UNIVERSITÁ CATTOLICA DEL SACRO CUORE

MILANO

Dottorato di ricerca in Criminologia

Ciclo XXIX

S.S.D: SPS/12

Shrinking businesses and expanding graveyards: how fluctuations in the value of cocaine markets influence the recourse to lethal violence

Tesi di Dottorato di: Alberto Aziani

Matricola: 4 2 1 2 2 2 7

Anno Accademico 2015/2016

Cycle XXIX

Shrinking businesses and expanding graveyards: how fluctuations in the value of cocaine markets influence the recourse to lethal violence

Ph.D. Thesis

Alberto Aziani

Academic Year 2015/2016

Abstract

Many scholars have investigated the escalation of violence associated with drug trafficking. Despite the plethora of literature, limited attention has been paid to the consequences of fluctuations in the value of markets. This study addresses this lacuna in extant research by proposing an original estimate of the gross value added of cocaine markets in 151 countries between the period 1998-2013, taking into consideration both national and international dimensions of cocaine trafficking through recourse to a flow/network approach. In conjunction with this, the fluctuation of the gross value added of the cocaine market is examined in terms of an etiological factor in the upsurge of interpersonal lethal violence. The analysis demonstrates how expansions and contractions of the gross value added in cocaine markets are significant determinants of the level of violence within the respective countries that constitute the global cocaine network. Finally, through mobilising innovative methods for estimating drug law enforcement actions, the study problematizes extant methods for disrupting drug trafficking on the basis that they may, paradoxically, engender cycles of violence.

Table of Contents

List of Tables

List of Figures

Acknowledgments

I would like to express my sincere gratitude to my advisor Prof. Francesco Calderoni for the continuous support of my Ph.D study and related research, for his patience, motivation, and precious advices on both research as well as on my career. His guidance and teaching helped me in all the time of research and writing of this thesis.

Besides my advisor, I would like to express my special appreciation to Prof. Ernesto U. Savona for encouraging my studies and for allowing me to grow as a research scientist at Transcrime.

My sincere thanks also go to Prof. Mark A.R. Kleiman, who provided me an opportunity to join the NYU Marron Institute as visiting scholar. The time spent there has been inspiring and fruitful for the development of this research.

I thank all my colleagues and ex-colleagues at Transcrime, especially Giulia Berlusconi, Serena Favarin, and Luca Giommoni for the stimulating discussions, for their insightful points of view, and for all the fun we have had in these years.

I gratefully acknowledge the two anonymous reviewers for their valuable comments on the draft version of my thesis and for their precious suggestions. They guided me in the adoption of a more critical approach to my own research.

Introduction

Violence constitutes one of the primary concerns of communities across the world. High levels of violence within manifold countries stand as testament to the contemporary relevance of this problem. Given the prevalence of violence, it is perhaps unsurprising that scholars have sought to identify its determinants in an attempt to curtail it (Messner and Rosenfeld 1997). Due to its vaunted status as one of the determinants of violence, the drug market has taken centre stage within criminological debates since the 1980s onwards. In his seminal paper, Goldstein (1985) identifies three possible ways in which drugs and violence are related: psychopharmacological, economic compulsive, and systemic. The psychopharmacological model focuses on violence or victimization resulting from feelings of excitability and/or irrationality that may accompany drug use. The economic compulsive model posits that some drug users engage in economically oriented violent crime, to support their costly drug habit. The systemic dimension pertains to the modes of violence consistent with lifestyles and business methods oriented around drug distribution and trafficking (Goldstein 1985). Since the publication of Goldstein's tripartite conceptual framework the illegal drug trade has been identified as a key driver of violence, with a veritable host of scholars now investigating the drug/violence nexus applying this conceptual framework (Ousey and Lee 2002; 2007; Romero-Daza, Weeks, and Singer 2003; Johnson, Golub, and Dunlap 2005; Martin et al. 2009; Werb et al. 2011; Collins 2014; Dickinson 2014).

Over the proceeding decades, scholars have developed and expanded upon Goldstein's original model, identifying a further series of factors which help account for the high levels of violence concentrated within specific drug markets (MacCoun, Kilmer, and Reuter 2003). These key drivers of violence are: the lack of legal instruments to settle disputes (Caulkins and Reuter 1998; Chimeli and Soares 2011; Mejía and Restrepo 2013; Robles, Calderón, and Magaloni 2013); the perpetuation of retaliation (Bourgois 1995; Topalli, Wright, and Fornango 2002); interaction between drug traffickers and law enforcement agents (Benson, Leburn, and Rasmussen 2001; Guerrero 2011; Werb et al. 2011; Rios 2013; Prieger and Kulick 2014); strength of competition and organizational structure (Reuter 1983; Kleiman 1989; Decker, Katz, and Webb 2007; Costa Storti and De Grauwe 2008). These studies are of paramount importance for mapping the link between illegal drug trade and systemic violence, a relationship, moreover, which is of significant interest today both in the academic and political domain (Chi et al. 2013; Collins 2014; Dickinson 2014; Dell 2015; Reuter 2016). More generally, these studies provide a solid foundation from which to study the role of systemic violence in illicit markets (e.g., Kulick, Prieger, and Kleiman 2015).

Having said this, despite the aforesaid emergent research interest and body of literature, there is still a relative dearth of empirical literature analysing how economic aspects of drug trafficking

intersect with the recourse to interpersonal violence. The paucity of suitable data and the singular focus of scholars on enforcement actions are the principal reasons underpinning this gap in the literature (INCB 2002; Friesendorf 2005; Werb et al. 2011; Kilmer et al. 2014). Consequently, there is a need for research to develop rigorous models to verify how the recourse to violence is affected by economic drivers of illegal drug trade - especially from a cross-national perspective (Heinemann and Verner 2006; Snyder and Durán Martínez 2009; Werb et al. 2011; Mejía and Restrepo 2014).

The most severe consequence of drug related violence is, of course, death (Falk and Falk 1990; Hutson et al. 1995), but it is important to stress that it is not the sole consequence. That is, drug related violence also causes non-lethal physical harm (Holder et al. 2001), psychological disorders (Brewin, Andrews, and Valentine 2000), as well as reducing the quality of life of those who are forced to cope with the reduced sense of security (Koonings and Krujit 1999; Felbab-Brown 2009; Diaz-Cayeros et al. 2011). Moreover, drug trafficking related violence places a heavy burden on the health and criminal justice systems in many countries, not to mention undermining the democratic process in others (Gaviria 2000; Krug, Sharma, and Lozano 2000; Fajnzylber, Lederman, and Loayza 2002a; 2002b; Thoumi 2002; Gawryszewski and Rodrigues 2006; Felbab-Brown 2009). Due to the aforesaid grave consequences of drug related violence, understanding its root causes is not only intellectually enriching but also has important policy implications (Castillo, Mejía, and Restrepo 2014; Dickinson 2014). Furthermore, the necessity for definitive answers concerning how best to engender peacefully transformations in drug markets is made more pressing yet still by the breakdown of traditional instruments of drug control and law enforcement that are likely to modify drug markets competitive environments.

With such considerations in mind, this study aims to explore the defining characteristics of the relationship between drug trafficking and lethal violence, focusing, in particular, on the economic aspects of the cocaine market and its relationship with socio-cultural determinants of violence. More specifically, the analytical gaze is fixed upon whether fluctuations in the value added generated by cocaine trafficking have a positive association with levels of violence.

To achieve its manifold objectives, the study proposes an original estimate of the gross value added generated by cocaine trafficking, which is calculated as the sum of the monetary value of the cocaine trafficking net of the cost of goods sold at international-trafficking level, national distribution level and retail level. The methodology underpinning this estimate is predicated upon both insights from the drug/monetary flow approach to the study of drug markets (Paoli, Greenfield, and Reuter 2009; Walker and Unger 2009), and data generation techniques developed in the field of criminal network analysis (Boivin 2013; 2014b; Chandra and Barkell 2013; 2015; 2016).

The focus on cocaine trafficking is primarily driven by the exceptionally high levels of violence that characterise this market, above and beyond that of other notoriously violent markets such as the heroin market (Moore and Stuart 2005; Bean 2008; Reuter 2009; UNODC 2013d; 2016c). This idiosyncrasy of cocaine trafficking, allied with the fact that this illicit activity is especially prominent in the Western hemisphere where data collection tools are generally more sophisticated, represents two advantages when attempting to study the drug/violence nexus. First, data on cocaine, whilst still relatively scarce, is more readily available than the data on other psychoactive substances, such as illicit opiates or methamphetamine-type drugs. Second, given that violence is more prevalent in cocaine markets than its other illicit counterparts, identifying it should be more straightforward. Having said this, focusing on a market whose level of violence is atypical also raises issues in generalizing findings to other illicit markets. Similarly, its concentration within specific geographical regions introduces additional confounding factors, again cautioning against too readily projecting any findings onto those countries, such as Asian countries for example, where cocaine trafficking is less prevalent.

Due to the impossibility of conducting either a natural experiment or developing a quasi-experimental design, the study tests the relationship between the fluctuation in the value of cocaine markets, socio-cultural factors and violence through conducting a panel-data analysis of 63 countries spanning the duration of 1999 to 2013. Countries were selected in terms of the availability of data and characterize for significant differences in the level of violence; 17 of the respective countries are in the Americas, 10 in Asia, 34 in Europe, and 2 in Oceania. The proposed regression models rely on the use of the system GMM estimators developed by Blundell and Bond (1998). The potential advantage of this econometric technique is that it is effective in controlling for unobserved country specific effects. In addition, exploiting the dynamic properties of the data allows for the generation of proper instrumental variables, thus reducing any bias stemming from the potential joint endogeneity of the explanatory variables (Fajnzylber, Lederman, and Loayza 2002b; Greene 2011).

The record of the homicide rate in each year is regressed on different sets of variables describing drug markets and potential socio-cultural determinants of violence. The core explanatory variables are the variation of the gross value added generated in the cocaine markets, in conjunction with a variable specifically indicating a contraction in the value of the market. Drug market indicators also include the overall gross value added in a market, an original estimate of the interception rate of cocaine, the level of cocaine consumption in each country, and a control for the role of the country in the international trafficking network. The selection of the other independent variables emerged out of extant literature on structural theories of violence and cross-national studies on homicides. Specifically, the review of the literature led to the inclusion of the share of urban population, GDP per capita, a synthetic index of

probity and rule of law, police rate, infant mortality, and the demographics of the countries and other variables.

Overall, the analysis indicates that fluctuation in the value of cocaine markets serve as a plausible explanation for the increase in lethal violence across the sample of 63 countries. Notwithstanding the acknowledged limitations in the reliability of several underlying data and estimates, the study nevertheless provides clear empirical support for the argument that socio-cultural factors and specific economic dynamics of drug markets are key determinants of violence. Furthermore, and regardless of its specific empirical findings, this study strongly advocates for a greater investigation of the quantification and analysis of drug markets' economic dimensions as instruments through which to understand their functioning.

The thesis is organised as follows. Chapter I introduces the key criminological theories on interpersonal violence, with an especial focus on literature which examines the relationship between drug markets and violence. Chapter II provides a rationale for the methodological approach adopted in this study, along with a detailed description of the original approach utilised to estimate the gross value added generated in cocaine markets. Chapter III delineates the results of the econometric regressions developed to test the main hypothesis of the study. Chapter IV centres around a discussion of the main findings, as well as a reflection on the key strengths and limitations of the study. The final chapter consists of a rumination on the key conclusions emerging out of the study.

I Chapter: Studying the determinants of violence, with a focus on drugs

Both the extraordinary levels of violence, and the evolution in the nature of the violence within specific countries involved in drug trafficking necessitate a reconsideration and integration of classical structural theories and more contemporary explanations of violence. More specifically, curtailing systemic drug violence requires an understanding of how market dynamics, business cycles, and fluctuations in illicit profits influence the recourse to violence by drug traffickers. Theoretically and politically speaking, it is of critical importance to find an empirical evidence-base pertaining to how social-cultural explanations and economic dimensions of drug trafficking impact upon the escalation of violence.

To date, finding a suitable definition, a substantive point of differentiation, a socio-political assessment, and moral evaluation of violence are contentious issues (Krug et al. 2002; Imbusch 2003). The World Health Organization, the leading international organization on public health, defines violence as: "The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation" (WHO 1996, 4). This definition encompasses all of the key types of violence, as well as marking the broad range of acts of commission and omission that constitute violence and its consequences beyond death and injuries (Krug et al. 2002). Other authors have proposed different definitions; McLaughlin and Muncie (2001) for example, posit that violence involves any form of behaviour by an individual that intentionally threatens or causes physical, sexual or psychological harm to others or to him/herself, whereas Heinemann and Verner (2006) assert that violence is a heterogeneous phenomenon which takes multiple forms: homicides, robberies, kidnappings, muggings, assaults, domestic violence, sexual violence, violence against children and the elderly. Violence, of course, has been at the forefront of teleological, philosophical, social, psychological, criminological studies since the birth of these respective disciplines, a trend which continues today within criminological debates pertaining to documenting the consequences of violence, developing the most effective strategies to curtail it, and identifying its determinants (Imbusch 2003; Pridemore 2011).

Researchers have hitherto mobilised a variety of perspectives in order to understand the causes and consequences of violence, focusing on an exhaustive range of details and dynamics, and, in turn, utilising an extensive suite of methods of analysis. This study contributes to this field of research by

specifically investigating the relationship between the economic aspects of cocaine markets and violence.

