these actors are not just affiliates, they are structural bridges. They enable the magnitude of organized crime by linking an operation of money-laundering in Lahore with a drug cartel in Balochistan. Without them, criminal groups would be localized and they would not be able to transfer value and contraband between provinces.

### **Digital Dimension**

The emergence of the Cyber- Specialist as one of the most prevalent mediators (Rank 5, Table 2) represents a new modern change. On the one hand, according to the GI-TOC (2023) and the latest research on cyber-dependent criminality, Pakistani organized crime cells increasingly transfer their coordination principles into the virtual space. The use of encrypted message providers, e.g., WhatsApp and Telegram, and cryptocurrencies enables intermediaries to transact business and reduce physical exposure. Such an occurrence can be described as the digital betweenness and is harder to control than the traditional face-to-face interactions and forms a significant problem in the Cyber Crime Wing of the Federal Investigation Agency.

### **CONCLUSION AND POLICY RECOMMENDATIONS**

This paper has used Social Network Analysis to plot the outline of organized crime in Pakistan between 2020 and 2025. The results describe such networks as semi-decentralized, extremely modular, and tough to conventional leadership-based implementation. This analysis shows that, the real structural power is not vested in the violent warlords (hubs) but in the financial and logistical facilitators (brokers) that fill the gaps between compartmentalized cells.

It is then on these empirical findings that three major policy recommendations are made:

**Switch to Network Disruption Strategies:** The police agencies (FIA, ANF, Police) should switch to the model of a Broker instead of a Kingpin. The intelligence operations must be more focused on detecting and eliminating the connectors, namely money launderers, document forgers, and inter-provincial transporters. Removal of these bridges produces much larger structural damage than even arresting gang leaders, which has been proven to be the case with simulations.

**Integrated National Data Grid:** Lack of sharing of data between provincial and federal agencies takes advantage of high modularity of criminal networks. The centralised and automated crime database that integrates the FIRs, the banking transaction reports, and the travel data across the jurisdiction are all needed by Pakistan. This system would enable the analysts to see the invisible connections that traverse provinces and as such this would eliminate the network strategy of compartmentalization.

**Financial Decoupling:** Financial facilitators are the main intermediaries in the network, so stricter implementation of the AML/CFT regulatory measures on DNFBPs (real estate, jewellers, lawyers) is necessary. A regulatory compliance approach in such sectors that is taken as frontline crime fighter instead of just a bureaucratic requirement will cut off financial life-blood vessels that allow local gangs to become transnational organizations.

The network-centric approach will allow the state to go beyond a mode of reacting to cases of crimes to destroying the systems that perpetuate them.

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