CRJ 523 Network Dynamics and Vulnerability

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The Social Organization of Conspiracy: Illegal Networks in the Heavy Electrical Equipment Industry

(Baker & Faulkner,.1993)

Introduction

- What is price-fixing?
- Heavy electrical industry conspiracies have been studied frequently
  - However, the internal social structure of these conspiracies, not so much
- Switchgears; Transformers; Steam Turbine Generators

Network structure

- Switchgears
  - Low-information processing; smaller and less complex
  - Decentralized network structure
- Transformers
  - Low-information processing; smaller and less complex
  - Decentralized network structure
- Steam Turbines
  - High-information processing; large and complex
  - Pricing more complicated

Theories of collusion

- Industrial organization economics
  - Examines the effect of variations and imperfections of the producers in the market on the needs of society

- Organizational crime theory
  - White collar crimes committed by a collective of individuals formed through complex networks/relationships

Network approach

- Organizations are interdependent
  - Customers, employees, sellers
  - Cooperation among competitors is used to reduce dependencies
- Illegal network structure
  - Secrecy and efficiency are key
  - In theory, sparse and decentralized networks should protect against prosecution

Data

- Archival data
  - Sworn testimonies from the U.S. Senate Committee on the Judiciary, Subcommittee on Antitrust and Monopoly (Kefauver Committee 1961).
- Participants
  - Any manager or executive employed by an electrical equipment manufacturer who 1) was a witness before the Kefauver committee, or 2) was cited as a witness, under oath, as involved in price-fixing activities

Data

- Ties
  - An explicit citation of someone being directly involved in price-fixing activities
- Organizational rank
  - Top executives, middle managers, low-level managers
- **Degree** (# of direct ties), **betweenness** (points as bridges), **closeness** (points connected via short paths)
- Outcomes: Verdict, sentence, fine

Results

- The data suggest that the need to conceal overrides the need for efficiency in both conspiracies for switchgears and transformers.
    - Networks were relatively sparse and decentralized
- However, network decentralization did not – in general – protect against prosecution
- Participants in centralized networks were more likely to be found not guilty
- Top executives in the centralized networks were more likely to be found guilty
- Middle managers more likely to be found guilty than junior managers
- Higher degree increased vulnerability
- Decentralized networks increase the sentence for top executives

Discussion & Significance

- Degree centrality makes a person vulnerable because there are more eye-witnesses
- Overall, members of centralized networks were less likely to be found guilty
    - Contrary to theory

- Novel approach to understand internal network structure
- Focuses on illegal activity, whereas prior research focused on legal activities

The Relative Ineffectiveness of Criminal Network Disruption

Duijn et al., 2014

Problem

- Although these studies help us to understand that remaining flexible is the key to criminal network resilience against disruption, little is known about how these flexible network structures actually recover from an attack and continue their illegal activities.
- What actually makes these flexible criminal network structures so difficult to disrupt?

Purpose of Study

- The first aim is to unravel the dynamics of the interaction between disruption and resilience within criminal networks.

- The second aim is to find the most effective criminal network disruption strategy according to this model, by simulating the effects of different network disruption strategies on network topology.