I.1 Differences in violence level

Although serious forms of violence are relatively rare in most societies (Gartner 1993), the severity of violence does vary tremendously across countries (Falk and Falk 1990; Land, McCall, and Cohen 1990; Miron 2001; Dills, Miron, and Summers 2010). The global distribution of homicide rates demonstrates that few countries have very high homicide rates, whereas most countries have a relatively low level of homicides (Cole and Gramajo 2009). Even in the case of Latin America, where violence levels are pronounced, there are marked differences in terms of violence rates between countries (Briceño-León, Villaveces, and Concha-Eastman 2008), which is consistent with previous findings about cross-national differences between neighbouring countries in other areas of the world (Gartner 1990). For instance, during the period 1950-1980, homicide rates were roughly four times higher in the United States than in Canada, three times higher in Norway than in Finland, 50% higher in Italy than in Switzerland, and 40% higher in Australia than in New Zealand (Gartner 1990, 92). These aforesaid differences in violence levels are yet more pronounced when the comparison is extended to a more heterogeneous sample of nations at different stages of economic development (Cole and Gramajo 2009; UNODC 2014b). For example, several countries in Southern Africa and Central America have homicide rates that are over four times higher than the global average of 6.2 homicides per 100,000 inhabitants, whereas, contrastingly, Western and Southern European countries and Eastern Asian countries have, on average, homicide rates five times lower than the global average (UNODC 2014b; Otieno et al. 2015). In many cases these differences have persisted over extended periods of time, which suggests there are structural differences in the determinants of violence across countries (Miron 2001).

Research has also demonstrated that violence fluctuates across history (Falk and Falk 1990; Land, McCall, and Cohen 1990; Liska and Bellair 1995; Eisner 2001; Eisner 2003). While violence has been omnipresent throughout human history, there has been significant variation in the extent of violence in any society at any given historical juncture (Eisner 2013). Violence has been in decline the course of the last several centuries in western societies, but both the beginning of the 19th century and the close of the 20th bore witness to short lasting upsurge of violence (Gurr 1981; Gartner 1990; Eisner 2001; Eisner 2003). This trend decreased as part of a more general reduction in crime in western society (Van Dijk, Tseloni, and Farrell 2012). In the US, for example, homicide rates decreased between the 1930s and the 1950s, substantially increased in the 1960s and early 1970s, peaked in the 1980s before dramatically declining in the 1990s (Blumstein and Wallman 2000; Dills, Miron, and Summers 2010).

In Mexico, historical data illustrates that homicide generally declined from the 1930s up to the latter half of the 2000s when the level of violence dramatically increased, due, in part, to changes in the structure of drug trafficking (Escalante Gonzalbo 2009; Dell 2012; Rios 2013; Heinle, Molzahn, and Shirk 2015). Mutatis mutandis for Colombia in the second half of the 1980s, when the country had notably high homicide rates (Martínez Ortiz 2001).

Researchers have also documented important fluctuations in violence rates across different socio-cultural contexts. For example, Japanese youths in the 2000s committed a tenth of the homicides of their counterparts in the 1950s (Johnson 2008). Further, Indian homicide rates declined by around a fourth during the period 1995 to 2010, while Pakistan and Nepal have both witnessed a marginal increase in their homicide rates between the same period (UNODC 2011b). As one would expect, such violence has profound repercussions on individuals and societies; consequently, innumerable researchers have attempted to understand why violence varies across time and space in the hopes of curtailing it (Beirne 1993; Messner and Rosenfeld 1997; Pinker 2011).

More specifically, the relationship between drug markets and violence has emerged as a recurring issue for social scientists, policymakers, and informed citizens, with illegal drug trade, in turn, coming to be seen as a crucial determinant of violent crimes such as murder. Whilst this is especially pertinent in developing countries such as Honduras, it is also a major issue for several developed countries (Latin American Commission on Drugs and Democracy 2009; Briceño-León, Villaveces, and Concha-Eastman 2008; UNODC 2016c).

I.2 Criminological theories of violence

Attempts to explain the difference in rates of violence between countries are as old as the very discipline of the sociology of crime itself (Messner and Rosenfeld 1997, 1393). Indeed, the seminal work of Quételet (1831) and Guerry (1833), which attempted to measure national differences in the level of violence, can be viewed as the prototype for future scientific criminological inquiry (Beirne 1993; Messner and Rosenfeld 1997). Of course, sociologists and criminologists have substantially advanced etiologic theories on violence since these ground breaking works. Whilst initially scholars focused upon biological explanations (Lombroso 1876; Ferri 1900), individual traits (Allport 1937; Cattell 1943), and psychological frameworks (Goring 1918), theories about the causes of violence gradually shifted towards more social-environmental arguments (Gelles and Levine 1999).

This section provides a précis of theories about the determinants of violence and homicide. The selected studies are organized into three subsections. The first subsection delineates the main theoretical frameworks which help us understand the drug/violence relationship. The second subsection centres on empirical studies which, firstly, examine the specific impact of the value of

cocaine markets on levels of violence, and, secondly, provide estimates about the value of cocaine markets. The third subsection provides an overview of the most prominent twentieth century structural theories, and evaluates their effectiveness for studying violence in the context of this research. Reviewing the key theoretical literature on structural violence is crucial in several respects: it allows for a deeper comprehension of the phenomenon; it helps identify lacunas in extant knowledge on the topic; and, with regards to grounded theory, it provides the key variables which inform the empirical study of the phenomenon.

I.2.1 Drug and violence

Drug is a signifier which has different meanings in medicine, pharmacology, criminology, as well as in the context of international drug control. The Oxford Dictionary (2016) defines a drug as: "A medicine or other substance which has a physiological effect when ingested or otherwise introduced into the body". Kleiman, Caulkins, and Hawken (2011), although setting out from a similarly pharmacological definition (i.e., "A drug is a chemical that influences biological function other than by providing nutrition or hydration"), propose an additional series of definitions useful for their investigation of drug policies. Most notably, they suggest that drugs which influence mental functions be labelled as psychoactive drugs or psychoactive substances (Kleiman, Caulkins, and Hawken 2011).

Abusable psychoactive drugs are a subcategory of psychoactive drugs, whose pleasurable effects can lead to people using them for recreational purposes as opposed to medicinal purposes (Kleiman, Caulkins, and Hawken 2011). Similarly, Nash (1992), in his *Dictionary of Crime*, defines a drug as "any often-abused substance that is primarily used for medical purposes". Alcohol, amphetamines, cannabis, caffeine, cocaine, entactogen (e.g., MDMA-ecstasy) methamphetamine and other stimulants, phencyclidine (PCP), LSD and other hallucinogens, inhalants (e.g., paint thinners and glue), nicotine, opioids such as codeine and oxycodone, heroin, and sedatives, hypnotics and anxiolytics all fall under the category of abusable, and addictive, psychoactive drugs (Kleiman, Caulkins, and Hawken 2011; Parekh 2015).

Evidently, not all of these abusable psychoactive drugs are necessarily illegal; in fact, when produced, sold, or possessed under license, psychoactive substances are designated as controlled drugs (Laufer 2012). The United Nation Convention is the social institution that ultimately determines the conditions under which the trade of psychoactive substances can be considered as legal or illegal (Laufer 2012). Hence, when criminologists refer to drugs more often than not they are, in fact, referring to the specific subcategory of abusable psychoactive drugs, whose use and/or market is illicit. Indeed, Bean (2008), one of the few criminologists to expressly define drugs, adopts a drug control

perspective in his work *Drug and Crime*. In the context of international drug control, drugs refer to the manifold controlled substances as so defined under the United Nation Convention. However, Bean (2008) also notes that physicians have the diagnostic privilege to prescribe many of the psychoactive substances designated under the United Nation Convention to chronic drug addicts as part of maintenance programs.

In response to the complexity of the phenomenon, Bean (2008) proposes a pragmatic, though albeit tautological definition: drugs are that which are usually included in debates about drugs. This definition is not unlike the second Oxford Dictionary (2016) definition, which defines drugs as "[a] substance taken for its narcotic or stimulant effects, often illegally". For the purposes of this study, I will follow Bean's (2008) lead and designate drugs as being that which is ordinarily included in contemporary debates about drugs. I will refer to psychoactive substances as consubstantial with what Kleiman, Caulkins, and Hawken (2011) label as "abusable psychoactive drugs", an umbrella term which encompasses, among other things, alcohol.

Researchers, policy makers, and the general public have had a concerted interest in the drug and crime nexus since the turn of the 20th century (Fagan and Chin 1990); indeed, the notion that drugs and crime are related can be traced back to that period (McBride and McCoy 1993; Ousey and Lee 2002). In the United States, where the vast majority of the debate is concentrated, the works of the 1920s and 1930s were xenophobic and, at times, racist in character (cf. the articles by Anslinger (1937), the then U.S. commissioner for the Bureau of Narcotics). Drug consumption was characterised as a degrading habit, imported to the US, as well as being confined to, African-Americans, Mexicans, and Chinese communities (Inciardi 1991; McBride and McCoy 1993). What we could consider to be more scientific inquiries into the connection between psychoactive substances and violence only emerged in the 1960s, although at that time most researchers adopted an individualistic perspective on the link between psychoactive substances and violence. Notably, the physical or psychological effects of drug use, along with violence deriving from crimes committed by drug users looking to score drugs, were considered to be the primary drivers of the drug/violence nexus (De la Rosa, Lambert, and Gropper 1990; Ousey and Lee 2002). Alcohol was another key focus of scholars' attention during this period, while the analysis of other substances was still at an embryonic stage (De la Rosa, Lambert, and Gropper 1990).

During the 1980s and 1990s the interest in the relationship between psychoactive substances and violence grew exponentially (Brownstein, Crimmins, and Spunt 2000). The rise of violent crime and the concomitant spread of the crack epidemic during this period engendered an analytical shift away from alcohol towards crack cocaine and other psychoactive substances (De la Rosa, Lambert, and Gropper 1990; Reuter 2009). Scientific studies investigating the relationship between illicit drugs,

especially crack, and violence proliferated (De la Rosa, Lambert, and Gropper 1990; Fagan and Chin 1990; Inciardi, Horowitz, and Pottieger 1992; Johnson, Hamid, and Sanabria 1992; Fagan 1993; Whitehead, Peterson, and Kaljee 1994; Blumstein 1995; Brownstein 1996; Parker and Auerhahn 1998; Jacobs 1999b). The most extensive body of research literature on drugs and violence centred on the relationship between cocaine use and violence (Parker and Auerhahn 1998). For instance, in their review of literature on psychoactive substances and violence, Parker and Auerhahn (1998) found four articles with "cocaine" or "crack" in the title published during the seventies. By comparison, in the following decade the number rose to about 75, whilst the figure was almost 200 in the 1990s. This testifies to the fact that crime, and violence, in particular the fear of the two, had become a source of major public concern across the US, with the popular press and political establishment reiterating the link between them (Goldstein 1985; Blumstein 1995; Parker and Auerhahn 1998).

Hitherto, illicit drugs and alcohol have come to be considered as relevant determinants of levels of violence, especially in urban areas (McBride and McCoy 1982; Harwood et al. 1984; Goldstein 1985; Blumstein et al. 1986; Reuter and Kleiman 1986; Goldstein et al. 1990; Fagan and Chin 1990; Smith, et al. 1992; Fagan 1993; McBride and McCoy 1993; Roth 1994; Blumstein 1995; Blumstein and Rosenfeld 1998; Ousey 2000; Ousey and Lee 2002; Romero-Daza, Weeks, and Singer 2003; Ousey and Lee 2004; Johnson, Golub, and Dunlap 2005; McCall, Parker, and MacDonald 2008; Andreas and Wallman 2009; Martin et al. 2009; Reuter 2009; Rios and Shirk 2011; Werb et al. 2011; Calderón et al. 2012; Dell 2015). One corollary of researchers investigating the drugs-violence link was a marked shift in focus from conceptualising violence as an individual phenomenon connected to drug consumption to studying drug related violence as a phenomenon involving entire communities and as having social determinants (Goldstein et al. 1989; Blumstein 1995; Brownstein 1996; Jacobs 1999b). Consequently, socio-structural theories took on increased prominence as explanations for the drug/violence nexus (Brownstein, Crimmins, and Spunt 2000).

The emergent relevance accorded to this relationship has led to its positioning as a key dynamic in criminology (Dickinson 2014). Today, the devastating levels of drug related violence in Latin American countries is fuelling interest in the topic and serving as a key catalyst for the production of academic studies (e.g., Bagley and Rosen 2015; Caulkins 2015; Dell 2015; Kleiman et al. 2015; Osorio 2015; Calderón et al. 2015; Copes, Hochstetler, and Sandberg 2015; Cockayne and Walker 2015; Rivera 2016).

I.2.1.1 Goldstein's theoretical framework

One of the major contributions to the study of the relationship between drugs and violence comes from the work of Goldstein (1985), a sociologist at the University of Illinois, who developed a

conceptual framework through which to explain the complex relationship between violence and drugs. In his seminal paper exploring the link between illicit drugs and levels of violence in consuming countries, Goldstein (1985) identified three potential mechanisms in which drugs and violence are related: *psychopharmacological, economic compulsion,* and *systemic.* The psychopharmacological aspect of the model draws attention to the fact that the consumption of psychoactive substances may lead to excitation, paranoia, irritability, and violent impulses. The economic compulsion dimension refers to violent crimes committed by addicted users in order to obtain money or other forms of currency to purchase drugs. The systemic component concerns violence intrinsic to the lifestyles and business methods of drug distribution and trafficking (Goldstein 1985). Subsequent studies which have collected and analysed a multitude of data have shown that these three associations are characterised by profound complexity and nuance (MacCoun, Kilmer, and Reuter 2003). Among other factors, structural conditions, cultural imperatives, and situational contingencies are all important determinants of the complex interplay between drug and violence (Jacobs and Wright 2006; Dickinson 2014; Topalli and Wright 2014).

Since its publication, Goldstein's tripartite conceptual framework has influenced a plethora of scholars investigating drug related violence, including Fagan (1990), Fagan and Chin (1990), De la Rosa, Lambert, and Gropper (1990), Johnson et al. (1990), Goldstein, Brownstein, and Ryan (1992), Brownstein, Baxi, Goldstein, and Ryan (1992), Blumstein (1995), Shover (1996), Riley (1998), Reuter (2009), Kleiman et al. (2015), McGinty, Choksy, Dickinson (2016) to name but a few.

