IDENTIFYING MARKERS OF TRANSIT STATES EMBEDDED IN INTERNATIONAL DRUG TRAFFICKING NETWORKS

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A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Criminal Justice

by
Citlalik Sulema Ibarra Figueroa
March 2020
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ABSTRACT

Illicit drugs can travel across multiple borders before reaching their intended retail market. International drug trafficking is important because it introduces a large quantity of foreign sourced illicit drugs into domestic drug markets. Of utmost importance are countries that lie along the transshipment paths used by international drug trafficking operations that facilitate the movement of illicit drugs. Understanding the characteristics of countries operating as transit states is necessary to combat transshipment operations. The study investigates social, economic, geographic, and political factors that have the potential to account for nations being positioned as transit states in illicit drug transshipment networks generated from the United Nations Office of Drugs and Crime Individual Drug Seizures data set. Quadratic assignment procedure (QAP) regression models reveal that border connectivity is the most significant identifying marker of transit states embedded in international drug trafficking.
DEDICATION

Cualquier logro mío, es un logro de mis papás—

Elizabeth Figueroa y Noe Ibarra.
# TABLE OF CONTENTS

**ABSTRACT** ................................................................................................................................. iii  
**LIST OF TABLES** ........................................................................................................................... viii  
**LIST OF FIGURES** ........................................................................................................................ ix  
**CHAPTER ONE: INTRODUCTION** ................................................................................................... 1  
Outline ............................................................................................................................................. 2  
**CHAPTER TWO: LITERATURE REVIEW** ......................................................................................... 4  
Transshipment of Illicit Drugs ........................................................................................................... 4  
Transit States – What are They? ....................................................................................................... 5  
Theoretical Frameworks ..................................................................................................................... 6  
  Small Worlds Perspective .............................................................................................................. 6  
  Prices and Risk Model ................................................................................................................... 8  
Characteristics of Transit States ....................................................................................................... 8  
  Social Factors .............................................................................................................................. 9  
  Economic Conditions .................................................................................................................... 11  
  Geographic Proximity .................................................................................................................. 12  
  Political Factors .......................................................................................................................... 14  
Current Study ................................................................................................................................... 17  
**CHAPTER THREE: METHODS** .................................................................................................... 20  
Primary Data Source and Network Generation ............................................................................. 20  
Dependent Variable .......................................................................................................................... 23  
  In-degree and Out-degree Centrality ............................................................................................ 23  
  Betweenness Centrality ............................................................................................................. 25
Hypothesis 4 .......................................................... 53
Hypothesis 5 .......................................................... 53
Hypothesis 6 .......................................................... 54
Implications .......................................................... 55
Limitations .......................................................... 57
Future Research ....................................................... 58
REFERENCES .......................................................... 61
LIST OF TABLES

Table 1. Why Combine Centrality Metrics? .................................................................27
Table 2. Combination of Centrality Metrics Allows Ranking.................................28
Table 3. Attribute Variables ..............................................................................29
Table 4. Descriptive Statistics of Attribute Variables..........................................30
Table 5. Characteristics of Networks Generated.................................................38
Table 6. Descriptive Statistics of Networks Generated ..................................38
Table 7. Countries Classed as Transit States .....................................................43
Table 8. Top Ten Percent Transit States by Network Type ...............................44
Table 9. Similarities Check Results ..................................................................45
Table 10. Quadratic Assignment Procedure Regression Models for Transit  
         Country Designation ............................................................................47
LIST OF FIGURES

Figure 1. Individual Drug Seizure Data Set Snapshot ........................................... 22
Figure 2. Equations for Degree Centrality ............................................................... 23
Figure 3. Degree Centrality Visual ................................................................. 24
Figure 4. Equation for Betweenness Centrality ..................................................... 25
Figure 5. Betweenness Centrality Visual ............................................................... 26
Figure 6. Aggregated Drug Seizure Network 2013-2016 ....................................... 39
Figure 7. Cocaine Drug Seizure Network 2013-2016 ........................................... 40
Figure 8. Heroin Drug Seizure Network 2013-2016 ............................................. 42
CHAPTER ONE
INTRODUCTION

International drug trafficking is a type of transnational organized crime in which groups and individuals operate to facilitate the global movement of illicit drugs. More formally, the United States National Security Council (2011) defines transnational organized crime as involving groups or individuals who—operate across national borders, are driven by monetary gain, conduct their activities often by illegal means, seek to influence institutional structures in which they operate, and exploit differences between countries to do their bidding. The profitability associated with international drug trafficking continues to draw individuals, making it the second most lucrative illicit market (Global Financial Integrity, 2017).

Global Financial Integrity estimates in their Transnational Crime and the Developing World (2017) report that the illicit drug market is worth between $426 billion to $652 billion US dollars. The demand for product drives the market, securing future profits as buyers and users become dependent. Since 2009, there has been a 30% increase in consumption rates of illicit drugs worldwide (World Drug Report, 2019). According to the United Nations World Drug Report (2019), an estimated 271 million individuals worldwide used some form of illicit drug in 2017. The consequences of illicit drug use are significant. For instance, more than half a million individuals between the ages of 15 to 64 died in 2017 from illicit drug use (World Drug Report, 2017).
International drug trafficking operations are structurally different from domestic operations in terms of functionality and operation (Reuter, 2014; Swanstorm, 2007). While the transshipment of illicit drugs is a considerably small component of the illicit drug market commodity-chain as a whole, it is a critical link in understanding the flow of illicit drugs (Malm & Bichler, 2011). Specifically, it is important to observe the role of countries (international level actors) embedded across transshipment operations as they facilitate the movement of illicit drugs. In this study, countries involved in the transshipment of illicit drugs will be referred to as transit states.

A *transit state* is operationalized as a country that enables the movement of illicit drugs across national and international borders (knowingly or not). Designated transit states act as a bridge between any two given countries, influencing the flow of illicit drugs. Understanding the markers associated with countries operating as transit states will enable researchers and practitioners to predict and identify areas of weakness along transshipment operations, and supports the development of proactive policies.

**Outline**

This thesis includes four additional chapters. Chapter two reviews the academic literature concerning the transshipment of illicit drugs. Then, transit states are described, and their importance highlighted. The theoretical frameworks applied to the study of transshipment operations are also reviewed.
Next, the role transit states play in facilitating the movement of illicit drugs is explained. Lastly, the characteristics of transit states are debated.

Chapter three explains the methodology. The chapter begins by providing a brief overview of the research design. Network generation is then described, as is the primary data source for the study. Next, I discuss attribute variables and explain how the dependent variable was classed using three network centrality measures. The chapter ends by discussing the analytic plan.

Chapter four describes the results obtained during the analyses. First, network descriptors are provided for networks generated, and then, countries designated as transit states are identified. Lastly, I present findings from Quadratic Assignment Procedure (QAP) regression models.

Chapter five discusses the study’s main findings in relation to the hypotheses made at the beginning of the study. Then, potential policy implications are presented and discussed briefly. Next, I present limitations relating to the scope of the study as a whole. The chapter ends with a discussion of avenues for future research.
CHAPTER TWO
LITERATURE REVIEW

Transshipment of Illicit Drugs

The most recent global estimates show that roughly 271 million people reported having used some type of illicit drug in a single year (World Drug Report, 2019). Of that, 11 million individuals reported having injected illicit drugs, from which 1.4 million reported having HIV, 5.6 million reported having Hepatitis C, and 1.2 million reported having both (World Drug Report, 2019). While medical costs associated with drug use and collateral disease transmission are significant, these estimates underrepresent the scope of the problem—of those who suffer from drug-related disorders, only about one in seven are able to receive treatment (World Drug Report, 2019). Moreover, the detrimental cost associated with the production, transshipment, and distribution of illicit drugs goes beyond financial burdens (Enderwick, 2016). Drug markets pose significant social and health issues at both the individual and community level, aggravating problems already affecting the nations involved (Trumbore & Woo, 2014; Enderwick, 2016; Bybee, 2012; Swanstorm, 2007).

Moving illicit products along the international drug market commodity-chain requires different activities (Malm & Bichler, 2011). To understand how product flows into retail markets, it is necessary to investigate what factors contribute to the success of transshipment operations. The transshipment of illicit
drugs is the process in which illicit drugs ship to an intermediary destination, before reaching their final destination. The intermediary destinations used for the transshipment of illicit drugs are referred to as transit states.

Transit States – What are They?

Transit states positioned within a network of international drug trafficking routes are key points that enable the transshipment of illicit drugs to cross borders and move between nations (Berlusconi et al., 2017; Trumbore & Woo, 2014). Without the fluidity of international movement, the perceived risk-to-benefit ratios associated with smuggling operations would decline significantly (Berlusconi et al., 2017; Trumbore & Woo, 2014; Miraglia, Ochoa, & Briscoe, 2012; Wyler & Cook, 2011).