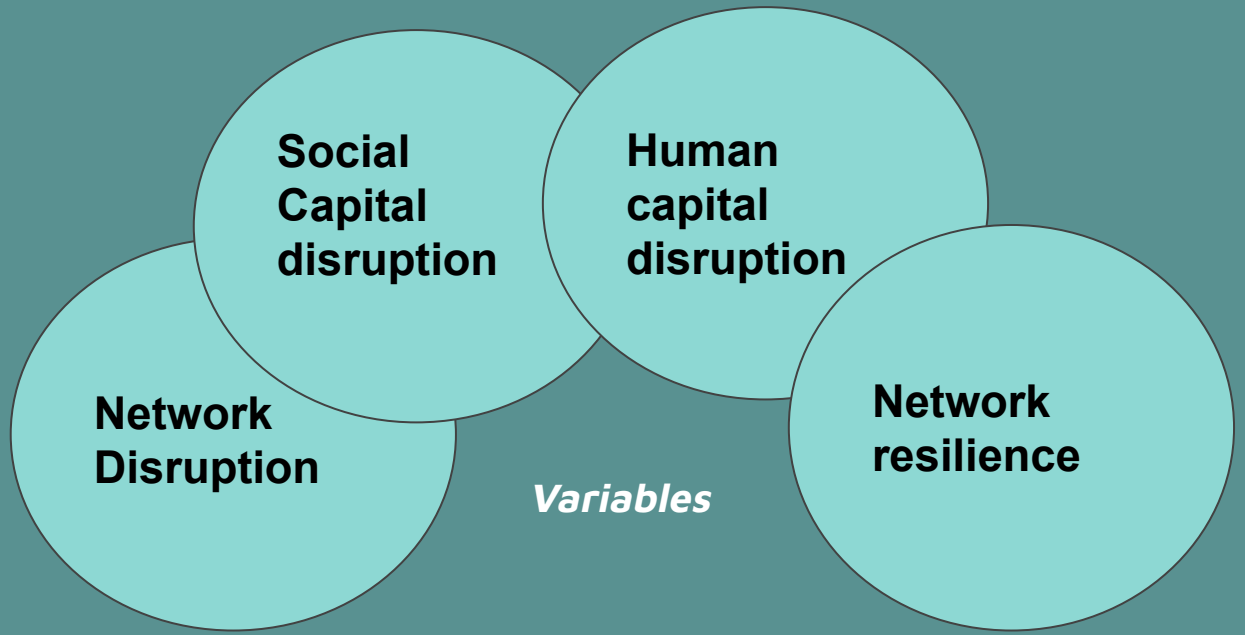
Data

- Dataset #1:
  - Collected by a regional criminal intelligence unit resorting under the Dutch police
    - over the period January 2008–January 2012
  - Contains information and reports from closed criminal cases aimed at organized crime

- Dataset #2:
  - This dataset consists of arrest records over the period 2008–2011
  - The dataset on arrest information consists of persons with a police arrest registration dating from the period 2008 until 2011 (N 5 24 284) within the same police region from which the soft data was collected. Every police suspect is registered into a police database with a connection to her or his arrest registrations. This arrest record contains variables of the date, time, place and law article for which they were arrested.

Methods

- Quantitative Methods: Computational modeling + Social network analysis
  - Simulate the behavior of a criminal network involved in organized cannabis cultivation based on intelligence data from the Dutch Police.



Results

- When more specific actors are being targeted from the value chain, the more efficient the network becomes after random recovery.
- Random and Role specific disruption strategies slightly increase the network efficiency.

- ‘Role specific’ specialist strategy might make network structures more vulnerable
- Only effective in the long run when the network is unable to replace the specialist

- **Main takeaway**
- It can be concluded that disruption of the criminal cannabis network is relatively ineffective. After applying multiple removals of actors the network efficiency is hardly affected.

Benefits

- Offers another explanation for the visibility of the ‘hubs’ observed within the results
  - Hub refers to degree centrality (measures the number of direct contacts surrounding an actor)
- Emphasize the importance of considering these criminal network structures within their complex adaptive dynamics, instead of focusing on a snapshot of a group at a certain point in time.
- Methods
  - Aids in thinking about the effectiveness of control strategies of organized crime on an operational level.

Limitations

- Failed to consider exogenous mechanisms that might disrupt the network strategy
  - Such as advancements in legislation
- Lacks generalizability
  - Collected by Duthc police department, highly subjective
- Data
  - Not all facts that are written within the intelligence reports can be checked. This might be a risk to reliability of the data (Dataset #1)
  - Arrest registrations do not contain much narrative information (Dataset #2)
  - Another weakness of this dataset is that important network actors might be under represented (Dataset #2)

Criminal network security: An agent-based approach to evaluating network resilience

(Duxbury & Haynie, 2019)

Purpose

Question:

- How do organized crime networks react to different disruption targets, how does the characteristic of the network function as well, and what is the recovery time?