In recent years this framework has been augmented (Parker and Auerhahn 1998; Collins et al. 2006; Bennett and Holloway 2009). Specifically, researchers have added to it by taking into consideration less proximate causations: developmental (e.g., violence committed as a result of foetal exposure to drugs), inter-generational (e.g., violence committed by people whose life-course was detrimentally affected by parental incarceration), and environmental (e.g., violence caused by people who arm themselves because they live in neighbourhoods where drug-dealing is prevalent) (Kleiman et al. 2015). Despite its exclusive focus on short-term causal pathways, it nevertheless remains the conceptual foundation of most of the studies analysing the drug and violence nexus post-1985 (Wright and Jacques 2010). Even today, it remains the predominant paradigm for etiological studies analysing the relationship between illicit drugs and violence (McGinty, Choksy, and Wintemute 2016).

Whilst drug related violence has historically been depicted largely in terms of the effects of drugs on individual users (e.g., Werb et al. 2011), more recently the systemic perspective has emerged as the most applied component of the model for understanding how illicit drugs, and other illicit goods potentially, relate to violence (Harwood et al. 1984; Goldstein et al. 1989; Ousey and Lee 2002). Authors have put forward educated estimates that over two thirds of the manifold forms of social harm

associated with drugs is ascribable to systemic violence in drug trafficking (Owens 2011). It is pertinent to note that the systemic aspect of the model has achieved prominence, in part, due to the explosion of violence in Mexico since 2006 (Dell 2015; Osorio 2015; Calderón et al. 2015; Copes, Hochstetler, and Sandberg 2015).

In his original paper, Goldstein declared he was unable to estimate the incidence of psychopharmacological violence, due to the fact that many crimes go unreported or are logged using different statistical systems, such as in the example of violence against children, notwithstanding the crucial fact that available official records ordinarily record no mention of the psychopharmacological state of the people involved (Goldstein 1985). To test his framework, Goldstein and his colleagues examined the causes of drug related homicides committed in the State of New York during 1984 and in New York City during 1988, during the zenith of the crack cocaine epidemic (Goldstein et al. 1989; Brownstein et al. 1992; Goldstein, Brownstein, and Ryan 1992). Subsequent to collecting detailed information pertaining to each case, the research team identified 218 drug related homicides (52.7% of the total number of homicides in New York City in 1988) and classified them under either psychopharmacological, economic-compulsion, or systemic drivers of violence. Overall, 14% of these homicides wre classified as psychopharmacological in origin, 4% as down to economic compulsion, 74% as systemic, whilst 8% were considered multidimensional (Goldstein et al. 1989). Indeed, there may be considerable overlap between the three modes of violence since the categories are not mutually exclusive (Parker and Auerhahn 1998). For example, a heroin user preparing to commit a robbery may consume alcohol or stimulants to pluck up the courage, which would thus classify this case as an example of both economic compulsion and psychopharmacological driven violence (Goldstein 1985). By contrast, in 1984, prior to the peak of the crack epidemic, 3% were due to economic-compulsion, 21% were systemic in nature, while the psychopharmacological aspect accounted for 59%. Alcohol was involved in 42% of all drug related homicides (Goldstein, Brownstein, and Ryan 1992). More recently, several authors designated the psychopharmacological dimension to be the least relevant of the three, positing that drug consumption plays a minor role in drug related violence (Fagan 1990; Caulkins and Reuter 1998).

Violent forms of economic-compulsion driven criminality are also relatively rare (MacCoun, Kilmer, and Reuter 2003). In fact, drug users are more likely to finance their drug use by trading in drugs as opposed to engaging in violent predatory thefts (Goldstein et al. 1990). On the contrary, and as aforementioned, systemic violence is across the board the most prevalent form of drug related violence, especially within producing and trafficking countries (Goldstein 1985; Miron 2001). Henceforth, many scholars have concentrated on analysing this specific dynamic.

I.2.1.1.i Psychopharmacological violence

As aforesaid, psychopharmacological violence primarily refers to violent crimes which are committed under acute or chronic influence of a psychoactive substance (Goldstein 1985). However, it also encompasses the violent victimization of individuals whose consumption of psychoactive substances has diminished their capacity to guard against attacks and even self-injury (Goldstein 1985). In the vast majority of cases the consumption of psychoactive substances is not associated with any form of violence and, moreover, most offenders are not drug users (Fagan 1990; White and Gorman 2000; MacCoun, Kilmer, and Reuter 2003; Boles and Miotto 2003; Bean 2008). Having said this, a significant corpus of research has demonstrated a positive, though complex, relationship between the use of specific substances and violent crimes (Parker and Auerhahn 1998; McCoy et al. 1995; Kilpatrick et al. 1997; Greenfeld 1998; Oser et al. 2009).

One must stress that these causal influences are both probabilistic as opposed to deterministic, and contingent rather than unconditional; the effects of alcohol and drug use upon consumers depends on physiology, psychology, history, gender, context, expectations, among other personal and cultural factors (Zinberg 1984; Parker and Auerhahn 1998; MacCoun, Kilmer, and Reuter 2003; Dalgarno and Shewan 2005). It is also evident that specific features of consumption, such as the amount consumed, patterns of use, and length of use profoundly influence the intensity of violent episodes (Bean 2001). In their review of extant literature, Parker and Auerhahn (1998) found a great deal of evidence to support the claim that the social environment is a far stronger determinant in the upsurge of violent behaviours than pharmacological side-effects stemming from the consumption of psychoactive substances. In a similar vein, MacCoun, Kilmer, and Reuter (2003) posit that no psychoactive substances in and of themselves, that is, in isolation from psychological and situational precipitators, are capable of inducing violent episodes. Fagan (1990), Steele and Josephs (1990), Ito, Miller, and Pollock (1996), Baumeister, Smart, and Boden (1996), Bushman (1997), Galanter and Kleber (2008) have all conducted studies pertaining to whether drug consumption facilitates violence. Further, Bean (2001) raises a crucial point that it is difficult to determine causal effects of using specific drugs due to the fact that so many people are taking a cocktail of drugs.

Research has shown that different substances affect individuals differently (Reiss and Roth 1993; Collins and Messerschmidt 1993; Roth 1994; Parker and Auerhahn 1998; Boles and Miotto 2003; MacCoun, Kilmer, and Reuter 2003). Research has consistently shown that alcohol, although typically legal, at least in Western societies, is the substance with the strongest connection to violent offenses (Pernanen 1991; Parker and Auerhahn 1998; MacCoun, Kilmer, and Reuter 2003; Bean 2008; Felson et al. 2008). MacDonald (1961) was among the first to investigate this issue. After conducting a review of studies on homicides, he found that between 19% and 83% of the murderers included in his

analysis had been drinking before committing their crimes. In the following decade, authors like Virkkunen (1974), Gerson and Preston (1979), Gayford (1975), Sorrells (1977), Johnson, Gibson, and Linden (1978) also studied the relationship between alcohol abuse and homicide, domestic violence, juvenile homicides, and rapes respectively. The findings of these studies confirmed the validity of the relationship between alcohol abuse and violent crimes. In conjunction with this, Felson and Burchifield (2004) showed how alcohol abuse also increases the risk of victimization, whilst other literature has identified the relationship between violence and barbiturates (Tinklenberg and Woodrow 1973; d'Orbán 1976; Goodman, Mercy, and Rosenberg 1986) and stimulants, such as cocaine – crack and powder – and amphetamines (Ellinwood 1971; Asnis, Smith, and Crim 1978; Fink and Hyatt 1978; Goldstein 1985; Fagan 1993; Boles and Miotto 2003; McKetin et al. 2014). However, authors such as Collins (1990) have stressed that most of these studies suffer from various methodological limitations; specifically, they rely on small and specialized samples, and lack the necessary controls for multiple correlates of violence. Research has found that stimulant drugs are much more likely to elicit violent behaviours when consumed in combination with alcohol (Kleiman, Caulkins, and Hawken 2011).

In contrast, there is limited evidence to support a relationship between psychopharmacological violence and marijuana, opioids or even Phencyclidine (PCP) use (Fauman and Fauman 1979; Kinlock 1991; Boles and Miotto 2003; Hoaken and Stewart 2003). According to Goldstein (1985) certain psychoactive substances, such as heroin or tranquilizers, may, in fact, reduce consumers' violent inclinations, as is the case with marijuana (Reiss and Roth 1993). Opioids similarly reduce violent impulses, but withdrawal is often so severe and painful that users can become aggressive and violent, either in an attempt to get more drugs or in response to provocation (Goldstein 1985; Roth 1994; Lavine 1997; Boles and Miotto 2003). In the case of marijuana consumption, this can produce an altered state of consciousness ranging from anxiety, paranoia, panic attacks, impairment of short-term memory and motor skills, mild euphoria, relaxation, to perceptual alterations (Piomelli 2014). Despite such negative effects, regular use of marijuana in moderate doses has been shown to temporarily inhibit violent and aggressive behaviour (Reiss and Roth 1993; Boles and Miotto 2003).

Among the body of scholars who adopted Goldstein's approach, criminologists from the St. Louis School have been notably prolific in developing his framework (Dickinson 2014). They refined the concept of psychopharmacological violence by subdividing it into intentional and unintentional episodes (Wright and Decker 1997; Baskin-Sommers and Sommers 2006; Dickinson 2014). Intentional offender-precipitated psychopharmacological violence refers to cases in which individuals deliberately ingest psychoactive substances so as to feel desensitised during perpetrating acts of violence (Wright and Decker 1997; Dickinson 2014; Havnes et al. 2014). Wright and Decker (1997),

in their extensive study of armed robberies, observed that criminals attempted to control their anxiety by consuming drugs, with the intention that this would heighten concentration and, in turn, eliminate mistakes. Offenders who take drugs in order not to think about the formal consequences of committing offenses constitutes another form of intentional psychopharmacological violence (Jacobs 2000; Wright and Decker 1994; 1997).

By way of contrast, authors designate as unintentional psychopharmacological violence those violent episodes which would not occur if those responsible individuals were not on drugs at the time (Dickinson 2014). In terms of this category, authors like Baskin-Sommers and Sommers (2006) and Cartier, Farabee, and Prendergast (2006), who both investigated the relationship between methamphetamine use and violence, cite incidents in which subjects under the influence of drugs become paranoiac, psychotic, or irritable and assault others due to their distorted cognitive and emotional state. Scenarios in which offenders on drugs assault people viewed as suitable targets because of their altered perceptions also come under the jurisdiction of this subcategory (Dickinson 2014).

I.2.1.1.ii Economic compulsive violence

Economic compulsive, the second feature of Goldstein's tripartite framework, encapsulates acts of violence committed by heavy drug users during robberies to finance their expensive drug habits (Goldstein 1985). This concept can also convincingly be expanded to include violent appropriative crimes connected to the incapacity of generating income as consequence of drug abuse.

Extant studies have corroborated the validity of a significant relationship between drug use and economic compulsive violence (e.g., Collins 1990; Wright and Decker 1997; Miller 1998; Jacobs 2000; MacCoun, Kilmer, and Reuter 2003). The correlation between the frequent use of expensive and addictive drugs, such as heroin and cocaine, and subsequent involvement in violent appropriative crimes is well established at this point (Ball et al. 1981; Chaiken and Chaiken 1982; Johnson et al. 1985). Robbery typifies economic compulsive violence (Collins 1990). As for the pharmacological category, the respective peculiarities of the suite of psychoactive substances influence their connection with violence (Collins 1990). In the vast majority of countries, cocaine and heroin are ordinarily the most expensive substances, thus placing greater economic pressure on consumers than other substances (Bean 2008). Indeed, while the drugs that epitomised the cultural upheaval of the 1960's, cannabis and hallucinogens, have almost no relationship with violence, heroin, which emerged in socio-economically disadvantaged neighbourhoods during the mid-1960s, coincided with an increase in violence related to appropriative crimes committed by drug addicts (Kleiman 2009). Longitudinal studies with heroin users confirm that periods of intense drug use are typified by increases in the

frequency of criminal activities (Fagan 1990). Conversely, periods of methadone rehabilitation ordinarily reduce criminal involvement for heroin addicts (Rettig and Yarmolinsky 1995). Similar dynamics characterised the crack market in the 1980's when Goldstein's framework was originally developed (Blumstein 1995). In contradistinction to this, while some studies have identified a connection between consuming marijuana and certain forms of appropriative crimes (Dembo et al. 1991; Salmelainen 1995; Stevenson and Forsythe 1998), economic violence has rarely been shown to be related to marijuana use (Pacula and Kilmer 2003).

Goldstein stresses that offenders do not commit this particular type of violence out of some blood lust; rather, specific factors within the social context in which the crime is perpetrated encourage violent behaviour (Goldstein 1985). Examples of such features within the social context could be the perpetrator's own nervousness, the reaction of the victim, whether weaponry is being carried by either the offender or the victim, or due to the intercession of bystanders (Goldstein 1985). Moreover, even though systemic violence is more intimately tied to the actions of law enforcement, economic compulsive violence may also emerge in response to policing pressure. For example, drug seizures or other policies with the potential to increase prices may push consumers to take part in violent appropriative crimes (e.g., robberies) by intensifying their need for money (Wright and Decker 1997; Jacobs 1999a; Miron 2001).

I.2.1.1.iii Systemic violence

The most important drug related modes of violence are those which Goldstein defines as systemic (Collins 1990; Miron 2001; Owens 2011). Systemic violence is the final component of Goldstein's framework, and refers to the violence emerging out of the interactions between people involved in the system of drug distribution and usage (Goldstein 1985). The systemic violence framework marks a key innovation in the study of the drug/violence nexus, due to the fact that it does not attribute drug related violence to individual drug use or addiction. Rather, it investigates how the structure of the market for illicit goods itself serves to generate violence (Ousey and Lee 2002). The contemporary relevance of this framework can be espied in the fact that the majority of crime and violence associated with drugs is related to the dialectic between drug commerce and law enforcement policies strategies that aim to curtail it, as opposed to drug use per se (Caulkins and Kleiman 2011).