Porous borders improve risk-to-benefit ratios by limiting exposure to legal barriers and maximizing profitability. When porous border controls interact with weak political and security systems, illicit drug problems can contribute to increased regional and global scale security threats (Toktas & Selimoglu, 2012; Sands, 2007; Swanstorm, 2007). Studies find that transit states are likely to suffer from institutional fragmentation and instability (Bybee, 2012, Maftei, 2012; Miraglia et al., 2012; Wyler & Cook, 2011; Sands, 2007; Emmers, 2003). Since involvement in the transshipment of illicit drugs is not always voluntary—at times couriers are coerced to participate (Caulkins, 2009; Sands, 2007)—drug related activities could exacerbate public safety concerns already prevalent in unstable
social systems. Studies also show potential links between illicit drug
transshipment operations and terrorist groups established in transit states, further
raising security threats in and around that region (Ekici & Coban, 2014; Wyler &
Cook, 2011).

Theoretical Frameworks

It is important to note that there is no established theoretical framework to
explain international drug trafficking fully. Combining two perspectives—the small
world perspective and the price risk model—it is possible to develop an
integrated explanation for the structural position of states within the network of
transnational illicit drug distribution.

Small Worlds Perspective

The small world perspective stems from a set of experiments conducted
by Milgram (1967), in which he observed how likely it was that two random
individuals from the same community of actors could be connected to one
another. Focusing on societal network structures, Milgram (1967) notes how two
individuals can be connected back to each other indirectly via six acquaintances
at most. The Milgram (1967) study emphasizes the role of intermediaries in
observed networks, identifying the critical function played by hubs and bridges in
generating structural features that foster social integration.

In the small world perspective, hubs are actors with many direct ties, and
often these highly connected individual's link to other hubs. Bridges are central
actors, whose positioning connects other actors that otherwise would not be connected. As societal networks evolve, a process of self-organization occurs wherein structures continue to develop, i.e., over time highly central actors, such as hubs, will link to other hubs. Relating the small world perspective to this study, a transit state is an actor that is central to the transshipment of illicit drugs. In applying the logic behind the small world’s perspective to this study, countries are only designated transit states if they are central to the network they are in.

The central positioning of actors is theoretically linked to centrality metrics. Prior research that incorporated the use of network analyses has used numerous centrality metrics to identify key individuals, countries, paths, and factors believed to facilitate the movements of illicit drugs (Berlusconi, Aziani, & Giommoni, 2017; Giommoni, Aziani, & Berlusconi, 2017; Boivin, 2014). The incorporation of more than one centrality metric allows for the robust identification of critical actors in any given network.

Drawing upon network science provides investigative techniques that can be applied to relationships observed between individuals and organizations, even physical spaces. Concerned with the interrelatedness of social units and how they influence one another, this discipline offers metrics to observe individual actors in relation to others, and the overall operating structure (Wasserman & Faust, 1994). Here, social actors are countries, and intended drug shipments constitute the ties connecting nations. If centrality metrics can be used to identify
critical actors in any given network, then these metrics could be used to identify transit states critical to international drug trafficking networks.

**Prices and Risk Model**

In 1989, Reuter and Kleiman proposed a risk and price model to analyze international drug trafficking. The model assumes that individuals involved in the illicit transnational drug trade are rational actors who intentionally select a transit states (Giommoni, Aziani, & Berlusconi, 2017; Boivin, 2014; Reuter, 2014). Reuter and Klein (1989) argue that choice structuring factors relating to risk and price lead illicit drug operations to channel shipments through countries where risk of seizure is low, resulting in higher profits. According to this model, illicit drug transshipment operations are driven by factors that mediate risk and increase profit for those involved (Reuter & Kleiman, 1989). It follows, that efforts to combat international drug trafficking require identification of transit states using characteristics that represent price maximization and risk minimization (Boivin, 2014; Reuter & Kleiman, 1989).

**Characteristics of Transit States**

Academic literature acknowledges that transit states embedded in illicit drug transshipment operations possess similar characteristics (Berlusconi et al., 2017; Boivin, 2013; Bybee, 2012; Maftei, 2012; Miraglia et al., 2012; Toktas & Selimoglu, 2012; Sabatelle, 2011; Sands, 2007; Morselli & Giguere, 2006). Four types of factors are believed to facilitate the use of a country as a transit state for
transshipment operations: social, economic, geographic, and political factors (Berlusconi et al., 2017; Boivin, 2013, 2014; Trumbore & Woo, 2014; Bybee, 2012; Toktas & Selimoglu, 2012; Wyler & Cook, 2011; Ellis, 2009; Sands, 2007).

Social Factors

Social factors observed to influence transshipment operations relate to how close one country is to another based on socially construed ties, a concept known as social proximity (Giommoni et al., 2017). Social proximity is crucial as it facilitates the use of a country as a transit state in transshipment by creating relational ties between individuals located in drug-producing countries and potential transit states. Academic literature notes that countries with higher levels of social proximity to drug producing countries are more likely to be used as transit states (Berlusconi et al., 2017; Giommoni et al., 2017; Trumbore & Woo, 2014; Bybee, 2012; Miraglia et al., 2012; Toktas & Selimoglu, 2012). In addition to influencing the direction of drug flow across transshipment operations, social proximity influences the frequency at which illicit drugs are trafficked (Berlusconi et al., 2017).

Several indicators may be indicative of social proximity and can be used to observe the social proximity between any two countries; such as migration patterns, the presence of ethnic enclaves, and even rates at which a non-native language is spoken (Leuprecht et al., 2016; Miraglia et al., 2012; Sabatelle, 2011). Social proximity facilitates the use of a country as a transit state across transshipment operations as it enables individuals to connect with others whom
they share some sort of tie stemming from socio-cultural construed relationships (Leuprecht et al., 2016; Miraglia et al., 2012; Sabatelle, 2011, Caulkins, 2009; Heber, 2009; Morselli & Giguere, 2006).

The likelihood of a country to be a transit state increases with corresponding increases in migrant populations. Heavy migration flow from a drug-producing country to a non-drug-producing country serves as a predictor for whether that country becomes a transit state (Berlusconi et al., 2017; Giommoni et al., 2017; Miraglia et al., 2012; Sands, 2007). Examples in which heavy migrant flow and relating factors was seen to facilitate the transshipment of illicit drugs is observed in countries like Tajikistan, El Salvador, Kenya, Turkey, and Spain (Berlusconi et al., 2017; Ekici & Coban, 2014; Giommoni et al., 2017; Miraglia et al., 2012; Sands, 2007).

Spain, for example, attracts migrants from Latin America, as the native language in both is similar. This, in turn, has facilitated that Spain be used as a transit state across transshipment operations originating primarily in Columbia, with the goal of the product making its way to other European countries (Sands, 2007). A study conducted by Ekici and Coban (2014) on the Afghan to Turkey heroin trade also found that dual citizenship, in particular, makes individuals more likely to be targeted for couriers across transshipment operations, as they will face fewer barriers to entry (Giommoni et al., 2017).

Research shows that the greater the size of a migrant population or ethnic enclave residing in a non-drug-producing country from a drug-producing country,
the more likely that country is used as a transit state (Heber, 2009; Sands, 2007). Shared ethnic or cultural ties allow individuals heading transshipment operations to secure passage for their illicit product, willingly or not, due to social ties (Heber, 2009; Sands, 2007; Enderwick, 2006; Morselli & Giguere, 2006). Migrant communities are often not trusting of legal institutions, leaving individuals vulnerable to coercion by drug traffickers, who force individuals to participate in drug trafficking operations (Sands, 2007).

**Economic Conditions**

Economic conditions observed to influence transshipment operations relate to economic development and profit maximization for those involved in the illicit activity (Berlusconi et al., 2017). Countries that lack robust economies, meaning they are economically unstable and little is done by institutional factors to better it, are more likely to serve as transit states (Bybee, 2012; Maftei, 2012; Toktas & Selimoglu, 2012; Sands, 2007). Countries with unstable economies are observed to emerge and remain as transit states across transshipment operations; this has been the case with Turkey as well as the Central Asia region (Toktas & Selimoglu, 2012; Emmers, 2003). Countries suffering from economic instability often have high poverty; being that the legal economy is limited, individuals often turn to alternative avenues like drug trafficking (Bybee, 2012; Miraglia et al., 2012). Similar observations have occurred across the region of Africa, where many national economies are characterized as being rather weak, poor, and oppressed (Bybee, 2012; Ellis, 2009).
In countries characterized as economically unstable, drug trafficking is viewed as a means to provide for oneself and their family (Ellis, 2009). Similarly, countries like Turkey and those in Africa still operate as transit states since institutional structures allow drug traffickers to reap higher profit. Due to risk minimization in these regions being inexpensive, those who head the transshipment operations are able to sell at a higher wholesale rate (Toktas & Selimoglu, 2012; Bybee, 2012; Ellis, 2009). Profit maximization at the wholesale level is indicative of a reduced cost of risk in a given country and fewer structural barriers (Boivin, 2014). Countries that operate as transit states minimize costs faced by traffickers relating to risk; therefore they tend to have lower drug price mark-up values (Giommoni et al., 2017).