Design:

- The purpose of this study was to evaluate the effectiveness of disruption strategies in 4 different organized crime models
  - 9/11 Terrorist Network
  - New York Heroin Distribution Network
  - Siren Stolen Vehicle Exporation Network
  - Caviar Network - Montreal based drug-trafficking group
- The disruption strategies consisted of:
  - Lead *k*
    - Remove node with highest level of centrality, in addition to ties connected to them
  - Broker targeting
    - Remove actor with the largest betweenness centrality, and all ties connected to person
  - Key player targeting
    - Remove actor best positioned to “diffuse a signal most quickly” (i..e. Shortest mean path length to all other actors)
- Also wanted to observe recovery time for the network post-disruption

Methods

- Each criminal network was given a weighted score based on efficiency (e) and security (s)
  - Efficiency was characterized by rapid information and resource dissemination
    - The ability to reduce the average distance between actors in the total network (Borgatti, 2006; Duijn, Kashirin, & Sloot, 2014)
    - The mean path length for a tie to form
  - Security was defined by the characteristics of the actors it connects
    - Those with ‘criminal capital’
- 9/11 network: s = .9 & e = .1
- Siren network: s = .7 & e = .3
- Caviar network: s = .4 & e = .6
- New York network: s = .3 & e = .7

- Simulation of how networks would react is implemented.
  - Each scenario was simulated over 100 times to ensure validity

Results & Limitations

Results:

- Broker targeting tends to outperform lead *k* targeting in both immediate and longer-term disturbance to a network
  - Broker and lead *k* are comparable strategies when attempting to disrupt highly efficient networks like New York and Caviar (meaning, no statistical difference in their effects comparatively)
  - Key targeting the least effective
- Efficiency-oriented networks able to return to prior rate of offending fast than security-oriented networks
  - Siren network takes longer than 9/11 model to recover structural characteristics (i.e., distance, number of components, and size of largest component)

Limitations:

- The primary limitation is that this is a simply a computerized simulation
  - Meaning, there are variables that the code may not accurately predict (such as maybe, network are more apt to disruption strategies than anticipated)
- Missing information on how networks resist disruption
  - How do motivations of network influence resilience (i.e., politically v. monetary driven)

Significance

- Though the data is taken from outdated network structures, by weighting the characteristics of the network (i.e., efficiency and security), the results can be applied beyond the scope of these selected networks.

- Allows for criminologists and criminal justice professionals to better understand what means of disruption are most suitable depending on the network

Exogenous Shocks, the Criminal Elite, and Increasing Gender Inequality in Chicago Organized Crime

(Smith, 2020)

Purpose

Question:

- The paper wanted to answer 3 questions:
  - (1) How did the structure of the organized crime network change after an exogenous shock?
  - (2) What were the consequences of organizational restructuring for organizational criminal elites?
  - (3) What were the consequences of organizational restructuring for women?

Methods:

- Data was taken from the Capone database in Chicago from the year 1900 - 1933
- Identifies criminal elite in network, and measures centrality and connectivity between nodes (elite men, non-elite men, and women)

Results:

- **Question 1:** The organized crime network changed both in terms of size and centralization
  - Prohibition made the illicit market more profitable, marginalized members (i.e., women, non-elites) entered criminal network through small decentralized networks, large centralized networks allowed elites to distance themselves from the core and still consolidate power.
- **Question 2:** The proportion of criminal elites dropped from 4 percent to 2 percent of the network
  - But, the number of connections (specifically, in decentralized networks where they are more accessible to non-elite actors) and power increased
- **Question 3:** The proportion of women in the network dropped from 18 percent to 4 percent after the Prohibition
  - Reflective of compounding effect due to the position of non-elite men improving

Figure 1. Pre-Prohibition Organized Crime Network, 1900 to 1919 (n = 267)