Illegal drug markets are, in actuality, relatively peaceable (Reuter 2009; Snyder and Durán Martínez 2009; Calderoni 2012; Bacon 2016). Indeed, an exhaustive review of literature conducted by Dorn, Levi, and King (2015) indicates that there is an academic consensus pertaining to the fact that, although violence is a distinctive feature of illicit drug markets, its manifestations tend to be linked to degenerate dynamics as opposed to being ubiquitous and quotidian. Research shows that drug

traffickers consider violence as their last resort, not only due to the risk of death, but because it attracts the attention of law enforcement agencies and media (Reuter and Haaga 1989; Dorn, Murji, and South 1992; Pearsons and Hobbs 2001; Morselli 2009b; Morselli 2009a).

Nevertheless, on occasion specific markets do exhibit high levels of violence which subsequently turns them into the most violent sector within the illicit economy (Andreas and Wallman 2009; Reuter 2009; Moeller and Hesse 2013). Forms of systemic violence encompass a variety of situations, including: conflicts over dealing territories; disputes about level of remuneration for selling drugs; enforcing rules within drug-dealing organizations; arguments between users over drugs or drug paraphernalia; conflict with law enforcement agents; retribution against informers (Goldstein 1985; Roth 1994). These examples testify to the manifold ways in which drug markets can generate lethal violence, as well as how this can vary across both time and cultures. Consequently, just as with drug consumption, illicit drug markets are a contingent, rather than a universal, cause of violence (Zimring and Hawkins 1997; Ousey and Lee 2002; MacCoun, Kilmer, and Reuter 2003).

Previous literature has identified how illegality itself is the principal explanation behind the escalation of violence within drug markets (Miron 2001; MacCoun, Kilmer, and Reuter 2003; Kleiman 2009; Werb et al. 2011). However, the hypothesis that prohibition itself leads to the use of violence is insufficient, as many prohibitions involve minimal levels of violence (Zimring and Hawkins 1997; Miron 2001; Reuter 2009). In light of this, scholars have extended the key category of illegality, by subdividing it and integrating it with other factors whose combination accounts for the high levels of violence observed in specific drug markets (MacCoun, Kilmer, and Reuter 2003). These main factors are the lack of legal instruments with which to settle disputes (Caulkins and Reuter 1998; Chimeli and Soares 2011; Mejía and Restrepo 2013; Robles, Calderón, and Magaloni 2013), the spread of retaliation (Bourgois 1995; Topalli, Wright, and Fornango 2002), interaction with law enforcement (Benson, Leburn, and Rasmussen 2001; Guerrero 2011; Werb et al. 2011; Rios 2013; Prieger and Kulick 2014), and strong competition and organizational structure (Reuter 1983; Kleiman 1989; Decker, Katz, and Webb 2007; Costa Storti and De Grauwe 2008).

As for psychopharmacological and economic modes of drug related violence, extant literature indicates that violence in the drug trafficking industry becomes all the more pronounced when the illicit market coincides with malformed social dynamics and violent subcultures (Zimring and Hawkins 1997; Rosenfeld, Jacobs, and Wright 2003; Jacobs and Wright 2006; Dickinson 2014). Systemic violence can thus be seen as an economic phenomenon deeply rooted in political and social contexts (Collins 1990). Further, socio-cultural theorists (e.g., Park, Burgess, and McKenzie 1925; Wirth 1938; Merton 1938; Shaw and McKay 1942) have consistently pinpointed how problematic social conditions provide fertile ground for potential violence within drug markets (Moeller and Hesse

2013; Dickinson 2014). In particular, economic hardship, disorganisation at both familial and community levels, as well as violent subcultures are crucial features for comprehending the systemic violence of drug distribution (Skogan 1989; Coomber 2006; Ellis 2015). People involved in drug trafficking are disproportionately from economically disadvantaged backgrounds and neighbourhoods, whereby selling drugs is an attractive option despite the inherent risks of this activity (Skogan 1989; Collins 1990; Reuter et al. 1990). Because of this, it may be particularly difficult to disentangle violence caused by the drug industry itself from forms of violence stemming from other social and cultural issues (Dickinson 2014; Bacon 2016). The same pervasive systemic violence observed in crack distribution, for example, was which is due, in part, to the fact that crack selling was concentrated in neighbourhoods where social controls had been weakened by profound social and economic hardship in the decade immediately preceding the crack epidemic (De la Rosa, Lambert, and Gropper 1990).

The following subsections consist of a more in-depth examination of the five principal modalities through which drug trafficking leads to increased violence (i.e., lack of legal instruments through which to settle disputes, the spread of retaliation, interaction with law enforcement, and competition and organizational structure). Especial attention is devoted to these particular five factors because of their intimate connection with profits generated through drug trafficking, whose relationship with violence constitutes the focus of this study.

Lack of legal instruments to set disputes

"[…] it is manifest that during the time men live without a common power to keep them all in awe, they are in that condition which is called war; and such a war as is of every man against every man. […] In such condition there is no place for industry […]; no account of time; no arts; no letters; no society; and which is worst of all, continual fear, and danger of violent death; and the life of man, solitary, poor, nasty, brutish, and short." (Hobbes 1651). In Goldstein's (1985) own terminology, the inability to access the legal system engenders conflict and violence; in the context of drug supply for example, violence is an important tool through which to enforce agreements (Caulkins and Reuter 1998; Jacques and Wright 2011; Chimeli and Soares 2011; Mejía and Restrepo 2013; Robles, Calderón, and Magaloni 2013).

Prohibiting goods for which there is both substantial demand and a plentiful supply of knock-offs gives birth to black markets, in which participants are unable to resolve disputes via the standard, nonviolent mechanisms (Miron 2001; Kulick, Prieger, and Kleiman 2015). Indeed, given its illicit nature, the drug industry is forced to operate without the customary protections against fraud and violence offered by the court system (Goldstein 1985). Consequently, disputes among actors cannot be settled in courthouses or national justice systems where contracts are conventionally enforced; rather,

agreements are made hurriedly, orally, and often in ambiguous terms (Goldstein 1985; Reuter 2009; Owens 2011). All the while, the state, rather than providing incentives to develop the market, tries to destroy it. Yet, in drug markets, actors must also set property rights, collect debts, and secure financial transactions; against this backdrop, the use of violence becomes a necessary part of the playbook to stay in the market (Bean 2008). Moreover, illegal enterprises incur lower risks for resorting to violence compared to a firm operating in the legal economy, due to the fact that the firm's employees are already violating the law (Reuter 1985).

The absence of a legitimate third party that arbitrates disputes among members may also contribute to the development of a pervasive honour culture (Anderson 1994; Castillo, Mejía, and Restrepo 2014), as one saw in the American West (Cohen et al. 1996; Grosjean 2014) or more recently in disadvantaged American suburbs, according to subcultural theorists (Kubrin and Weitzer 2003b). Within these cultural frameworks, violence serves as a proxy for a third party capable of settling disputes, and thus people become predisposed to respond with violence against any sort of offence – perceived or otherwise (Castillo, Mejía, and Restrepo 2014). In conjunction with the spread of honour culture, the inability to solve disputes within a legal context favours the personal handling of grievances and violent forms of retaliation, which is another key driver of systemic violence (Jacques and Wright 2011). As the drug industry establishes itself as an integral activity within a particular community, the concomitant change in social norms and attitudes might also trickle down to people outside of the drug industry (Dorn, Murji, and South 1992; Blumstein 1995; Cohen et al. 1998; Blumstein, Rivara, and Rosenfeld 2000; Moeller and Hesse 2013). For example, the custom of carrying guns, so widespread among drug dealers, may push members of the community to arm themselves in the interest of self-defence or as a means to gain respect, thus engendering a further potential spread of lethal violence (Blumstein 1995).

Spread of retaliation and violence inertia

Honour culture often goes hand-in-hand with a powerful inclination towards retaliation, which is another key shot-in-the-arm for violence (Loftin 1986; Topalli, Wright, and Fornango 2002; Kubrin and Weitzer 2003b). Violent retaliation serves to restore damaged reputations, and provides offenders with some sense of symbolic control over their identity and their environment (Topalli, Wright, and Fornango 2002; Jacobs and Wright 2006), notwithstanding protecting criminals against future assaults (Castillo, Mejía, and Restrepo 2014). Criminologists have long recognized retaliation schemes within mafia organizations (e.g., Arlacchi 1983) and youth gangs (e.g., Decker and van Winkle 1996; Peterson, Taylor, and Esbensen 2004; Sobel and Osoba 2009). However, this mechanism is also pertinent for criminals active in the drug industry (Bourgois 1995; Blumstein and Rosenfeld 1998; Castillo, Mejía, and Restrepo 2014), as these criminals cannot rely on legal institutions, and because

they often carry drugs and cash, hence making them attractive targets (Jacques, Wright, and Allen 2014). Through interviewing drug dealers themselves, Topalli, Wright, and Fornango (2002) found that direct retaliation represents for these criminals the best response to victimization, because it allows them to achieve multiple ends, such as retribution, deterrence, and compensation, all at once.

Criminologists have also observed a second pernicious dynamic related to retaliation within drug markets: imperfect retaliation. This pertains to the fact that victims are not always able to identify or locate those who have wronged them, and, henceforth, victims might defend their reputation and extract retribution against individuals who are not directly involved in the original offense (Jacobs 2004, 312). The concept of imperfect retaliation is particularly valuable for understanding the connection between drugs and the recourse to violence, because it explains how a single act of aggression can initiate an ever increasing cycle of imperfect retaliation and violence, encompassing actors well beyond the bounds of the original dispute (Jacobs, Topalli, and Wright 2000; Topalli, Wright, and Fornango 2002; Jacobs and Wright 2006).

Fajnzylber, Lederman, and Loayza (1998) econometrically tested the inertia of crime with respect to homicides and robberies, in order to verify the widely held assumption that crime begets further crime (Sah 1991). Their cross-national analysis confirmed the inter-temporal dependency of crime: previous levels of violence contribute to future levels of violence. Drug trafficking is no exception in this regard, as it tends to produce vicious, ever-expanding cycles of crimes (Schrag and Scotchmer 1997; Gaviria 2000). A vast theoretical literature has investigated this course of action, pinpointing the lowering of risk factors for criminals as the main explanatory factor (Gaviria 2000). That is to say, criminality increases if either the certainty or the size of punishment diminishes. Consequently, the observed repetition of criminal behaviour, in combination with the illicit activities of other criminals, may lead to congestion within the law enforcement system, which, in turn, lowers the probability of capture (Gaviria 2000). Moving on from this theory, the chance of punishment can thus be expressed as a function of the number of law enforcement agents (+) and other criminals operating in the same area (-) (Freeman, Grogger, and Sonstelie 1996). Within these dynamics, the role of expectations and perceptions are also crucial (Sah 1991), as, along with a diminished risk of punishment, illicit drug trafficking may also lead to an increase in other crimes due to the diffusion of criminal knowhow and criminal technologies (Gaviria 2000).

Disruption of the social fabric and the spread of corruption

Many authors, who focus on countries were drug trafficking is endemic, posit that the disintegration of the social fabric and the rise of corruption are the two primary channels through which illicit drug trafficking may affect the capacity of legitimate institutions to curtail the rise of violence (Giraldo 1999; Moser et al. 1999; Guizado 2005; Corso et al. 2007; Singer 2008; Chalk

2011). Thoumi (2002), in particular, focuses on the transformation of common values and institutions as the single most important factors impacting upon societies. In his examination of the Colombian context, Thoumi (2002) observes that the growth of the illicit drug economy has contributed to lower levels of social capital and trust, in a country where individuals already tend to follow their own ethical norms and society imposes weak behavioural constraints. As a consequence of this transformation, one sees the preponderance of private over collective interests, and the concomitant growth of unlawful and antisocial behaviours. These effects are especially strong among youths, who are more generally sensible to external influences, and what we see is that growing up in a criminal environment facilitates the erosion of morals and nourishes a predisposition toward crime (Gaviria 2000, 3).

This process may even extend up to and including law enforcement agencies and governments, thus depriving them of their necessary authority (Thoumi 1995; 2002). It is through this mechanism that drug trafficking congests the justice system and impairs the entire institutional architecture of society (Gaviria 2000). The lessening of authority of relevant institutions and the weakening of the judicial system thus engenders a further decline in trust that, ultimately, contributes to increased violence, impunity, and security costs (Rubio 1995). The growing connections between criminals and politicians and, more generally, between crime and politics, which is concretised in organised crime members infiltrating local and national branches of government, plays a pivotal role in the deterioration of the social fabric (Latin American Commission on Drugs and Democracy 2009). These harmful linkages are embodied in the proliferation of corruption among public servants. Observers indicate that corruption has infiltrated all levels, including judges, governors and politicians, as well as, most disconcertingly, enforcement agencies (Thoumi 2002; Latin American Commission on Drugs and Democracy 2009; INCB 2013; 2014). This has an indirect, but nonetheless profound impact upon public policy and everyday governance, and is even capable of stunting economic development (Thoumi 2002, 111; INCB 2014). Corruptive practices involving judges, politicians, and police officers are incredibly common in countries with massive drug flows, such as Mexico and the Northern Quadrangle of Belize, El Salvador, Guatemala, and Honduras (Shelley 2001; Chabat 2006; INCB 2013).