Geographic Proximity

Geographic proximity, meaning how close one country is to another based on geographic features, has been observed to facilitate the use of a country as a transit state (Giommoni, Aziani, Berlusconi, 2017). Geographic proximity—geographic distance between nations, border connectivity, the size of a region/country, and geographic positional importance—creates relational ties between drug-producing countries and those geographically close to them, because of who that country is connected to (Giommoni et al., 2017; Sands, 2007).

The most basic measurement of geographic proximity is geographic distance, such as the Euclidian distance between central points within two
countries. Distance can be measured between a drug-producing country and a transit state, or between a transit state and a retailing country (Maftei, 2013; Sabatelle, 2011). Border connectivity relates to the number of borders a given country shares with other countries, increasing geographic proximity as it has more options for connectivity (Boivin, 2014; Maftei, 2012). The size of a region can also relate to geographic proximity as it enables drug trafficking operations to reach their intended destination without having to cross more than one international border (Maftei, 2012). Positional importance relates to how geographically close a country is to a traditional trafficking route or important region entryway (Maftei, 2012). Traditional trafficking routes like the Balkan Route and the Northern Route are able to provide a blanket of security for international drug trafficking operations due to their territorial features (De Danieli, 2014; Sabatelle, 2011). Therefore, countries that are geographically close to them become targets to operate as transit states to gain point of entry (Sabatelle, 2011).

Research observes countries like Spain, Turkey, Ukraine, and Iran to operate as transit states across transshipment operations because they serve as entry points for other European countries with higher barriers to entry (Ekici & Coban, 2013; Calderoni, 2012; Toktas & Selimoglu, 2012; Layne, Khruppa, & Muzyka, 2011). The region of Africa often serves as a transit state for illicit drugs traveling from South America with the intent of making it to various European countries and North America (Wyler & Cook, 2011). The country of Tajikistan is
often used as a transit state for its geographic proximity to what is known as the Northern Route (Reuter, 2014; Miraglia, Ochoa, Briscoe, 2012). Located right in the middle of the established trafficking route, the country of Tajikistan operates as a known transit state for the transshipment of heroin from Central Asia due to its geographic proximity to the drug-producing region (Reuter, 2014; Miraglia, Ochoa, Briscoe, 2012).

Across the literature, findings are not conclusive when assessing the importance of geographic proximity. Some researchers (Berlusconi et al., 2017; Giommoni et al., 2017; Leuprecht et al., 2014; Trumbore & Woo, 2014; Wyler & Cook, 2011) agree that geographic proximity is important in whether a country is used as transit state, while others argue that geographic proximity can easily be overlooked and therefore its' influence is minimal given advances in transnational logistics (Trumbore & Woo, 2014; Ekici & Ozbay, 2013). Geographic proximity appears to play less of role when risk is too high, and social proximity is rather low (Ekici & Ozbay, 2013; Sands, 2007). The availability of non-land modes of transportation like international flights reduces the importance of geographic proximity as well (Ekici & Ozbay, 2013). Nonetheless, literature does support the influence of geographic proximity, simply by varying degrees across observed drug trafficking operations.

**Political Factors**

Political factors observed to influence transshipment operations relate to the inability of a country to maintain order or to uphold the law within its borders,
a concept known as weak governance (Bybee, 2012). A country characterized by weak governance lacks the institutional and structural powers to combat illicit activity, like the transshipment of illicit drugs (Sands, 2007). Additionally, countries characterized by weak governance functioning as transit states tend to view the transshipment of illicit drugs more favorably (Ellis, 2009).

A country characterized as having weak governance is likely to have inefficient forms of law enforcement, or perceived as corrupt (Toktas & Selimoglu, 2012; Ellis, 2009; Sands, 2007). Turkey for example, lacks efficient border controls, as a result, often used as a transit state due to the limited capabilities of the institutional system itself (Toktas & Selimoglu, 2012). Literature supports that countries with weak governance are more likely to become transit states; however, the relationship is nonlinear (Giommoni et al., 2017). Meaning that weak governance within a transit state is preferred; however, countries characterized as having extremely weak governances are not ideal (Layne et al., 2001). Countries in which drug traffickers feel they have a stronger hold than the country itself are more likely to become a transit state, as lower levels of risk are perceived (Trumbore & woo, 2014). The longer that a country allows itself to operate as a transit state, the more embedded it becomes across transshipment operations (Ellis, 2009).

Corruption plays into risk minimization as it ensures that the illicit goods will make it across national borders for profit (Leuprecht et al., 2014). Across the literature, every country that has been observed as a transit state within
international drug trafficking operations is to some degree perceived as corrupt
(Berlusconi et al., 2017; Leuprecht et al., 2016; Boivin, 2014; De Danieli, 2014;
Trumbore & Woo, 2014; Miraglia et al., 2012; Sabatelle, 2011; Wyler & Cook,
2011; Emmers, 2003; Layne et al., 2001; Sands, 2007; Swanstorm, 2007). Litterature acknowledges that countries with higher levels of perceived corruption are more likely to become transit states, as drug-producing countries are better able to minimize risk within their borders. (Berlusconi et al., 2017; Giommoni et al., 2017; Leuprecht et al., 2014; Trumbore & Woo, 2014; Bybee, 2012; Wyler & Cook, 2011).

Trumbore and Woo (2014) identified that worldwide, politically stable countries where corruption can take place are more likely to become transit states. Spain is a clear example where the country is politically stable, yet corruption is present and thus used as a transit state (Calderoni, 2012; Sands, 2007). Corruption has been observed to heighten the effects of all social and geographic factors in relation to whether a state will become a transit state, making it the most relevant factor (Berlusconi et al., 2017; Leuprecht et al., 2016; Boivin, 2014; De Danieli, 2014; Trumbore & Woo, 2014; Miraglia et al., 2012); Sabatelle, 2011; Wyler & Cook, 2011; Emmers, 2003; Layne et al., 2001; Sands, 2007; Swanstorm, 2007). Coinciding with Boivin (2013), the current study argues that the combination of the factors mentioned throughout rather than individually enable the transshipment of illicit drugs.
Current Study

Internal and external factors that facilitate the use of a country for illicit drug transshipment operations as a transit state warrant scholarly attention. It is evident that illicit drug trafficking as a whole is a risky business, and despite the policies meant to curb the illicit activity, its lucrative nature continues to attract individuals. For every seizure made in a country known to operate as a transit state, many more go unnoticed (Caulkins, 2009). Understanding what facilitates the use of a country as a transit state for transshipment operations is important because identifying specific factors provides direction for interdiction and crime prevention efforts at two socio-political levels—national and international.

Limited research investigates the attributes of countries positioned as transshipment points in the transnational flow of illicit drugs. The majority of research available focuses on a specific country, region, or drug type, limiting the scope of the problem. For that reason, this study seeks to observe the transshipment of illicit drugs by aggregating all data available into one network for the selected observation period. Doing so generates a more comprehensive understanding of transit states. The study aims to highlight which factors are more highly correlated with transshipment positioning across illicit drug trade networks. The primary goal of this study is to identify what factors are more predictive of being a transit state within transnational illicit drug flow based on characteristics commonly referenced in academic literature to be facilitators.
Thinking about the transnational illicit drug trade as a network of countries, linked by the flow of drugs, it is possible to identify key transshipment nations. Extrapolating from the small world perspective, central countries operate as critical bridges linking networks, as such, transit states should be those most central countries in the illicit drug trafficking networks. Since drug traffickers decide where to route drug shipments, Reuter and Kleiman (1989) assert that the transshipment countries selected should exhibit characteristics that are most likely to minimize risks and maximize profit. Four factors are associated with transshipment countries—social connectivity among countries measured with migrant population, geographic proximity captured as border connectivity, economic benefit as indicated by drug-price mark-ups, and political climate—as reflected by the perceived level of and control of corruption. The following six hypotheses emerge from the literature:

Hypothesis 1: The higher the degree of corruption in a country, the more likely it is to be a transit state.

Hypothesis 2: Transit states have more border connectivity in comparison to countries that are not transit states.

Hypothesis 3: Transit states have larger migrant population percentages in comparison to countries that are not transit states.

Hypothesis 4: Transit states have lower drug price mark-up percentages in comparison to countries that are not transit states.
Hypothesis 5: Corruption is the most significant identifying marker of transit state designation.

Hypothesis 6: The same countries are positioned as transit states within the illicit drug transshipment network irrespective of illicit drug examined (e.g., heroin, cocaine).
CHAPTER THREE
METHODS

This chapter describes the various components of the study. This investigation used a non-experimental cross-sectional design to identify which factors best explain the positional attributes of transit states situated within country-to-country transshipment networks. Six years of seizure data were aggregated to map the international drug flow and to identify countries operating as transit states. Using centrality metrics, transit states were identified as those best positioned in the network to serve as hubs or bridges along transshipment paths. Aggregated data can obscure drug-specific patterns; therefore, cocaine only and heroin trafficking networks were compared. Descriptive and multivariate analyses are run for each network.