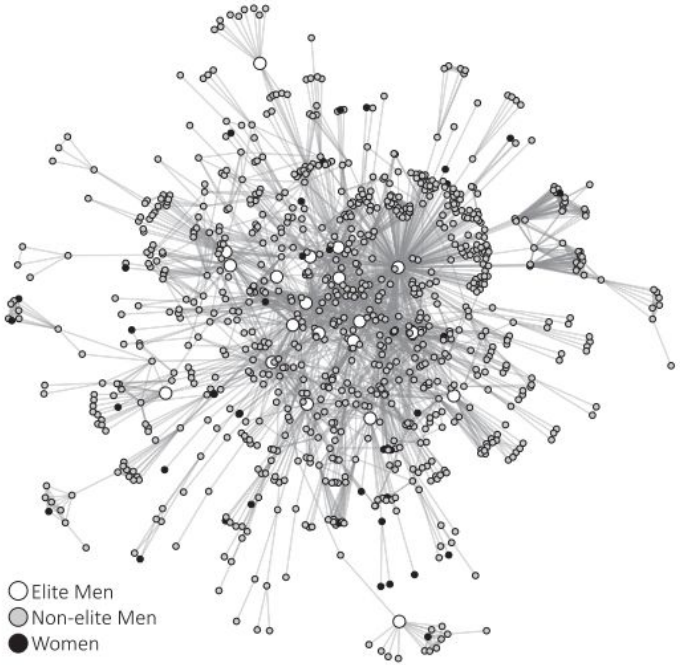


Figure 2. Prohibition Organized Crime Network, 1920 to 1933 (n = 937)

Significance & Limitations

Significance:

- Provides a better understanding of how “exogenous shock” impacts criminal networks
  - The Prohibition led to an increase in the number of components and
- Examined the gender dynamics in organized crime networks and thus provides a baseline understanding of their presence

Limitations:

- Acts under the assumption that the organized crime network is accurate and complete
  - For example, the authors point out that women may have been left out of the data due to gender biases (i.e., women were not seen as associates of criminal groups)
- Data as was taken from the early 1900s
  - We know that organized crime networks do not act the same
  - The perceptions of gender are not the same which would highly alter the status of women in organized crime networks

Discussion Questions

- Baker & Faulkner (1993):
  - How might these findings transfer over to the organizational structure of gangs or terrorist groups?
  - Does it make sense that in a centralized network, the top executives were more likely to receive a guilty verdict? Especially after their explanation for why, in general, members in centralized networks were less likely to be found guilty?
- Dujin et al. (2014):
  - How might the legalization of cannabis help disrupt cannabis cultivation networks, if disruption would occur at all? Could legalization contribute to resilience instead? What are your thoughts?
  - What might be some other factors that contribute to network disruption and resiliency that were not mentioned in the Duijn et al., 2014 article?
    a. Natural disasters? Age?
  - Disruption of criminal networks often depends on the interaction of police agents. In what ways has police technology evolved to where they have been able to disrupt criminal networks? How do you see criminal networks combating this to keep their illegal activity in operation?

Discussion Questions

- Duxbury & Hanie (2019):
  - The authors throw a lot of information at you (specifically about their results) do you believe that the system simplifies the ability to disrupt a network? Meaning, we know that removing the broker and their connections is the most impactful in creating long-term damage to crime syndicates but is that an easy feat to accomplish?
  - Do you think there are any variables that system was not able to account for (for instance, does the type of crime network matter)? Or other general concerns?
  - We talked about some of the crime networks that live in the metaverse (like Anonymous), do you believe these disturbances would be as effective to them as well? Does their online status make them more secure and efficient than other organized crime networks?
- Smith (2020):
  - What do you make of Smith (2020) pulling data from the Capone database to evaluate the gender hierarchy in organized crime? Is this applicable to present criminal networks (i.e., are women still marginalized in these networks or was it more so a reflection of the period in time)
  - Do you feel that findings of Smith are fairly limited? For instance, Smith examines the shock of Prohibition (where it enhances the illicit market) but what about an ordinance like Proposition 64 (legalize marijuana). How might a negative to an illicit market impact its structure?
  - Do we need to advocate for women to be given the opportunity to become the elites of criminal networks?