Interaction with law enforcement

To this today, drug enforcement policies that emphasize the imposition of criminal laws for drug use and drug related crimes remain the primary strategies for reducing drug related harm within producing, trafficking, and consuming markets (Drucker 1999; Caulkins and Reuter 2010; Werb et al. 2011; Collins 2014; Mejía and Restrepo 2014). Such interventions take the form of targeted crackdowns on known street-drug markets (May and Hough 2001; Aitken et al. 2002), military

interventions (Veillette 2005), seizures and eradications, and legal sanctions against drug users, traffickers and producers (Drucker 2002). More than 100USD billion are spent annually to implement these policies (Count the Costs 2013).

Drug law enforcement pursues several objectives, including: disrupting established drug markets and reducing public disorder, reducing drug availability, and increasing the time drug users spend searching for drugs (Kleiman 1992; Caulkins 1993; Hough and Natarajan 2000; Kerr, Small, and Wood 2005; Kleiman, Caulkins, and Hawken 2011). The second goal of the U.S. National Drug Control Strategy synthetizes the aim of enforcement by stating: "Increase the safety of (America's) citizens by substantially reducing drug related crime and violence" (ONDCP 2000, 5). However, the primary means through which law enforcement could reduce consumption and, in turn, the size of the illicit markets for drugs is through its capacity to raise prices. Illicit substances, such as heroin and cocaine, are not necessarily expensive; for instance, an entrepreneur could purchase a kilogram of cocaine in Colombia for about 2,000USD and ship it to a lucrative market like the U.S. for about 50USD if it were legal to do so. Hence, it is law enforcement, by virtue of forcing drug traffickers to operate inefficiently and placing them at risk of incarceration, which raises prices and, ultimately, leads to cocaine not entering into the U.S. for less than 15,000USD (Kleiman, Caulkins, and Hawken 2011).

Evidence shows that global drug prices have been in decline, whilst purity has increased despite a dramatic growth in global enforcement spending (Collins 2014). Nonetheless, drug prohibition is capable of raising the prices of drugs above and beyond their market value so to speak (MacCoun and Reuter 2001a; Kleiman, Caulkins, and Hawken 2011; UNODC 2013d; Caulkins 2014). As aforesaid, drug use itself can lead to violence, thus one might expect that prohibiting drug use might, in turn, curtail violence (Miron 2001, 617). However, a large number of scholars have demonstrated that drug enforcement, in fact, can lead to an increase in violence (Riley 1998; Miron 1999; Eck and Maguire 2000; MacCoun and Reuter 2001a; Freeman 2006; Kleiman 2011; Kleiman et al. 2012; Rios 2013; Calderón et al. 2015; Osorio 2015).

A growing body of quantitative research looking at the Mexican war on drugs provides clear evidence that government crackdowns contributed to the escalation of violence between Mexican drug-trafficking organizations (Freeman 2006; Guerrero 2011; Calderón et al. 2012; Dell 2015; Osorio 2015). However, other scholars have come to different conclusions about the direction of the causality in the relationship between law enforcement on drug trafficking and violence (Donohue and Levitt 1998; Resignato 2000; Miron 2001; Shepard and Blackley 2005; Caulkins, Reuter, and Taylor 2006; Werb et al. 2011; Rios 2013). This might be due to the specificities of drug markets which can

generate counter-intuitive effects, including supply curves that slope downward because of enforcement (Caulkins and Reuter 2006; Werb et al. 2011).

The association between levels of drugs, law enforcement and violence in drug markets is a result of how enforcement affects the structure of the market, and it should be said that the mechanisms involved in this dynamic are varied (MacCoun and Reuter 2001a; Moeller and Hesse 2013). Dell (2015), for example, argues that law enforcement which focuses on Mexican drug corridors culminates in drug trafficking and violence being transplanted to different routes, thus bringing the violence of drug trafficking organizations into other areas. The incapacitation of established sellers and the intensification of drug law enforcement also increases competition between surviving factions (MacCoun, Kilmer, and Reuter 2003; Werb et al. 2011). A further consequence of tough law enforcement is the way in which it increases the level of uncertainty inherent to transactions within drug markets, which, in turn, raises the potential for violence due to the increased likelihood of perhaps dealing to an informant (MacCoun, Kilmer, and Reuter 2003). Enforcement can also increase the recourse to violence due to the fact that prohibitions tend to raise the price of illicit goods (Miron 2001; Reuter and Kleiman 1986). Higher prices in turn lead to more appropriative violence, as well as a higher return from entering the drug market (Miron 2001). Furthermore, increased levels of enforcement disrupt contractual arrangements which, in turn, damage reputational capital and increase the likelihood of violence in any given market (Miron 2001). Researchers have also documented that drug law enforcement, through the removal of key players from the market and the concomitant disruption of established hierarchies, has the perverse effect of increasing recourse to violence due to the creation of new opportunities for other individuals to enter the market (Rasmussen, Benson, and Sollars 1993; Benson, Rasmussen, and Kim 1998; Benson, Leburn, and Rasmussen 2001; Levitt and Rubio 2005). The final two mechanisms through which enforcement affects the recourse to violence within drug markets underscore the relevance of the competitive structure as a key determinant of the drug/violence nexus.

Competition and organizational structure

Competition over illicit drug markets is another widely espoused contemporary explanation for homicides (Blumstein 1995). Scholars attribute great relevance to the use of violence as a means through which to acquire or maintain market share within the lucrative business of drug trafficking (Goldstein et al. 1989; Blumstein 1995; Donohue and Levitt 1998; Brownstein, Crimmins, and Spunt 2000; Werb et al. 2011; Rios 2013). In the context of illicit markets, the traditional strategies at the disposal of legal companies, such as advertising products, are off-limits, hence the capacity for and willingness to use violence becomes a key competitive resource (Kleiman 1989; Rasmussen, Benson, and Sollars 1993; Desroches 2007; Costa Storti and De Grauwe 2008; Moeller and Hesse 2013). For

example, violence enables drug traffickers to challenge traditional hierarchies both within and between illicit enterprises (Rasmussen, Benson, and Sollars 1993; Moeller and Hesse 2013). This is because competition within drug markets is highly multidimensional in nature: there is spatial competition (Rasmussen, Benson, and Sollars 1993; Reuter 2009), internal competition (Reuter 2009), as well as competition over contacts (Schelling 1967).

To this day, retail street markets for drug use are often located in specific sites, as buyers and dealers can more easily locate one another, in turn, making the transaction more efficient for both parties. Even though mobile phones and instant messaging systems have transformed the modus operandi of drug dealing, the geographical specificity of particular points of sale alone are reason enough to instigate violent competition between rival sellers, who want to encroach on lucrative areas or defend their territory. Dealers can easily spot intruders, and will attack them to defend their competitive advantage (Reuter 2009). The dynamic is wholly different for international and wholesale trafficking (Osorio 2015); the shipments are larger and the business is organized to the point whereby it is preferable for the respective parties to set a specific place and time for their transaction (Desroches 2007; Reuter 2009). The potential time and place of drug shipments are thus much less circumscribed, and, as such, completion of the transaction is not likely to be concentrated within specific areas. Reuter (2009) explains the competitive violence between high-trafficking organizations as being focused upon competing over corrupt officials who control specific channels, rather than, say, competing over direct control of fruitful territories. He grounds this insight in Schelling's (1967) classic conjecture about the role of the Mafia in the US, that is, that these organized crime groups can be thought of as rent collectors of the franchises held by corrupt police departments.

Research has primarily focused on violence arising out of the competition between sellers and different organizations (Reuter 2009). However, within organizations themselves violence is also used to settle internal competition, disciplinary problems, and successional acts (MacCoun, Kilmer, and Reuter 2003; Reuter 2009; Moeller and Hesse 2013). This is due, in part, to a shortage of information within the criminal job market. Emerging mid-level actors, for example, cannot simply change their employer and provide a resume of their skills and experience, whilst, at the other end of the spectrum, high-level traffickers get weak market signals and may refuse deserved salary increases. Then, lower-level actors seek upward mobility through the use of violence (Reuter 2009). This dynamic might be translated into the inability to enforce contracts also, in this instance, contracts within the same organization. It follows, then, that in markets characterized by the hegemony of a few powerful criminal organizations, there are more of sources of violence than in properly competitive markets (Decker, Katz, and Webb 2007; Reuter 2009).

As for other aspects of the relationship between drug markets and violence, it would be misleading to investigate the effects of competition without considering their interrelation with other aspects of the phenomenon. Many scholars have theorized that, in the absence of enforcement, illicit drug markets would move towards a state of equilibrium dominated by a powerful supplier, at least within a specific area (Reuter 1983; Kleiman 1989; Rasmussen, Benson, and Sollars 1993). The emerging dominant actor would then be able to offer better prices and more reliable services, thus consolidating its market leading position (Kleiman 1989; Costa Storti and De Grauwe 2008; Moeller 2012). Such equilibrium would result in low levels of violence (Eck and Gersh 2000, 244). Under such a monopolistic structure, few organized groups would supply the market, thus reducing the use of violence so as to not attract the attention of law enforcement (Moeller and Hesse 2013).

However, market structures characterized by a high level of concentration are extremely rare outside of theoretical models (Reuter 1983; Caulkins and Reuter 2006). In reality, law enforcement interventions tend to favour the creation of more flexible and adaptive organizations who are in heavy competition with each other (Eck and Gersh 2000; Paoli 2002; Ignatieff 2005). This aforesaid reasoning on competition applies perfectly to cocaine trade, which, as we know from research which has analysed the structure of groups' active in its trade, is an extremely competitive market (Kenney 2007; Estrada 2013).

I.2.2 The value of drug markets and violence

One stream of research sets out to explain the link between drug markets and violence in economic terms. Researchers who adopt this perspective ordinarily do not reject socio-cultural theories of violence, nor do they downplay the relevance of structural characteristics of drug markets (e.g., lack of a legal framework to solve disputes, the structure of trafficking groups, etc.) (Collins 1990; Dickinson 2014; Castillo, Mejía, and Restrepo 2014). Rather, they set out to understand the role played by the value of drug markets in the drug/violence nexus. To do this, they use indicators such as drug prices, revenues, supply shortages, profits, among others (e.g., Wright and Decker 1997; Miron 1999; MacCoun, Kilmer, and Reuter 2003; Reuter 2009). The interest of criminologists in illicit market is nothing new, of course. The basis of this approach, focusing on illicit markets directly rather than on criminal offenders, has its origins in the classical studies of the American organised crime syndicates during the prohibition era (Landesco 1932), not to mention studies on the emergence of black markets in Europe during World War II (Louwage 1951). The diffusion of this type of research has increased greatly since the end of the 1960s, with the study of drug policies and drug markets (Cave and Reuter 1988), as well as of criminal enterprises (Schelling 1967), due, in part, to the growing contribution of economists to criminological literature.

A first set of studies, focusing on market indicators, identified the high value of drugs as an important driver of violence. These authors began by observing that the most peculiar characteristic of illicit drugs is their extraordinarily high price per unit weigh (Caulkins and Reuter 1998), which in and of itself acts a key incentive for the spread of violence - especially in retail markets (Miron 1999; MacCoun, Kilmer, and Reuter 2003). Indeed, the high value of substances increases the likelihood of appropriative crimes against drug dealers (MacCoun, Kilmer, and Reuter 2003; Reuter 2009), who are prime targets precisely because they are likely to carry money and drugs, and are unlikely to seek out police protection. The higher the value of the drug they possess, the higher the return for assailing them (Wright and Decker 1997; Jacobs 2000; Topalli, Wright, and Fornango 2002; Rosenfeld, Jacobs, and Wright 2003). Due to this this straightforward dynamic, drug transactions can thus cause sudden, situational forms of violence. Not all drugs are of the same value, however; outside of producer countries, heroin and cocaine tend to cost more than marijuana or amphetamines (Reuter and Greenfield 2001). Consequently, violence in the marijuana market has proven to be less disruptive than in more valuable markets, such as that of cocaine (Moore and Stuart 2005; Reuter 2009).

Besides the value of drugs, "[u]nderstanding drug system violence will also probably require understanding how economic opportunity is linked to involvement in trafficking" (Collins 1990, 267). In line with this, structural criminologists emphasise that the concurrent presence of various structural, cultural, and situational conditions that invariably characterise the environments in which drug transactions take place, are of critical importance for explaining violence which occurs during robberies (Zimring and Hawkins 1997; MacCoun, Kilmer, and Reuter 2003; Dickinson 2014). The desperate need for cash and social marginalization are two key situational precipitators and background factors determining the use of force by drug dealers and drug users, while the widespread street culture of honour exacerbates the situation by discouraging both aggressors and victims from retreating (Wright and Decker 1997; Jacobs and Wright 2006).

The high value of certain illicit drugs is, indeed, a convincing explanation for some forms of violence inherent to drug markets, such as robberies. However, as aforesaid, the primary motivation behind involvement in drug trafficking is economic in nature (Reuter and Kleiman 1986; Desroches 2007; Chi et al. 2013). Even the infamous Colombian traffickers Pablo Escobar and Carlos Lehder, whose ambitions notoriously extended beyond reaching the pinnacle of their criminal profession to actually seeking to serve for Colombia's national congress, were at the apex of organizations which were absolutely profit driven (Kenney 2007). "The raison d'etre of trafficking networks is to produce, process, and transport illicit drugs in pursuit of satisfactory profits, while minimizing their exposure to unnecessary risks" (Kenney 2007, 9). Therefore, analysing profits and other structured indicators of

the value of drug markets would appear to be a more promising avenue through which to comprehend systemic violence.