Primary Data Source and Network Generation

Transshipment networks were generated from the United Nations Office of Drugs and Crime (UNODC) Individual Drug Seizure Cases data set. The UNODC is a division of the United Nations that gathers data on drugs and crime at an international level. The data set records the location of seizures that took place from 2013 to 2016. The report also includes data on the region, sub-region, country, administrative division, place, and date a drug seizure occurred. Also reported is the drug type, amount, unit packed in, how and where it was hidden,
and how it was transported. Where the drug was produced, where it was sent from, where it was meant to arrive, and the route used are also reported.

Seizure data was used to generate three networks. The aggregated drug network (network one) represents all and any reported drug seizures that took place from 2013 to 2016 — the additional two networks record seizures involving cocaine only (cocaine network) and heroin only (heroin network) derivatives. Drug specific networks permit the identification of differences, if any, to be observed among countries serving as transit states due to the type of product being handled.

All networks were single-mode and directed. Actors (nodes) represent countries reported to have seized illicit drugs, and ties (directed arcs) connect origin and destination countries involved in the seizure. Thus, the drug trafficking networks map country-to-country links, by connecting the country from which a drug ships and the country where the seizure of drug shipment occurred. A tie exists only when the location of the departure country and the receiving country was specified (refer to Figure 1 for a snapshot of IDS data set). Since connectivity was based on relational events, drug seizures, the network represents an observed flow of drug trafficking.
The most significant limitations affecting the comprehensiveness of this data set are (1) that agencies report on a voluntary basis, and (2) that illicit drugs pass through borders undetected. The capacity and willingness of countries to detect international illicit drug shipments and report on drug seizures may be a byproduct of several factors—e.g., border control resources, political stability, and drug control policy. Consequently, the full scope of the transnational illicit drug trade is not known. Nonetheless, prior studies have relied on UNODC data (Berlusconi et al., 2017; Giommoni et al., 2017; Boivin, 2014, 2013), and this source is considered to be one of the most comprehensive data sets involving international drug trafficking.
Dependent Variable

The dependent variable was transit state designation. As the focus of the study was on countries operating as transit states, the dependent variable identified which countries were more central across transshipment networks, and thus, functioned in a structural way as transit states. For the purposes of this study, a transit state was operationalized as a country that exhibits in-degree, out-degree, and betweenness centrality. Only countries with high scores on all three forms of centrality were designated a transit state.

In-degree and Out-degree Centrality

The first two metrics were derived from degree centrality, which measured how central a node relating to the number of ties they had within a network (Wasserman & Faust, 1994). There are two forms of degree centrality, in-degree, and out-degree (Wasserman & Faust, 1994). Only normalized score values were used. For the mathematical equations of in-degree (top equation) and out-degree (bottom equation) centrality, refer to Figure 2 (Wasserman & Faust, 1994).

\[ C'_{d}(n_i) = \frac{x_{i+}}{g - 1} \]

\[ C'_{d}(n_i) = \frac{x_{i+}}{g - 1} \]

Figure 2. Equations for Degree Centrality.
In-degree centrality refers to the number of edges (interactions) in which a node is a receiver (Wasserman & Faust, 1994). Out-degree centrality refers to the number of edges in which the node is the sender (Wasserman & Faust, 1994). An actor is the most central when either it has the most incoming or outgoing ties, depending on the measure selected (refer to Figure 3 for visual representation).

Figure 3. Degree Centrality Visual.

These measures of degree centrality accounted for the number of ties a node has while accounting for directionality (Wasserman & Faust, 1994). Doing so was important because it can alter ones’ perception of a structure, potentially leading to false inferences about a networks’ structure and functionality (Wasserman & Faust, 1994). In the study, degree centrality accounted for the
number of interactions (drug seizures) experienced by countries within the generated network. In-degree centrality accounted for the number of times a country received a drug shipment (resulting in a seizure), while out-degree centrality accounted for the number of times a country sent a drug shipment. Scores obtained from degree centrality metrics are calculated using a valued network. Meaning the number of countries involved in a network were accounted for, in addition to the reported number of drug seizures taking place on any given path.

**Betweenness Centrality**

The third centrality measure was betweenness centrality, which measured how central a node is relating to its' positional importance within a network (Wasserman & Faust, 1994). Betweenness centrality accounts for centrality by calculating the number of times a particular actor appeared on any given path to connect to another actor within the same network (Wasserman & Faust, 1994). Only normalized score values were used. Refer to Figure 6 for betweenness centrality equation.

\[
C'_B(n_i) = \frac{C_B(n_i)}{\left[\frac{(g - 1)(g - 2)}{2}\right]}
\]

Figure 4. Equation for Betweenness Centrality
Betweenness centrality assumes that an actor is centrally based on how favored it is in relation to other actors within the network. Actors identified as having high betweenness centrality are often referred to as bridges, as they lie between and connect with other various actors. According to betweenness centrality, an actor is most central in a network when it appears numerous times on paths to lead to a connection with other actors (refer to Figure 8 for a visual representation).

Figure 5. Betweenness Centrality Visual.

For the study, betweenness centrality accounted for the number of times a country was positioned on the shortest paths among others who may be sending and receiving a drug shipment. This measure of centrality helps to highlight countries with the heaviest drug flow within a network. To account for the directionality of flow, a directed version betweenness centrality is used.
**Why Combine Centrality Metrics?**

Using a combination of centrality metrics identified crucial actors based on multiple concepts of centrality. Doing so was useful, as relying on a single centrality measure would have led to different inferences about which actor is the most important in a network (refer to Table 1). Accounting for three different network centrality measures highlights crucial actors in any given network. For the purpose of this study, only countries exhibiting all three forms of centrality were classed as transit states. This is how the dependent variable was identified. Furthermore, the combination of centrality metrics allowed for countries classed as transit states to be ranked. Ranking of classed transit states was done by summing only normalized values of the centrality scores found (refer to Table 2).

<table>
<thead>
<tr>
<th>Node</th>
<th>In-Degree</th>
<th>Out-Degree</th>
<th>Betweenness</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100.000</td>
<td>66.667</td>
<td>58.333</td>
</tr>
<tr>
<td>B</td>
<td>33.333</td>
<td>66.667</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>33.333</td>
<td>8.333</td>
</tr>
<tr>
<td>D</td>
<td>66.667</td>
<td>33.333</td>
<td>8.333</td>
</tr>
</tbody>
</table>
Prior research supports the use of various centrality measures to assess the importance of actors within a network (Berlusconi et al., 2017; Giommoni et al., 2017; Leuprecht, Aulthouse, & Walther, 2016; Bright & Delaney, 2013; Bright, Hughes, & Chalmers, 2012; Malm & Bichler, 2011). Centrality depends on context, and by combing various centrality measures, actors highlighted are representative of more than one element of centrality (Bichler, 2019). This allowed for a better-rounded assessment of an actors’ true importance within a network in relation to others.

Country Attributes and Data Sources

The study examined the degree of influence a country’s migrant population, drug price mark-ups, border connectivity, and corruption had (if any) on whether a country was central across transshipment networks, thus functioning as a transit state (refer to Table 3). Support for these attribute variables was available across academic literature to varying degrees. The

<table>
<thead>
<tr>
<th>Node</th>
<th>Classed as Transit State?</th>
<th>Combined Total</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Yes (3)</td>
<td>225.612</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>No (2)</td>
<td>100.282</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>No (2)</td>
<td>42.189</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Yes (3)</td>
<td>108.856</td>
<td>2</td>
</tr>
</tbody>
</table>
selected attribute variables represented important factors discussed in the literature review observed to influence drug flow across transshipment operations.

Data for the study came from five different sources (see Table 3). Data collected allowed us to develop country related attributes (similar to independent variables in conventional research methods). Sources include Transparency International, the World Bank, the CIA World Fact Book, The United Nations Department of Economic and Social Affairs (UNDESA) division, and the United Nations Office on Drugs and Crime (UNODC). Data provided by selected sources are secondary. For descriptive statistics on attribute variables refer to Table 4. A brief description and potential limitations of each data source follows.

Table 3. Attribute Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migrant Population</td>
<td>UNDESA</td>
<td>Social</td>
</tr>
<tr>
<td>Border Connectivity</td>
<td>CIA WF</td>
<td>Geographic</td>
</tr>
<tr>
<td>Drug Price Mark-Up</td>
<td>UNODC</td>
<td>Economic</td>
</tr>
<tr>
<td>Perceived Corruption</td>
<td>TI</td>
<td>Political</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>World Bank</td>
<td>Political</td>
</tr>
</tbody>
</table>

Note: CIA World Factbook (CIA WF); Transparency International (TI); United Nations Office on Drugs and Crime (UNODC); United Nations Department of Economic and Social Affairs (UNDESA).
Table 4. Descriptive Statistics of Attribute Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migrant Population</td>
<td>164</td>
<td>0</td>
<td>87</td>
<td>9.711</td>
<td>14.422</td>
</tr>
<tr>
<td>Border Connectivity</td>
<td>164</td>
<td>0</td>
<td>15</td>
<td>3.430</td>
<td>2.727</td>
</tr>
<tr>
<td>Cocaine Mark-Up</td>
<td>164</td>
<td>0</td>
<td>99.094</td>
<td>50.987</td>
<td>23.339</td>
</tr>
<tr>
<td>Heroin Mark-Up</td>
<td>164</td>
<td>0</td>
<td>95.233</td>
<td>42.272</td>
<td>21.939</td>
</tr>
<tr>
<td>Perceived Corruption</td>
<td>164</td>
<td>9</td>
<td>91</td>
<td>43.570</td>
<td>19.370</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>164</td>
<td>0</td>
<td>9</td>
<td>4.51</td>
<td>2.017</td>
</tr>
</tbody>
</table>

**Migrant Population**

The first variable was migrant population percentage, which reflected the known migrant population of a given country. The variable captured which percentage of the population in any given country that was foreign born, meaning they were not born in the country they resided. High rates of social proximity between nations have been argued to serve as pillars for illicit activity to take place (Giommoni et al., 2017; Bybee 2012).

Data for this variable came from the International Migrant Stock (IMS) data set. Information for this data was compiled by the United Nations Department of Economic and Social Affairs (UNDESA); a division of the United Nations responsible for gathering data on population and development of countries around the globe. Data collection for the data set was done in conjunction with the United Nations High Commissioner for Refugees. Based on official statistics
identified by the agency division, information on migrant stocks was available for 1990, 1995, 2000, 2005, 2015, and 2017.

The greatest limitation to this data set is that annual data is not available for every year within the study’s period. The relevance of social proximity is identified as a major influencer of drug flow; therefore, IMS estimates provided for 2015 will be used for all of the annual networks included in the study. The accuracy of totals and stated origins is limited, being that migrant populations tend to shy away from official organizations and agencies. Even so, the UNDESA is one of the few divisions with the demonstrated ability to track international migrant flow.

Accounting for a country’s migrant population percentage allowed us to observe the influence of social proximity. Data for migrant population percentage came from the IMS data set. Migrant population percentage was coded as ratio; estimates of reported migrant population percentages were coded as exact numbers given. IMS data for 2015 served as the migrant population estimate for all networks generated and provided the percent of which the population in any given country reported to belong to a migrant community. Descriptive statistics of this variable are available in Table 4.

**Border Connectivity**

The second variable was border connectivity, which captured how connected a country is based on the number of borders it shares with other countries. Boivin (2014) identified how countries with numerous shared borders
are able to generate more profit at a lower risk in comparison to those with fewer borders. Data is taken from the CIA World Factbook to generate a country-to-country attribute file. The CIA World Factbook is a source produced by the Central Intelligence Agency that provides information on countries around the world. Their land boundaries publication accounts for the number of borders a given country shares with others.

Accounting for border connectivity allowed us to observe the influence of geographic proximity. Border connectivity was coded as ratio, reflecting the exact number of shared borders a country had. To generate a score for each country, the number of borders it shared with other countries was included in the study. Descriptive statistics of this variable are available in Table 4.

**Drug Price Mark-Up**

The third variable was drug price mark-ups, which captured the rate at which a drug bought at the wholesale value was marked up when selling at the retail value. Studies have found that countries in which drug price mark-ups were relatively low are indicative of a high-profit margin for individuals involved in the transshipment of illicit drugs (Giommoni et al., 2017; Boivin, 2014; Reuter, 2014; Reuter & Kleiman, 1989). Accounting for drug price mark-ups allowed us to explore economic factors that relate to profit maximization. Data was taken from the Retail and Wholesale Drug prices data set to create an attribute file. The UNODC compiles information for this data set as well, which contains information on the sale value of illicit drugs around the world. Information on illicit drug prices
were available for 2013 to 2016. The data set identified the rate at which drugs went in different countries and provided a low to max range at which illicit drugs sell based on the unit, along with the average price that a specific illicit drug sold for in each nation. Data obtained on drug price mark-ups are coded as ratio, allowing us to capture the true value and to generate accurate mark-up percentages.

The given dollar amount may not truly reflect the worth of a product in the country it is being sold in. Meaning, a product can be worth more or less in one nation, but because of the currency exchange rate during any given year, its value may be different in the United States. Nonetheless, approximations are useful as the monetary gain is what drives the illicit drug market. Provided dollar amounts are standardized and adjusted for inflation using the United States Department of Labor Bureau of Labor Statistic Customer Price Index Inflation Calculator prior to calculating wholesale to retail price mark-up percentage. To calculate the drug price mark-up percentage, the retail cost is deducted from the wholesale price and then divided the sum by the retail cost. This provided us with the whole to retail mark-up percentage. Descriptive statistics of this variable are available in Table 4.

**Corruption**

Both the level of perceived corruption and the level of control of corruption in a given country are used to measure corruption. It has been observed that individuals involved in drug trafficking tend to operate where the risk is lower
(Berlusconi et al., 2017; Leuprecht et al., 2016; Boivin, 2014; De Danieli, 2014; Trumbore & Woo, 2014; Miraglia et al., 2012; Sabatelle, 2011; Wyler & Cook, 2011; Emmers, 2003; Layne et al., 2001; Sands, 2007; Swanstorm, 2007). By accounting for corruption, political factors relating to risk can be explored.

Data was taken from the annual Corruption Perception Index (CPI) reports to create the perceived corruption attribute file. Transparency International, an organization that captures information on the perceived level of corruption within a country produces the reports. The annual CPI reports provide a corruption score based on how corrupt the public sector of a given country is believed to be. Data for these particular reports were available from 1995 to 2018. Reports include a ranking of the nations included and the number of sources that used to generate individual estimates. Descriptive statistics of this variable are available in Table 4. Not every country had data listed for them. To account for missing data, the median CPI value is used for countries where data was not available. Additionally, calculated scores stem from relatively small sample sizes. Caution was taken when interpreting scores provided by the CPI.

Data was also taken from The Worldwide Governance Indicators (WGI) project to create the control of corruption attribute file. The World Bank, a financial institution that funds projects in developing countries around the globe intending to ending poverty, also funds the WGI project. The WGI report includes data on six aspects believed to influence the ability of a government to function effectively. Of interest is the Control of Corruption aspect (CCI). The CCI
provided information on the perceived level of corruption based on the believed extent that public power is used as a means for personal gain. The WGI project captured data from 1996 to 2017 and provides estimates for whether a country has weak or strong governance, signaling whether a nations’ government is or is not influenced by corruption. Descriptive statistics of this variable are available in Table 4.

Scores provided by CCI will be interpreted with caution as well. Like the CPI reports, CCI data is limited, and scores stem small samples. For countries where data was not available, the median CCI value was used. Both measures for corruption were interpreted together to produce greater results. Corruption was coded as both an interval and ratio. Data obtained from CPI were coded as interval, scores of perceived corruption range from zero (very clean) to 100 (highly corrupt). Data obtained from CCI were coded as interval, scores of control of corruption range from zero (high control) to nine (low control).

Analytic Plan

Network visuals were created using NetDraw and descriptive statistics calculated with UCINET 6 (Borgatti, Everett, & Freeman, 2002). Centrality metrics (in-degree centrality, out-degree centrality, and betweenness centrality) were run for each network individually using UCINET as well. Doing so allowed for data within each network to be evaluated independently of one another. The combination of centrality metrics allowed for the dependent variables to be
identified. In addition to identifying the top ten percent of countries classed as transit states across the three networks.

Next, variables were assessed for multicollinearity. The concept of multicollinearity refers to when a set of incorporated attribute variables in a given study are highly correlated with one another (Hanneman & Riddle, 2005). This is problematic as it affects the results and their potential significance (Hanneman & Riddle, 2005). Upon running a correlation statistic on the set of attribute variables, it was determined that they were not highly correlated. From there, I moved on to a multivariate regression analysis.

A Quadratic Assignment Procedure (QAP) was used to assess the extent that corruption, border connectivity, migrant population, and drug price mark-up in a given country influences transit state designation. QAP is a two-part process in which an initial regression is run, followed by multiple regression permutations to account for standard error (Hanneman & Riddle, 2011). A QAP is ideal for this study as the model recognizes that the actors involved in the network are not necessarily independent from one another (Hanneman & Riddle, 2005). By incorporating a multiple regression analysis, all five attribute variables are assessed in relation to the dependent variable at the same time. This allowed the value of how much an independent variable impacts the dependent variable to be calculated during the observation period.
CHAPTER FOUR
RESULTS

Network Descriptors

Aggregated Drug Seizure Network

The Aggregated Drug Seizure (ADS) Network consisted of 164 countries. While more than 100 different types of drugs were seized, approximately 70% of seizures captured in the ADS network involved cocaine or heroin derivatives. Network characteristics are provided in Table 5. The network included 696 unique ties, reflecting the number of relationships between countries reported within the observed period. Important to note that reflexive ties are not accounted for when observing unique ties. The observed ties accounted for directionality (reflected in the arrows), indicating whether a country was on the sending or receiving end. With an observed density of 73%, more than half of the countries involved in the ADS Network were connected to one another, indicating moderate cohesion (see Table 6). Metrics describing network size and structural properties were calculated with UCINET 61.