If one accepts the notion that the value of a drug market is likely to be an important indicator of the relationship between drugs and violence, then it follows that fluctuations in the value of a drug market can be a useful instrument for understanding systemic violence. For example, a series of studies published in the 1990s explains the initial increase and subsequent decline of homicides in the U.S. in terms of the introduction, increase, and stabilization of crack cocaine markets (Johnson, Hamid, and Sanabria 1992; Smith, et al. 1992; Brownstein 1996; Jacobs 1999b). In contradistinction to this, other authors attribute the reduction in homicides rates in American cities since the early 1990s to the stabilization of the drug market and law enforcement actions aimed at disrupting them (Cork 1999; Ousey and Lee 2002; 2004). "Unfortunately attempts to study this nexus have been hampered by an uncertainty in the literature about how to conceptualize the stability or instability of drug markets" (Brownstein, Crimmins, and Spunt 2000, 867). To measure drug markets, previous studies have mainly focused upon indicators of the size of the markets, such as seizures, arrests, or prevalence rates, rather than its actual value per se. Consequently, "a closer inspection of the available evidence reveals that such a conclusion may be premature" (Ousey and Lee 2007, 49). That is to say, differences in how the respective researchers conceptualized fluctuations in the value of drug markets may, in fact, explain the partial discordance in the findings of these two series of studies.

Although lacking empirical support for his theory, Kleiman (2004) is among those authors who explains violence by taking into account revenues, as opposed to simple prices or other indirect indicators of the value of the market. On the one hand, he considers violence in drug markets to be proportional to the size of the market, as defined by volumes and revenues, whilst, on the other, he argues that a reduction in revenues may also lead to increased interpersonal violence. To explain this concept he cites the example of dealers whose market has been disrupted by law enforcement initiatives, and who subsequently enter into conflict with pushers who control other areas. Kleiman's (2004) contribution is insightful inasmuch as it suggests that both expansion and reduction in the value of drug markets may lead to a potential increase in violence. One must stress, however, that his work remains wholly speculative, as he merely proposes that these two dynamics are plausible, without any empirical substantiation.

Reuter (2009) also discusses the possibility that contractions in the market, measured in terms of reductions in revenues, might underlie increases in the recourse to lethal violence. More specifically, he considers the contraction of expenditure on cocaine and heroin in the U.S. as one possible explanation for the upsurge of violence observed in the Mexican drug industry. According to Reuter (2009), the downsizing of the drug market makes redundant part of the labour force active in the

business. Unfortunately, these drug traffickers do not have the luxury of accessing any alternative form of employment which would offer a similar income. Indeed, participation in the drug market is invariably more financially rewarding than either other forms of criminal work or legal low-wage jobs (Collins 1990; Reuter et al. 1990; Count the Costs 2013). As a consequence, these people have a strong incentive to defend their revenues by fighting other traffickers (Reuter 2009).

In both Miron's (1999) and Resignato's (2000) studies, their reasoning centres on profits instead of revenues, as a means through which to analyse high-level markets. In this context, the use of violence may be an inevitable consequence when groups are competing for the opportunity to amass massive profits, especially when one considers that it is an industry lacking any formal non-violent institutions through which to negotiate and resolve disputes. Bean (2008) follows suit in terms of focusing on profits, arguing that the prospect of big profits allied with the lack of any specific skills required to enter into the drug trafficking industry itself, make this business attractive for ambitious low-skilled youths. Further, incumbent actors might use violence or the threat of it as a barrier to entry for newcomers.

Despite the fact that Bean (2008) does not explicitly refer to expansions or contractions in the amounts of profits, his reasoning nevertheless appears to give due relevance to large and expanding markets as potential explanations for violence. Indeed, ceteris paribus, newcomers will have a far greater incentive to enter into a more lucrative market than in a market which is downsizing. Once again, these insights underscore the way in which all proposed explanations for the relationship between drug and systemic violence are both interconnected with one another and mutually influential.

Despite the abundance of literature on the economic and monetary determinants of systemic violence, empirical analyses of the consequences of fluctuations in the value of illicit drug markets have been marginal to say the least. Over the last several years, a series of studies adopting particularly rigorous econometric strategies have attempted to address this lacunae in extant knowledge, by seeking to explain the connection between fluctuations in the value of high-level drug markets and violence in Colombia, Mexico, and Afghanistan.

Angrist and Kugler (2008) and Mejía and Restrepo (2013) documented how the growth of the cocaine trade in Colombia and increases in external demand have exacerbated violence within the country. These researchers used fluctuations in coca cultivation as a proxy for the evolution of the market, just as Fajnzylber, Lederman, and Loayza (1998) did before them. Rios (2012) develops an original approach to this field by controlling for the opening of new markets for cocaine through examining data on hospitalizations and records of overdose. Alternatively, scholars have used seizures as indicators of trafficking activities. Serrano-Berthet and Lopez (2011) adopt this strategy in order to examine drug trafficking, whilst Castillo, Mejia, and Restrepo (2014) use cocaine interceptions in

Colombia to model the level of supply, and, in turn, the scale of revenues. Osorio (2015) meanwhile uses Colombian seizures as a proxy for the level of cocaine supply in Mexico, whilst controlling for the purity-adjusted price of cocaine.

Angrist and Kugler (2008) have designed perhaps the most refined and convincing identification strategies. Angrist and Kugler (2008) utilise a quasi-experimental research design by organising their study around the blockade of the *Andean air bridge* by the United States in 1994. Prior to that point, the majority of Colombian traffickers used to refine Bolivian and especially Peruvian coca. The air interdiction pushed them to grow coca directly in Colombian rural areas. This historical event provided a unique opportunity to study the impact of the cultivation of coca on the rural population, and to assess the connection between natural resources and violence. Their study concluded that, in the areas where coca cultivation took hold, self-employment income and boys' labour supply registered large and significant increases. However, the likelihood of procuring an income from this source, the overall chances of working, and wages themselves did not increase. Therefore, the living conditions of the general population itself failed to substantially improve in the area where the cultivation took place. This study is significant for highlighting that the expansion of the coca/cocaine industry does not necessarily lead to a reduction in conflict, rather it stokes the flames. This research is more interesting yet still because of its robust and persuasive methodology. However, it focuses solely on the cultivation of coca, as opposed to the cocaine industry as a whole.

Rios (2012) argues, in relation to Mexico, that the causal relationship between profits from drug markets and violence is not empirically robust. Rios (2012) tries to trace the opening of new cocaine markets in Mexican municipalities by looking at records documenting the first hospitalization or first overdose related to cocaine consumption in the municipality. Within these municipalities, she concludes that the value of the cocaine market is increasing since previously there was no market there at all. She proceeds to show that domestic markets expand with a higher probability when and where municipal and state governments are not coordinated. Rios uses drug selling within Mexico as an overall indicator of misconduct, including violence, by drug trafficking organizations. Therefore, in her approach drug dealing and violence are both influenced by the political situation, and, as such, are not theorised as being in a causal relationship with each other.

Mejía and Restrepo (2013) construct an index of suitability for coca cultivation within Colombian municipalities, and show how different shocks in the demanded amounts of cocaine can predict variations in the size of coca cultivation at the municipal level. Further, Mejia and Restrepo use their index as an exogenous source of variation to set up an instrumental variable, concluding that increases in coca cultivation engender increases in the level of violence. They interpret their results by positing that, in response to the increase in the value of coca, criminal organizations fight both with each other

and the government for control of territories suitable for coca cultivation and cocaine production. However, as discussed previously, this approach does not allow for the disentangling of the role of prices from the year effects. Moreover, their study assumes that volumes of coca production influence systemic violence regardless of the actual value of cocaine markets themselves; however, one should not take for granted that size of cocaine production and cocaine market value always necessarily move in the same direction.

Castillo, Mejía, and Restrepo (2014) conducted an empirical study of the role played by scarcity, understood in terms of drug supply shortages, in increasing violence in illicit drug markets. These authors start out from the assumption that total revenues are likely to increase as a consequence of the reduction in availability of illicit drugs. Indeed, so the authors argue, increases in the cost of the drug more than compensate for any contraction in the traded volumes, because of an inelastic demand for the drug. In turn, interpersonal violence increases as a result of the larger revenues at stake for criminals to tussle over. Thus, in the absence of any adjudicating third party, the market in highly valuable goods exhibits greater levels of violence in response to a contraction of the supply of the good itself (Castillo, Mejía, and Restrepo 2014).

The authors test their hypothesis by taking advantage of an especially large interception of cocaine in Colombia, which is considered to be capable of significantly impacting upon the drug flow reaching Mexico. As a corollary consideration to their analysis, the authors assert that law enforcement initiatives capable of reducing the availability of a drug in a particular market is, ultimately, likely to increase revenues, and, in turn, increase violence. The work by Castillo, Mejia, and Restrepo (2014) is one of the very few sound empirical studies which investigate the effects of fluctuations in the value of drug trafficking on violence.

However, I argue that the central assumption underpinning their analysis is wholly unconvincing. In fact, some of the studies cited by the authors, such as Bachman (1990) and DiNardo (1993), consider the demand for cocaine to be inelastic or, at the very most, marginally responsive to price variations (e.g., Saffer and Chaloupka (1999) found a price elasticity of demand for cocaine of -0.28), whilst other influential studies on the topic consider the demand for the drug to be negatively correlated with price. While it was once common knowledge that the price elasticity of demand for cocaine must be low because of its addictiveness, empirical studies have, in fact, shown that the elasticity for cocaine is not dissimilar to that of many licit goods (Caulkins and Reuter 1998; MacCoun, Kilmer, and Reuter 2003). Caulkins (1995c) estimates an elasticity for cocaine ranging between -1.5 and - 2.0, which he arrives at by calculating the fraction of arrestees testing positive for the drug. As a result of reviewing available estimates, Caulkins and Reuter (1996) conclude that the elasticity for cocaine is likely between -2.0 and -0.7. One possible explanation for these findings, put

forward by MacCoun, Kilmer, and Reuter (2003), is that heavy cocaine users, that is, those who are more likely to develop a dependency to the substance, ordinarily spend a substantial portion of their earnings in order to satisfy their habit; hence, in the event of rapid price hikes they may find it difficult to maintain their required level of consumption. Moreover, the assumption that an increase in revenues corresponds with a reduction in supply also goes against other previously accepted findings. For instance, Reuter and Kleiman (1986) purport that, despite an increase in drug and asset seizures, the street value of cocaine has actually declined since enforcement initiatives intensified. Although the authors are discussing a different market (i.e., the U.S. retail market) at a different historical juncture, it still points to the complexity of the relationship between different indicators of respective drug markets size and value.

The level of supply of cocaine from Colombia has been shown to have a profoundly detrimental effect on violence between drug traffickers according to most models proposed by Osorio (2015). This finding suggests that a contraction of the international supply of drugs due to cocaine seizures in source countries mitigates violence in Mexico, which is in contradistinction to the findings of Castillo, Mejia, and Restrepo (2014). The purity-adjusted price of cocaine has also been shown to have a significantly positive effect on violence;, yet its effect is almost null (Osorio 2015).

Even though these aforementioned studies are buttressed by sophisticated empirical methodologies, none of them has proved truly capable of determining the scale of profits or accurate monetary value of drug markets. Rather, these authors have used proxies like drug production (Angrist and Kugler 2008; Mejía and Restrepo 2013), or shortages of cocaine supply (Robles, Calderón, and Magaloni 2013; Castillo, Mejía, and Restrepo 2014). The principal advantage of using these variables is that it releases scholars from the hefty burden of estimating the value of drug markets, as well as allowing them to sidestep all of its attendant limitations. Yet, simultaneously, these indicators are simply incapable of representing the full complexity of the economic dynamics of drug markets. For example, while the number of users may decrease in response to a drug prevention policy, total expenditure may actually increase because consumers may transition to heavier use, or because of an increase in supply, or even because of price hike (Kilmer and Pacula 2009). In a similar vein, an increase in seizures may not lead to a reduction in the total value of the market, because of a potential increase in prices. The process of cutting up the drug may also play a pivotal role in the cushion of supply reductions. Therefore, estimating the size of the market, both in terms of volume and expenditure, is critical if we are to truly understand the full impact of interventions intended to influence demand and/or supply (Kilmer and Pacula 2009, xi).

Moreover, while relatively few studies investigate the downsizing of markets, and those that do often fail to provide empirical evidence to support their theorising (Kleiman 2004; Reuter 2009), the

majority of indicators, including cultivation of coca plants, seizures of cocaine, and estimates of prevalence suggest that, on the whole, the cocaine market is in decline (UNODC 2015l). Since cocaine markets are the single most violent of all of the illicit markets, exploring this dynamic is now of critical importance (Bean 2008; UNODC 2013d).

Integral to the understanding of the relationship between the value of drug markets and violence is a rigorously informed estimate of the economic dimension of drug markets. Given that cocaine markets constitute the principal focus of this study, the following subsection presents a series of studies that provide estimates of its overall value.

I.2.2.1 The monetary value of cocaine trafficking

The illegality of the drug industry makes it difficult to estimate its true size and value (Reuter and Greenfield 2001; Thoumi 2002; 2005; Mejía and Posada 2008; Pedroni and Verudgo Yepes 2011). Scholars have utilised data from a multitude of sources, such as interviews with dealers and traffickers, journalist reports, overdose data, satellite photos of coca fields, police statistics, declared prices, and other sources in order to assess the economic dimension of specific sections of the illicit drug industry (Reuter and Greenfield 2001; Thoumi 2005; UNODC 2015f). Nonetheless, estimates of the profits generated through international cocaine trafficking are altogether rare.

Difficulties in calculating the overall value of drug markets begin immediately when trying to evaluate the amount of available cocaine in the market, and persist through every other step of the process (Mejía and Posada 2008). In fact, assessing the value of drug markets is so challenging that researchers from the International Narcotics Control Board (2002) assert that estimates of the monetary value of illicit drug production and trade simply cannot be conducted accurately. Any estimates, at best, can only provide an idea of the magnitude of the short-term and long-term impacts of drug trafficking on economies (INCB 2002). Indeed, most of the commonly cited figures refer to total revenues at the retail level (Reuter and Greenfield 2001), and, as such, fail to cover either the earnings of the international cocaine trade, or any associated costs. Therefore, they cannot account for the overall profits of the drug trafficking industry. Work which does attempt to estimate the profits generated by drug trafficking are rare to say the least. Focusing on cocaine, even in the countries where the problem is more pressing, such as Colombia, Mexico and the US, the number of studies which aim to quantify the economic dimension of the business are scarce. The paucity of studies is even more acute in the case of countries which hold peripheral positions within international cocaine trafficking. In a similar vein, research which attempts to estimate international revenues are also rare (UNODC 2011a).