1 Using UCINET and NetDraw characteristics pertaining to a networks size and their structural properties were calculated. For information pertaining to a networks size, refer to Table 5. For information pertaining to a networks structure, refer to Table 6. Size and structural information is provided for all three networks to better understand them. Using UCINET and NetDraw characteristics pertaining to a networks size and their structural properties were calculated. For information pertaining to a networks size, refer to Table 5. For information pertaining to a networks structure, refer to Table 5. Size and structural information is provided for all three networks to better understand them.
Table 5. Characteristics of Networks Generated

<table>
<thead>
<tr>
<th>Network Type</th>
<th>Total Ties</th>
<th>Unique Ties</th>
<th>Actors</th>
<th>Components</th>
<th>Actors’ Main Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregated Drug Seizure Network</td>
<td>26732</td>
<td>696</td>
<td>164</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Cocaine Drug Seizure Network</td>
<td>10920</td>
<td>291</td>
<td>105</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Heroin Drug Seizure Network</td>
<td>7656</td>
<td>151</td>
<td>87</td>
<td>3</td>
<td>86.4%</td>
</tr>
</tbody>
</table>

Table 6. Descriptive Statistics of Networks Generated

<table>
<thead>
<tr>
<th>Network Type</th>
<th>Density</th>
<th>Average Out/In Degree (SD)</th>
<th>Normed Average Out/In Degree (SD)</th>
<th>Out/In Degree Centralization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregated Drug Seizure Network</td>
<td>73.5%</td>
<td>119 (379.03) / 119 (687.34)</td>
<td>0.02 (0.08) / 0.02 (0.14)</td>
<td>0.62% / 1.25%</td>
</tr>
<tr>
<td>Cocaine Drug Seizure Network</td>
<td>51.1%</td>
<td>53 (217.20) / 53 (307.94)</td>
<td>0.06 (0.23) / 0.06 (0.32)</td>
<td>1.69% / 3.04</td>
</tr>
<tr>
<td>Heroin Drug Seizure Network</td>
<td>11.2%</td>
<td>9.73 (28.16) / 9.73 (24.69)</td>
<td>0.13 (0.37) / 0.13 (0.32)</td>
<td>2.86% / 1.59%</td>
</tr>
</tbody>
</table>

The aggregated network is illustrated in Figure 6. Each node (circular figures) in the network represent countries involved in the transshipment of illicit drugs, and the ties linking them represent a relationship between any two countries. All colored nodes represent countries classed as transit states; those in yellow represent countries identified to operate in the top ten percent.
Cocaine Network

The Cocaine Drug Seizure (CDS) Network consisted of 104 countries and made up 41% of all reported drug seizures during the selected time frame. Descriptive statistics are provided in Table 5 above, and the network is illustrated in Figure 7. All colored nodes represent countries classed as transit states; those in yellow represent countries identified to operate in the top ten percent. The network captures 291 unique ties, reflecting the number of observed relationships between countries included. With an observed density of 51%,
more than half of the countries involved in the CDS Network were connected to one another, indicating weak to moderate cohesion (see Table 6). Important to note that reflexive ties are not accounted for when observing unique ties.

Figure 7. Cocaine Drug Seizure Network 2013-2016

Heroin Network

The Heroin Drug Seizure (HDS) Network consisted of 87 countries, with unique 151 ties spread amongst three components. The HDS network made up 29% of all reported drug seizures during the selected time frame. Important to note that reflexive ties are not accounted for when observing unique ties. All
colored nodes represent countries classed as transit states; those in yellow represent countries identified to operate in the top ten percent. Descriptive statistics are provided in Table 5 above, and the network is illustrated in Figure 8. Component one, the smallest, consisted of two countries, capturing a single tie. Component two, the second smallest, consisted of nine countries, capturing eight ties. While component three, the largest and main component, consisted of 76 countries and captures unique 142 ties. With an observed density of 11%, only a few countries involved in the HDS Network were connected to one another, indicating weak cohesion (see Table 6).
Combination of Social Network Analysis (SNA) Metrics

The combination of SNA metrics led to the designation of 62 countries as transit states within the ADS network, 27 countries in the CDS network, and 25 countries in the HDS network (refer to Table 7). Spain headed the AGS and CDS networks, falling in second in the HDS network. Pakistan, which is classed as a transit state the AGS top ten percent and in the overall CDS network, headed the HDS network. Austria, India, Italy, and Spain were observed in the top ten percent as transit states across all three networks. For the ranking of the top ten
percent countries classed as transit states refer to Table 8. Nine countries were observed to overlap across the three networks as transit states (countries italicized in Table 7).

<table>
<thead>
<tr>
<th>Aggregated Network (n=62)</th>
<th>Cocaine Network (n=27)</th>
<th>Heroin Network (n=25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>Macedonia</td>
<td>Austria</td>
</tr>
<tr>
<td>Austria</td>
<td>Malaysia</td>
<td>Colombia</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>Malta</td>
<td>Cuba</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>Mexico</td>
<td>Czech Republic</td>
</tr>
<tr>
<td>Belgium</td>
<td>Montenegro</td>
<td>Dominican Republic</td>
</tr>
<tr>
<td>Benin</td>
<td>Morocco</td>
<td>Ecuador</td>
</tr>
<tr>
<td>Bosnia &amp; Herzegovina</td>
<td>Myanmar</td>
<td>El Salvador</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Nigeria</td>
<td>Germany</td>
</tr>
<tr>
<td>Colombia</td>
<td>Pakistan</td>
<td>Ghana</td>
</tr>
<tr>
<td>Croatia</td>
<td>Paraguay</td>
<td>India</td>
</tr>
<tr>
<td>Cuba</td>
<td>Peru</td>
<td>Hungary</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Philippines</td>
<td>Latvia</td>
</tr>
<tr>
<td>Ecuador</td>
<td>Portugal</td>
<td>Lithuania</td>
</tr>
<tr>
<td>Egypt</td>
<td>Romania</td>
<td>Mexico</td>
</tr>
<tr>
<td>El Salvador</td>
<td>Russia</td>
<td>Morocco</td>
</tr>
<tr>
<td>Finland</td>
<td>Slovakia</td>
<td>Nigeria</td>
</tr>
<tr>
<td>Georgia</td>
<td>Slovenia</td>
<td>Pakistan</td>
</tr>
<tr>
<td>Germany</td>
<td>South Africa</td>
<td>Peru</td>
</tr>
<tr>
<td>Ghana</td>
<td>South Korea</td>
<td>Philippines</td>
</tr>
<tr>
<td>Greece</td>
<td>Spain</td>
<td>Portugal</td>
</tr>
<tr>
<td>Hungary</td>
<td>Tajikistan</td>
<td>Romania</td>
</tr>
<tr>
<td>India</td>
<td>Tanzania</td>
<td>Slovakia</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Thailand</td>
<td>South Africa</td>
</tr>
<tr>
<td>Iran</td>
<td>Trinidad &amp; Tobago</td>
<td>Spanish</td>
</tr>
<tr>
<td>Italy</td>
<td>United Arab Emirates</td>
<td>Tajikistan</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>United Kingdom</td>
<td>Tanzania</td>
</tr>
<tr>
<td>Laos</td>
<td>Uzbekistan</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>Latvia</td>
<td>Venezuela</td>
<td>Zimbabwe</td>
</tr>
<tr>
<td>Lithuania</td>
<td>Zambia</td>
<td>Venezuela</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>Zimbabwe</td>
<td></td>
</tr>
<tr>
<td>Macau</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Italicized countries are present as transit states across the three networks generated.
Table 8. Top Ten Percent Transit States by Network Type

<table>
<thead>
<tr>
<th>Aggregated Network</th>
<th>Cocaine Network</th>
<th>Heroin Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Spain</td>
<td>1. Spain</td>
<td>1. Pakistan</td>
</tr>
<tr>
<td>2. Ecuador</td>
<td>2. Ecuador</td>
<td>2. Spain</td>
</tr>
<tr>
<td>3. Colombia</td>
<td>3. Colombia</td>
<td>3. Austria</td>
</tr>
<tr>
<td>4. India</td>
<td>4. Romania</td>
<td>4. Italy</td>
</tr>
<tr>
<td>5. Portugal</td>
<td>5. Dominican Republic</td>
<td>5. Bulgaria</td>
</tr>
<tr>
<td>6. Morocco</td>
<td>6. Austria</td>
<td>6. India</td>
</tr>
<tr>
<td>8. Thailand</td>
<td>8. Italy</td>
<td>8. Germany</td>
</tr>
<tr>
<td>10. Latvia</td>
<td>10. Philippines</td>
<td>11. India</td>
</tr>
<tr>
<td>11. Italy</td>
<td>11. India</td>
<td>12. Pakistan</td>
</tr>
</tbody>
</table>

*Note: Italicized countries are present as transit states operating in the top ten percent across the three networks generated.*

Inter-item Correlations

Prior to running a Quadratic Assignment Procedure (QAP) a diagnostic check was conducted on independent attribute variables to identify if any were correlate highly with one another. No variables were found to highly correlate with one another (refer to Table 9).
Table 9. Similarities Check Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Migrant Population</th>
<th>Border Connectivity</th>
<th>Drug Price Mark-Up</th>
<th>Perceived Corruption</th>
<th>Control of Corruption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migrant Population</td>
<td>1</td>
<td>-0.279</td>
<td>0.079</td>
<td>-0.280</td>
<td>-0.422</td>
</tr>
<tr>
<td>Border Connectivity</td>
<td>-0.279</td>
<td>1</td>
<td>-0.143</td>
<td>0.228</td>
<td>0.392</td>
</tr>
<tr>
<td>Drug Price Mark-Up</td>
<td>0.079</td>
<td>-0.143</td>
<td>1</td>
<td>-0.049</td>
<td>-0.056</td>
</tr>
<tr>
<td>Perceived Corruption</td>
<td>-0.280</td>
<td>0.228</td>
<td>-0.049</td>
<td>1</td>
<td>0.544</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>-0.422</td>
<td>0.392</td>
<td>-0.056</td>
<td>0.544</td>
<td>1</td>
</tr>
</tbody>
</table>

Quadratic Assignment Procedure (QAP)

Table 10 reports the results of three QAP regression models. The first model focuses on the aggregated drug network, the second model focuses on the cocaine drug network, and the third model focuses on the heroin drug network. Regression coefficients computed were based on 10,000 permutations reflecting potential outcomes.

Model fit varied. The explanatory variables accounted for 24% of variance in the dependent variable when looking at the ADS network. That percentage dropped to 20% when looking at the HDS network, and then to 12% when looking at the CDS network. Despite the low r squared coefficients, significant results were obtained. QAP outputs identified three of the five variables significant as to varying degrees (refer to Table 10).
Migrant Population Percentage

A negative relationship is observed between a country’s migrant population percentage and their likeliness of being classed as a transit state (refer to Table 10). This means that nations with a higher percentage of migrants were less likely to be among the most central transit nations in the drug distribution network, as revealed by seizure data. Failing to achieve significance at a p<.05 level, it was not possible to reject a null hypothesis.

Notably, the relationship approached significance for the cocaine network, suggesting that countries involved in the transshipment of cocaine do not have large migrant populations. When observing the heroin network, the relationship once again failed to achieve significance, and it was not possible to reject the null hypothesis.
### Table 10. Quadratic Assignment Procedure Regression Models for Transit Country Designation

<table>
<thead>
<tr>
<th>Variables</th>
<th>Aggregated Network</th>
<th>Cocaine Network</th>
<th>Heroin Network</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta</td>
<td>SE</td>
<td>P. Sig</td>
</tr>
<tr>
<td>Cocaine Price Mark-up %</td>
<td>-0.150</td>
<td>0.004</td>
<td>0.016</td>
</tr>
<tr>
<td>Heroin Price Mark-up %</td>
<td>-0.101</td>
<td>0.004</td>
<td>0.112</td>
</tr>
<tr>
<td>Perception of Corruption</td>
<td>0.390</td>
<td>0.008</td>
<td>0.000</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>0.266</td>
<td>0.079</td>
<td>0.028</td>
</tr>
<tr>
<td>Border Connectivity</td>
<td>0.321</td>
<td>0.028</td>
<td>0.000</td>
</tr>
<tr>
<td>Migrant Population %</td>
<td>-0.103</td>
<td>0.004</td>
<td>0.115</td>
</tr>
<tr>
<td>Overall Regression Fit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>235</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Adj. R-square</td>
<td>0.241</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Prob. &gt; F</td>
<td>0.000</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**Drug Price Mark-up**

A negative relationship is observed between a country’s drug price markup and their likeliness of being classed as a transit state (refer to Table 10). Based on the results, it can be inferred that countries with lower drug price markups are likely to be central to the transshipment of illicit drugs. When observing the ADS network, only the relationship between cocaine drug mark-ups achieved
significance. However, the relationship achieved significance at a p.<.05 for the CDS and HDS networks. Therefore, the null hypothesis was rejected.

**Corruption**

Two modes of corruption were used to assess corruption is a marker of countries embedded in the transshipment of illicit drugs—the level of perceived corruption and the level of perceived control of corruption. When assessing corruption through the level of perceived corruption in a country, a positive relationship is observed (refer to Table 10). Based on this measure, it appears that countries exhibiting higher levels of corruption are likely to be central to the transshipment of illicit drugs. A positive relationship is also found when assessing corruption through the level of perceived control of corruption in a country (refer to Table 10). By this measure, countries identified as having higher levels of corruption, due to their lower levels of perceived control of corruption, are likely to be central to the transshipment of illicit drugs.

The relationship between both measures achieved significance at a p.<.05 in the ADS network. Thus, leading us to reject the null hypothesis. Corruption appears to have limited influence with potential transit states in the CDS network, as both measures failed to achieve significance. When looking at the HDS network, only the level of perceived corruption achieved significance at a p.<.05 level.
**Border Connectivity**

A positive relationship is found between a country’s border connectivity and their likelihood of being classed as a transit state (refer to Table 10). Based on the results, it can be inferred that countries embedded in the transshipment of illicit drugs are marked as having high border connectivity. Meaning the more borders a country shares with other countries, the likelier it is to operate as a transit state.

This relationship achieved significance at a p<.05 across all three networks and is the only variable with such an effect. As a result, the null hypothesis is rejected. Of the five attributes, border connectivity is found to have the most influence on whether a country is to operate as a transit state, making it the most important marker.
CHAPTER FIVE
DISCUSSION

This study investigated the importance social, geographic, economic, and political factors that have the potential of serving as predictive markers for identifying transits states already embedded in international drug trafficking. In analyzing drug seizure data reported to the United Nations Office on Drugs and Crime (UNODC) this study mapped and compared countries central to the transshipment of illicit drugs generally, and more specifically, heroin and cocaine. Doing so allowed a test of five possible facilitating factors—migrant population in a country, border connectivity, drug price mark-ups, and corruption—that might account for countries centrally positioned within illicit trade networks. While the explanatory variables did not account for all the variance in the dependent variable, it did account for a significant amount. The findings confirm that transit states do share similar characteristics—even if to varying degrees, which can also serve as identifying markers.

Main Findings

This study posed six hypotheses predicting how a country’s migrant population, their border connectivity, drug price mark-up observed, and perceived level of corruption would be associated with being positioned as a central actor for the transshipment of illicit drugs. Mapping drug seizures reported to the
United Nations Office of Drugs and Crime between 2013 and 2016 resulted in the following conclusions.

**Hypothesis 1**

Corruption was present in countries operating as transit states and served as a significant predictive marker for identifying them. Thus, confirming the first hypothesis—the higher the degree of corruption in a country, the more likely it is to be a transit state. This finding is consistent with prior research focusing on the European region and South East Asia (Trumbore & Woo, 2014; Emmers, 2003).

Prior research has also observed the role of corruption in countries like El Salvador, Tajikistan, and Ukraine, where its presence led to the targeting of these countries to function as transit states (Miraglia et al., 2012; Layne et al., 2001). Countries exhibiting higher levels of corruption offer drug traffickers more security at a lesser price, contributing to why such countries are sought for the transshipment of illicit narcotics (Caulkins, 2009).

**Hypothesis 2**

High border connectivity was present in countries operating as transit states and served as a significant predictive marker for identifying them. Therefore, countries with numerous shared borders are more likely to function as transit states embedded in international drug trafficking. This finding confirms the second hypothesis—transit states have more border connectivity in comparison to countries that are not transit states.
Academic literature supports the influence of high border connectivity, noting that it preserves costs associated with risks and transportation (Boivin, 2014). The value of a country’s high border connectivity is observed in Turkey, where its vast region enables individuals to trek a great distance without running into institutional controls (Ekici & Ozbay, 2013; Toktas & Selimoglu, 2012).

**Hypothesis 3**

The migrant population percentage did not influence whether a country operated as a transit state. Therefore, the influence of migrant population percentage was not observed as a significant identifying marker for transit states embedded in international drug trafficking. While it was hypothesized that—transit states have larger migrant populations in comparison to countries that are not transit states—a determination was not possible due to lack of significant results.