Finally, very few studies take into consideration the temporal evolution of profits or turnover generated from cocaine trafficking. This has the pernicious effect of favouring the production of unreliable estimates, which are published with the justification that in this field any estimate is as good as any other (Steiner 1998). On the contrary, reliable estimates provide invaluable information about the scale of the drug trade, both nationally and globally, and cast a light on the value added across countries and along each step of the supply chain (Reuter and Greenfield 2001).

The lack of economic estimates on drug trafficking reverberates in empirical analyses of the drug/violence nexus. As discussed in the previous subs-section, studies investigating the relationship between market dynamics and violence have used proxies like coca cultivation or seizures as indicators of trafficking, without being able to measure it in terms of profits. More rigorous information is critical for attempts to develop theoretical analyses and implement more effective countering policies (Reuter and Greenfield 2001; Kleiman 2009).

Understanding whether a market is expanding or contracting, if it is worth thousands, millions, or billions of dollars, or if it accounts for tens or hundreds of metric tons is integral to both expanding our theoretical knowledge about the functioning of illicit markets, and properly evaluating the impact of drug reduction policies (Ousey and Lee 2007; Castillo, Mejía, and Restrepo 2014; Giommoni 2014; Kilmer et al. 2014). As stated by Kleiman (2010), in reference to arrests, it is not possible to measure the effectiveness of law enforcement in terms of number of arrests; rather, one must construct some adequate measure for the number of arrests per volume of drug sold. Similarly, if one hopes to understand the impact of border patrolling, then it is expedient to have an idea of the amount of drugs pouring into the country in the first place (Kilmer et al. 2014).

Over the last thirty years, policymakers, and both national and international institutions have taken an increased interest in quantifying different dimensions of the illicit drugs market (Walker and Unger 2009; Boivin 2011; Chandra, Barkell, and Steffen 2011). This afforded the estimate of the size of the markets, both in terms of consumption and supply of drugs, as well as in terms of revenues (J. Walker and Unger 2009; UNODC 2011a; Kilmer et al. 2014). Within the literature, one can find various quantifications pertaining to the value of the cocaine market within specific developed countries, particularly the U.S. (Rhodes and McDonald 1991; Rhodes et al. 1997; Bramley-Hanker 2001; Reuter and Greenfield 2001; ONDCP and Abt Associates 2001; 2008; 2012; Kilmer and Pacula 2009; Kilmer et al. 2014; Department of State. The Office of Website Management 2015), but also Canada (Kilmer and Pacula 2009), Australia (Ryan and Griffiths 2013), and several European countries (e.g., Pudney et al. 2006; Kilmer and Pacula 2009; Giommoni 2014; 2015; EMCDDA 2015; Palomo, Márquez, and Laguna 2016).

Although researchers' attention has primarily been focused on consumer markets, estimates have also been produced for Colombia (Bagley 1988; Kalmanovitz 1990; Thoumi 1995; Clawson and Lee 1996; Rocha 1997), Bolivia (Nadelmann 1989; De Franco and Godoy 1992; Shams 1992; Painter 1994), and Peru (Shams 1992; Thobani 1992; Alvarez 1995; Pedroni and Verdugo 2011), the three main producers of coca leaves in the world (UNODC 2010c), in addition to Mexico (Resa Nestares 2003; Barro and Sala-i-Martin 2004; Rios 2008; Latin American Commission on Drugs and Democracy 2009; Kilmer et al. 2010; UNODC 2012). Estimates for these countries have especial relevance for this study, because they deal with the problem of quantifying the monetary value of the production and trafficking of cocaine. In contrast, studies on those countries where consumption is the main issue tend to concentrate on estimating revenues at a retail level.

The first studies which aimed to quantify the economic dimensions of drug trafficking tended, broadly speaking, to concentrate on Colombia; Bagley (1988), for example, is among one of the first to present estimates of the revenues from drug trafficking in the country, indicating that revenues from the traffic of cocaine and marijuana were around 1.5 billion of USD at the beginning of the 1980s and between 2.5 and 3.0 billion at the close of the decade. Two years later, Kalmanovitz (1990) also quantified the monetary value of cocaine trafficking in Colombia. According to his estimation, Colombian cocaine traffickers were able to invest around 2 billion USD per year during the decade 1980-1990. Including gained interests, he argued that their capital accounted for almost a third of the total Colombian wealth in 1990. Subsequently, Thoumi (1995) uses Kalmanovitz's figures and compares them with official data about private investments in Colombia, in an attempt to illuminate the extent of the influence that this illicit capital has on the national economy. In 1997, Rocha (1997) makes a substantial contribution to this field of research by estimating Colombian net cocaine revenues across different scenarios and across time. Rocha's estimates of the Colombian drug industry encompass a broad range of figures: between 161 million and 3.96 billion of USD in 1991, from 331 million to 3.32 billion in 1992, from 357 million to almost 3 billion in 1993, and from 194 million to 2.62 billion USD in 1994. The relevance of Rocha's contribution does not derive solely from the serial estimate of the value of the market, but, rather, from his capacity to highlight both the ambiguity of available estimates and the profound difficulty in producing them. Rocha's work thus calls for a scrupulous review of the methodology underpinning the available estimates, allied with exercising tremendous caution when dealing with the estimates themselves. In a subsequent study on Colombia, Thoumi (2002) expands the research field to include the spill over of illicit capital within the legal economy, and address the consequences of drug trafficking on economic development. Thoumi stresses that capital deriving from drug trafficking has infiltrated countless licit activities, particularly the real estate industry. Despite the steady flow of illicit capital into these businesses, his study indicates that the Colombian economy has not been a beneficiary of its deep involvement in all of the

illicit traffic. More specifically, when the traffic first began to flow, its short-term effects on development were largely positive, but in the medium to long-term they have been mostly negative. Indeed, GNP's rate of growth between the explosion of the drug-economy at the beginning of the eighties and the end of the nineties was around 3.2 %, in contrast to 5.5 % over the preceding three decades.

It is predominantly at the beginning of the nineties also that the number and complexity of economic estimates for the drug industry in Bolivia began to emerge. De Franco and Godoy (1992) are among the first to provide a detailed estimate of the added value of cocaine production in Bolivia. Beginning with the cultivation of coca plants, they go onto consider several steps, and, by combining volumes and values, place the value of the export of cocaine from Bolivia at around 1.5 billion USD in 1987 and 700 million USD in 1989. According to the authors, a decline in the international price of cocaine is the principal explanation for the decreased value of cocaine production that occurred during the two year period. Shams (1992) estimates that the total value of exported cocaine in Bolivia was about 600 million USD, which accounts for the impressive figure of 75% of official Bolivian export earnings. These figures confirm others produced at the time by the Government of Bolivia, which were cited in Nadelman (1989). In 1994, an edited collection by Painter (1994) presents an extensive account of multiple aspects of the cocaine industry in Bolivia. The chapter entitled *The Coca-Cocaine Economy* posited that total revenues in the country rose from about 250 million USD in 1986 to almost 700 million four years later.

Much like the case of Bolivia, literature seeking to quantify the economics of the cocaine industry in Peru also expanded at the beginning of the nineties. Shams' (1992) work was seminal in this regard. He estimated the flow of money entering Peru in exchange for coca derivatives to be around 800 million USD a year. Alvarez (1995) provides even higher figures; indeed, she places the value of exports of coca base and cocaine to be somewhere between 23% and 40% of the Peruvian licit exports, arguing that the years 1993-94 corresponded to 0.9-1.6 billion USD (Steiner 1998). Thobani (1992) conceptualises this in terms of coca cultivation and processing as opposed to exports, and estimates that they contribute to the Peruvian GNP to the tune of 550 million USD in 1991. Using UNODC data, Pedroni and Verudgo Yepes (2011) provide an annual estimate of the gross added value of illegal coca leaf and derivatives production during the period of 2001 to 2009. According to the authors, the gross added value of the production of cocaine and derivatives increased from 184,651,000 USD in 2001 to 504,342,000 USD in 2009. The authors adopt a supply-side approach to construct their estimate of GDP equivalents of illegal coca and coca derivatives production, and consider three different coca derivatives (e.g., coca paste, washed coca paste, and cocaine) in addition to raw coca leaf. For each

product, their estimates correspond to the estimated volume of production time and price per ton, subtracted by the cost of intermediate products.

With time, the interest of scholars in the cocaine market in Mexico has grown enormously (see for example Freeman 2006; Brophy 2008; Carpenter 2010; Felbab-Brown 2009; Rios 2013). However, quantification of profits from cocaine trafficking are not as readily available as one might expect after our discussions above. One interesting study is conducted by Resa Nastares (2003), who measures the profits of the Mexican drug industry between the period of 1961-2000 through a demand-based model. Resa Nastares (2003) takes into consideration prices, potential losses due to seizures, and demand for illicit drugs in the US, Europe, and Canada. An increased demand for drugs in the United States and Canada in the eighties swelled the value of Mexican illegal drug exports. At its peak at the end of the eighties, illegal drug exports accounted for around 10 billion in 2000 USD. Nastares' analysis yielded an estimate of profits deriving from the export of drugs to be around 3 billion USD in 2000, of which 2.5 of that came from cocaine.

A further estimate is put forward by Rios (2008). She performs an economic analysis on the impact of Mexican narcotrafficking prior to 2006, using findings gathered from extant literature. The author purports that, according to available estimates, drug trafficking generates around 2.8 billion U.S. dollars per year that is then distributed among those involved in the industry. A portion of this profit is subsequently reinvested into the Mexican legal economy generating a cash flow of 2.5 billion USD annually. Her conclusion is that, even if prior to 1999 drug cash flows and investments exceeded the related costs, subsequent drug trafficking has led the country to lose around 4.3 billion USD per year.

Kilmer and colleagues (2010) are interested in the potential effects of the U.S. legalizing marijuana on the level of violence in Mexico. To enable a better understanding of this dynamic, they estimate the gross revenues for Mexican organized crime groups exporting cocaine, heroin, marijuana, and methamphetamines. The starting point for their estimate is the value of the retail market for cocaine in the U.S. The idea is to divide this value, which is estimated at 30 billion USD, by the purity adjusted retail price of a kilogram of cocaine. Then, by dividing wholesale purity, they obtain the total imported volume of wholesale purity. After multiplying this by the price of cocaine when entering the US, the authors obtain the total export revenue. The result of this calculation is 4.3 billion USD, and the share entering from Mexico is approximately 80% of that total. Therefore, the value of Mexican exports to the U.S. is 3.4 billion USD per year (Kilmer et al. 2010). The authors measure this in terms of gross revenues because, in their opinion, there is no data which permits reliable estimations of profits.

In expanding this review to studies which focus on countries where the central issue is drug consumption rather than cocaine production and trafficking, two publications stand out above all. The first, edited by Kilmer and Pacula (2009), marks one of the only attempts to develop an original

methodology through which to estimate drug expenditure and consumption in nine different countries located across North America and Europe. The second study, by Kilmer and colleagues (2014), provides invaluable insights into the complexity of patterns of cocaine consumption. Moreover, by drawing on previous studies promoted by the ONDCP (Rhodes and McDonald 1991; Rhodes et al. 1997; ONDCP and Abt Associates 2001; ONDCP 2008; 2012), they propose one of the most rigorous estimates of cocaine expenditure across time.

Scholars from the RAND Corporation estimate that the U.S. final market for drugs, including cocaine, heroin, marijuana, and methamphetamine, has accounted for about 100 billion USD annually between the period 2000-2010 (Kilmer et al. 2014). While, at least at the beginning of the decade, cocaine was considered to be the single drug with the most valuable retail market, over time the market for marijuana actually emerged as the largest (Kilmer et al. 2014). Kilmer and colleagues estimate that cocaine expenditure contracted by a half during the period 2000-2010, due, in part, to diminishing numbers of addicted consumers, meaning that the value of the retail market of this substance went from about 55 billion USD in 2000 to 28 billion USD in 2010. These authors go to great lengths to detail how uncertain and imprecise these estimates might be: in 2000 they estimate a possible range of 46 billion USD (37-83), while in 2010 their estimated range spans between 18 and 44 billion USD.

The study developed by Kilmer and colleagues (2014) concentrated on consumers' expenditure, which, of course, is different from the overall margins emerging from drug trafficking. However, its real significance stems from the methodology they adopted to reach these figures and, more specifically, from the relevance these authors attribute to the difference in patterns of use among four different categories of users (e.g., light (one to three days), medium (four to ten), heavy (11 to 20), and daily/near-daily (21 or more). The same authors assert that it is not only purchasing patterns themselves, but, rather, also the cost of purchases which differs across these respective user groups (Kilmer et al. 2014); moreover, they assert that, despite not being strictly necessary from an analytical point of view, differentiating among types of consumers can help us better understand the underlying reasons for changes in the value of drug markets over time.

With few exceptions, scholars have predominantly estimated revenues either from cocaine retail distribution or from international drug trafficking, with the analytical focus upon one or the other dimension mostly depending on the particular country of interest, as seen in the previous sub-section. Studies conducted in coca producing countries tend to estimate the monetary value of international drug trafficking, while studies focusing on final destination markets are more likely to concentrate on the retail level of the business. Very few estimates are cross-sectional (e.g., Kilmer and Pacula 2009), and there is a dearth of longitudinal estimates (e.g., De Franco and Godoy 1992; Rocha 1997; Resa

Nestares 2003; Pedroni and Verudgo Yepes 2011; Kilmer et al. 2014). Further to this, it is uncommon that research takes into account different levels of the drug market (e.g., Reuter and Greenfield 2001), while research that focused on added value rather than revenues is scarce at best (e.g., De Franco and Godoy 1992; Reuter and Greenfield 2001; Pedroni and Verudgo Yepes 2011). Above all, no research considers all of these elements simultaneously. Trafficking in cocaine is a global phenomenon characterised by important national specificities, temporal variation, a strong orientation toward profit, not to mention that it concerns a series of national and international transactions (Trumbore and Woo 2014). Consequently, it is worth including all of these features so as to better apprehend the economic aspect of cocaine markets.