Despite this finding, a study done by Sands (2007) found that large migrant populations in a given country do facilitate the presence of illicit organized crime, particularly Spain. The presence of ethnic enclaves and communities across various countries are noted to work as facilitating factors, being that they reduce risk itself and price associated to risk (Berlusconi et al., 2017; Giommoni et al., 2017; Toktas & Selimoglu, 2012; Sabatelle, 2011; Caulkins, 2009). Lack of support for the migrant population percentage in the study may be due to the variable simply focusing on the size of a community rather than the strength of ties shared.
Hypothesis 4

Drug price mark-ups influence whether a country is to operate as a transit state. The selling price of an illicit product represents the ease at which it moves across any given network (Reuter & Kleiman, 1989). The study observed drug price mark-ups as a significant identifying marker for identifying transit states. The finding confirms the fourth hypothesis—transit states have lower mark-up percentages in comparison to countries that are not transit states.

The higher the risk, the higher the drug price mark-up to account for the price of risk involved, reducing the economic return for those involved (Boivin, 2013, 2014). These results suggest that there is less of a drug price mark-up in countries operating as transit states, which may suggest that the risk of seizure or apprehension is minimal (Boivin, 2014). The influence of drug price mark-up cost, however, is not relevant to transit states involved in the transshipment of heroin products. Giommoni et al. (2017) note how, when observing the transshipment of heroin, various countries are involved, increasing the size of the heroin drug market and reducing the effect of the cost associated. It is plausible that other factors relating to risk influence of drug price mark-ups, such as market size or consumption rates in a given country.

Hypothesis 5

While corruption serves as a significant marker for identifying transit states embedded in international trafficking, it is not the most important. Border connectivity, unlike corruption, proved significant across all three networks
generated, making it the most significant marker, and corruption the second. While it was hypothesized that corruption would be the most significant identifying marker of transit state designation, the study failed to confirm the hypothesis.

While academic literature discusses and identifies corruption more widely as a facilitating factor (Maftei, 2012; Wyler & Cook, 2011), the present study found the impact of border connectivity to be more pronounced. The data revealed that the more shared borders a country had, the likelier is to act as a transit state, in relation to the level of corruption taking place within that country’s borders. This makes sense, as countries with higher border connectivity are likelier to suffer from weak or inefficient border control, making them the ideal transit state as they literally bridge multiple countries to one another. A country with numerous borders is not limited by the will of single individual, and offers more than one entry and exit point. A corrupt country offers an illicit drug a way in, but not necessarily a way out, while a country with numerous borders offers both advantages.

**Hypothesis 6**

Different countries were found to operate as transit states across each of the drug networks generated. Great differences were noted in the top ten percent of countries operating as transit states. While it was hypothesized that—the same countries will be positioned as transit states within the illicit drug
transshipment network irrespective of illicit drug examined (e.g., heroin, cocaine)—the study was unable to confirm the hypothesis.

In reducing the number of drug types captured in a network, the number of potential countries involved was also reduced. Differences in countries identified as transit states can be attributed to differences in the significance of the selected attribute variables across each of the networks. The majority of cocaine-based products are produced in Colombia, Peru, and Bolivia—all of which are in South America (Global Financial Integrity, 2017). Roughly 50 countries are involved in the production of opium-based products, with Afghanistan producing roughly 70% of the available product (Global Financial Integrity, 2017). Unlike cocaine, opium is produced in numerous regions (the Middle East, Asia, Latin America), involving more countries in the transshipment of the product.

Implications

The transshipment of illicit drugs, despite being a small part of the drug-market commodity chain, is an important aspect deserving of attention. By observing the avenues in which illicit drugs are trafficked, it is possible to understand why those particular avenues are selected and how to disrupt drug flow. This study not only reveals how certain characteristics heighten the likeliness of a given country to function as a transit state but also sheds light on the lack of efficient reporting practices that hinder these types of observations.
In using data from the United Nations Office on Drugs and Crime it was revealed how certain countries appear to report more than others. It is possible that countries like Spain are identified as crucial actors in transshipment operations due to their high reporting. However, Spain’s level of reporting, and the lack of reporting by other major suspected transit states may heighten the role played by Spain and other nations with strong reporting practices.

Incentivizing or mounting collaborative efforts to strengthen border screening capabilities would improve the identification of illicit drug shipments. In addition, administrative support may be needed to enhance the capacity to accurately report the results of drug interdiction efforts.

High border connectivity, high perceived corruption, and low drug price mark-ups are all significant markers for identifying countries that are operating as central transit states, or with the potential to do so. Of the three, border connectivity is the most influential identifying marker. Countries with high border connectivity often have more traffic and are less able to provide adequate resources to all their border entry points, inadvertently making it easier to smuggle illicit goods (Trumbore & Woo, 2014; Ekici & Ozbay, 2013; Toktas & Selimoglu, 2012). Therefore, efforts aimed to aid countries as it relates to them operating as transit states should focus on strengthening controls at their borders. Doing so will minimize both entry and exit points provided by any given country, increasing risk and the price of risk for those involved in the transshipment of any type of illicit good.
Furthermore, depending on the type of drug product being trafficked, different countries operate as key players and transit states. However, there were a few countries present across the three networks. Of those in the top ten percent, the study observed three countries operating as transit states, regardless of the drug type involved—Spain, Austria, and Italy. Efforts to curb participation in the transshipment of illicit drugs would benefit from zoning in on countries, such as these, and identifying why involvement for some countries is not limited by drug type.

Limitations

It is important to acknowledge that several limitations arose throughout the course of this study. Some of which could influence conclusions made. Of note, the primary data source used for this study contains information that is provided on a voluntary basis. Agencies reporting seizures do so because they want to, and information they report is not fact-checked. As a result, certain countries were more represented in the drug seizure networks since they were avid reporters.

Furthermore, a country in which a seizure took place is only present in networks generated if the sending country is known. Countries, like Afghanistan, despite a seizure having taken place there are not present in the study, as all the seizure data linked to Afghanistan did not provide information on who sent a
shipment. It is important to acknowledge that results of this study may not be truly representative, being that some major transit states did not appear.

Lastly, another limitation pertains to why significance was not achieved for the migrant population variable. While it was the goal to obtain more information on the origin of migrant populations in any given country, data available was severely limited. Therefore, the variable of migrant population as coded in this study captured more the size of a migrant population than its strength of attachment to any given country.

Future Research

Future research relating to countries involved in the transshipment of illicit drugs can benefit from the following suggestions. First, future research will benefit by incorporating various sources into their data to map international drug flow. Network generation based on data derived from a single source runs a risk that the network is not comprehensive. Thus, affecting the identification of key actors and structural properties. Many studies have relied on the United Nations Office on Drugs and Crime. However, the data sets available are limiting, as the information provided is incomplete. The integration of various sources to generate and map a network of international drug flow would enable a wider scope of analysis to take place, as more countries would be included.

Additionally, future research will benefit from incorporating different variables from the ones applied in this study. While it is known that transit states
share similar characteristics, there is still debate to the degree that some of them influence their participation across transshipment operations. Future research would benefit from better operationalizing variables under observation, and by controlling for variables that relate to political, social, geographic, and economic factors. Such as, controlling for the influence of port flow and openness, while assessing border connectivity. Perhaps even controlling for the rate at which money is laundered in a country while assessing economic driving factors and even corruption.

Even by assessing variables already observed in the literature but from different angles would benefit future research. This study observed migrant population by overall size rather than strength. Future research will benefit by assessing the origin of migrant flow and seeing how that impacts drug flow. Furthermore, this study focused on overall border connectivity. However, future research will benefit by assessing the quality of borders shared between countries—taking into account the costal lines of a country and how that may impact a country’s role as a transit state.

Future research will also benefit from evaluating drug flow by observing the flow of different drug types, not just cocaine and heroin. This study revealed how significance of variables varies by drug type, therefore, future research should look how the influences of certain variables vary by drug type under observation and why. It is likely that by observing the influence of certain variables across distinct drug type networks (i.e. hallucinogens,
methamphetamines, cannabis) researchers will gain a better understanding of which factors are most important. Expanding focus can potentially lead to the identification of new factors never even considered in the literature.

It is important to note that while this study looked at variables influenced by risk and the cost of risk in any given country, it did not actually measure risk. Future studies will benefit from accounting for the level of risk, as it may help to better understand attribute variables and their influence. Risk can be accounted for the rate at which seizures take place in a given country, the number of drug busts operations, or the rate of conviction rates relating to drug trafficking charges.

Lastly, future research will also benefit by incorporating a longitudinal design into their studies. Literature pertaining to drug flow and international drug trafficking is limited to static models. Data derived from longitudinal studies can lead to more accurate methods to combat international drug trafficking as it identifies potential trends and patterns. Furthermore, in observing drug flow networks annually over a prolonged period enables researchers to attach changes in a network to external changes occurring in the year of observation, like policy changes or major drug busts. Overall, observing international drug trafficking as a whole from a longitudinal perspective poses the ability to identify temporal order of trends, that otherwise would not have been seen.
REFERENCES