The review of the literature also emphasises the necessity to scrupulously manage some of the inherent weaknesses of the available data. For example, as Thoumi (2005) points out, a fundamental conclusion of Rocha's studies is the stark need to produce ranges of possible values rather than punctual estimates. Both prior to and subsequent to Rocha's work, a veritable host of authors have highlighted the issue of mythical numbers which afflicts academic studies on illicit markets generally, and drug markets even more acutely (Reuter 1984; Reuter 1986; Fischer 1995; Thoumi 1995; Cook, Ludwig, and Hemenway 1997; 2005; Kleiman and Smith 1990; Naik et al. 1996; Caulkins and Reuter 1998; Reuter and Greenfield 2001; Calderoni 2014; Savona and Calderoni 2016).

Emerging out of all of these studies is a pressing need for estimates that are held together by more transparent, robust, and self-critical methodologies. Difficulties in providing reliable estimates of the gross value added in relation to cocaine markets, in particular, are manifold and pronounced. Seeking to account for the international dimension of the phenomenon makes the challenge even harder yet still (Reuter and Greenfield 2001; Thoumi 2002; INCB 2002). However, these kinds of data would be extremely valuable to ongoing attempts to design better and more effective drug trade countering policies (Reuter and Greenfield 2001; Mejía and Posada 2008; Kilmer and Pacula 2009).

I.2.3 Structural and cultural theories of violence

Classic, structural criminological theories provide the theoretical frameworks for the majority of aggregate-level cross-sectional and cross-national studies of violence rates (Parker, McCall, and Land 1999; Ousey 2000; McCall and Nieuwbeerta 2007). Indeed, structural theories are applied to investigate macro relations at aggregate levels of analysis (Miethe, Hughes, and McDowall 1991; Anderson 2014). Even today, the majority of studies seeking to explain differences in violence rates across countries, as well as the drug/violence nexus, either explicitly or implicitly draw upon the rich tradition of sociological and cultural theories of crime (Brookman 2005; Seddon 2006; Bello Montes

2008; Wright and Jacques 2010; Castillo, Mejía, and Restrepo 2014). With this in mind, this review provides a précis of the most prominent sociological theories of crime and violence.

Structural approaches to criminology originally emerged in the U.S. during the 1920s and 1930s and coincided with the emergence of the Chicago School of Criminology and, more specifically, the application of its explanation of human conduct to the study of city, crime, and delinquency - albeit without necessarily exclusively focusing on violence. Although far from being perfect, structural theories have had, and continue to have, a profoundly unique impact on the way in which we think about violence and homicide (Krahn, Hartnagel, and Gartrell 1986; Lilly, Cullen, and Ball 1989; Gartner 1993; Ousey 1999; McCall and Nieuwbeerta 2007; McCall, Parker, and MacDonald 2008; Zembroski 2011; Favarin 2014).

These theories include social disorganization theories (Park, Burgess, and McKenzie 1925; Sutherland and Cressey 1934; Wirth 1938; Shaw and McKay 1942), inequality theories (Merton 1938), subcultural theories (Cohen 1955; Cloward and Ohlin 1960), and developmental life-course theories (Glueck and Glueck 1950; Wolfgang, Figlio, and Thorsten 1972; Blumstein et al. 1986). Within this structural framework, authors have identified various economic and social factors, such as demographics, ethnic diversity, education, income, inequality, deterrence that contribute to structural explanations for violence (Gurr 1981; Gaviria 2000; Miron 2001).

I.2.3.1 Social disorganization theory

Beginning in the early 1900s, sociologists at the University of Chicago published a series of studies about life in Chicago. Under the guidance of Park and Burgess, these studies were designed to lend support to the viewpoint that problems such as crime and delinquency resulted from social disorganization (Land, McCall, and Cohen 1990; Brookman 2005; Barlow and Kauzlarich 2010). Social disorganization theories, then, assume that crime and delinquency emerge when there is a breakdown in social control (Bursik 1988; Miethe, Hughes, and McDowall 1991). The paradigmatic hypothesis of these structural theories is that community-level characteristics and a commitment to social rule are capable of altering the functioning of social control networks, such as community attachment, anonymity, and social surveillance. In turn, the weakening of these functions of society would cause an increase in the level of deviance, crime, and violence (Kornhauser 1978; Sampson 1987; Land, McCall, and Cohen 1990). Members of the Chicago School believed that the dissolution of social control resulted from ecological changes, like rapid population changes driven by social mobility and migration (Barlow and Kauzlarich 2010). Of course, the classical sociologists such as Weber, Marx and Engels, and especially Durkheim had already extensively theorised how the transition from more traditional societies to industrialized societies radically transformed human

behaviour and social ties. According to those thinkers, an important consequence of this transformation is the gradual erosion of traditional social institutions and their replacement with modern, formal ones.

Durkheim, much like Marx and Engels before him, saw in the division of labour and the increased fragmentation of society the rudiment of crime and violence (Bernburg 2002; Zembroski 2011). However, Durkheim shifted his analytical gaze on the deterioration of the society from the economic order to the moral order. That is to say, in a society without a complex division of labour, the mechanical solidarity shared by people operates as a form of social glue. In what Durkheim called segmental societies, all of its members would tend to react in a similar manner to problems; this shared sense of norms provides objectivity, scale, unanimity, and solidity to moral responses, which are concretized in the effective disapproval and repression of deviant behaviours. The emergence of a complex division of labour inculcated such a profound transformation of social relationships, to the point that only an external entity such as the State could bind society together (Maguire, Morgan, and Reiner 2007; Zembroski 2011).

According to Durkheim (1893), in industrialized societies individual differences become striking, traditional social controls weaken, and three potential abnormal forms of the division of labour emerge. The author labels as “anomic” the principal of these abnormal forms of labour and considers 1) not integrated work functions, 2) a conflicted relationship between labour and capital, and 3) an exponential specialization of tasks to be its primary characteristics (Zembroski 2011). When there is an anomic division of labour, it is power and socio-economic status, rather than personal skills and individual efforts, which underpins the division of tasks. In such circumstances, the division of labour fails to generate normative consensus, and a state of anomie manifests from the resulting failure to create satisfactory relationships between members of the given society (Durkheim 1893). The belief that people living in societies transitioning towards capitalism were trapped in a society with little or no moral legitimacy and partial control over their own desires became theoretical doxa among criminologists (Maguire, Morgan, and Reiner 2007). According to Lilly, Cullen, and Ball (1989, Durkheim’s identification of abnormal forms of the division of labour and the collapse of the moral order as underlying reasons for the breakdown of society and the growth of crime forms the basis of structural functionalist criminology.

The work of the first generation of authors out of the Chicago School of Criminology during the late 1920s and 1930s provided the inspiration for Shaw and McKay to formalize their theory of social disorganization (Brookman 2005). Among these various studies, the most important are those by Park, Burgess, and McKenzie (1925) who, through using a social ecological model, studied the ways in which communities evolve and grow (Zembroski 2011). The ecological approach to criminology

assumes that the organization and design of space in which human conduct takes place profoundly influences the distinctive patterns of conduct themselves (Watts, Bessant, and Hil 2008).

Consequently, ecological theories aim to explain variations in levels of violence in terms of the different incentives, pressures, and deterrents that individuals come across in their immediate environments (Kelly 2000; Almeida, Haddad, and Hewings 2005). The link between criminal and violent behaviours and space is pivotal within Park and Burgess' studies (Watts, Bessant, and Hil 2008); indeed, these authors do not even focus on criminals, but, rather, on the geographical locations of crimes. This perspective leads the authors to assert that crime and violence are socially patterned, and that they develop naturally in concentric zones. From within their perspective, it is the urban environment itself that shapes human behaviour and "the social and spatial characteristics of life in the urban environment provides an ecology which makes possible specific activities like crime" (Watts, Bessant, and Hil 2008). It is important to note that Park and Burgess are not the only scholars in the Chicago School whose work addresses the study of cities. Subsequent to their seminal work, Wirth (1938), the father of urbanism, observed that the transformation of the urban social environment is associated with an increase in both the anonymity of people and in the superficiality of interpersonal relations. The process produces alienating environments, which crushes shared cultural understandings, and leads to the spread of a multitude of issues, violence being chief amongst them (Wirth 1938).

Shaw and McKay (1942) adapted the work of the Chicago School criminologists when proposing their theory of social disorganization. They observed persistently high crime rates in certain neighbourhoods in Chicago over long periods. In particular, they noted that changes in the population and ethnic composition of these areas did not influence crime rates. In 1942, they published *Juvenile Delinquency and Urban Areas* in which they expanded upon their earlier analysis of Chicago, corroborating those findings with similar patterns in the distribution of crime across 21 U.S. cities. In an attempt to explain their findings, the scholars theorized that the ecological conditions of the neighbourhood influence the level of criminality more than the individual characteristics of any of its inhabitants. Shaw and McKay concluded that three urban conditions above all promote high delinquency rates: poverty, heterogeneity, and mobility. In particular, economic hardship diminishes the effectiveness of social controls and gives rise to deviant subcultures (Shaw and McKay 1942).

Social disorganization theory, much like other structural theories, fell out of favour in the 1960s before regaining momentum towards the end of the seventies (Kubrin and Weitzer 2003a; Barlow and Kauzlarich 2010). Consequently, authors have introduced and tested several significant additions to the original theory proposed by Shaw and McKay (Pratt and Cullen 2005; McCall, Parker, and MacDonald 2008). From a social disorganization perspective, researchers studied the validity of a

growing number of social dimensions in determining different levels of crime and homicides (McCall, Parker, and MacDonald 2008). Scholars have extensively investigated the role of socio-economic status (Quinney 1966; Hunter 1974; Bursik 1988; Bursik and Grasmick 1993), ethnic heterogeneity and/or segregation (Guest and Weed 1976; Wilson 1987; Massey 1990; Peterson and Krivo 1993; Sampson and Wilson 1995), population mobility (Warner and Pierce 1993), collective efficacy (Sampson and Groves 1989; Sampson, Raudenbush, and Earls 1997), transformation in family structure (Gartner 1990; Land, McCall, and Cohen 1990; Kennedy, Silverman, and Forde 1991; Breault and Kposowa 1997; Pratt and Cullen 2005), formal and informal controls (Coleman 1990), and mechanisms of trust (Browning 2002; Kubrin and Weitzer 2003) as determinants of different levels of violent crimes. These determinants of violence are not mutually exclusive; rather, they integrate and complete each other.

The focus of these studies is the criminal dynamics at play within community and neighbourhood levels (Kubrin and Wo 2016). However, both criminologists and sociologists generally assert that collective dynamics also affect individual behaviours and vice versa (Durkheim 1984; Schoepfer and Piquero 2006). Consequently, an extensive corpus of research has utilised the key concepts of social disorganization theory in order to study and compare larger aggregations, such as cities (Humphries and Wallace 1980), states (Kennedy et al. 1998), and countries (Loftin and Hill 1974; Smith and Parker 1980; Land, McCall, and Cohen 1990).

I.2.3.2 Inequality theories

Almost all of the behavioural and social sciences developed some form or another of inequality theories (Marx 1859b; Merton 1938; Cohen 1955; Becker 1968). In general, inequality theories explain violence by showing how inequalities, including privilege, hierarchies, discrimination, and oppression permit people to abuse, exploit, and generally take advantage of those labelled as socially inferior. In contrast, inequality pushes people in lower social positions to react against their status and act out on the frustrations induced by inequality (Barak 2006, 139–40).

Most of these types of explanations of violence are grounded in the political economy of private property and capitalist development (Iadicola and Shupe 2012). The unequal distribution of opportunities for example, forms the cornerstone of Merton's thought, whilst the social disorganization theory of Shaw and McKay (1942) correlates poverty and crime (Blau and Blau 1982). Indeed, all of the disciplines that make up the social sciences have explicitly or implicitly developed theories of inequality to explain the genesis of violence (Barak 2006). Although Karl Marx himself never proposed a complete theory of crime, he does refer to the problem of crime and the issues of law and social control in several of his writings, which, of course, gives a prominent role to inequality

(Marx 1853; 1859). Becker's (1968) economic theory of crime predicts that inequality increases crime rates and violence. Cohen (1955), as well as Henry and Short (1964), support Merton's thesis that relative deprivation and blocked opportunities are important determinants of crime and delinquency.

Although scholars connected with the Chicago School correlate poverty and crime, their studies do not, in fact, specifically address the issue of economic inequality. Following in the tradition of both Marx and Durkheim, Merton (1938) sees the manifold pressures stemming from American capitalist society as the main determinants of crime and deviance. While the Chicago School authors assumed that absolute deprivation and rejection of conventional middle-class values resulted in high rates of crime within urban communities, Merton is the first to explicitly investigate the specific role of relative deprivation and economic inequality (Blau and Blau 1982; Wortley 2008). Merton's strain theory suggests that the distribution of opportunities is unjust among the respective classes within the social structure, and it is this imbalance that ultimately leads to deviance and violence (Merton 1949). Focusing on the American context, Merton (1938) observes that, despite the widespread belief in the possibility of upward social mobility, the social structure itself actually inhibits the lower classes from achieving economic success through legitimate means. The impossibility to reach the goals set by society and to gain socially desirable status symbols frustrates people; the success of those around them makes this failure yet more exasperating still. Consequently, unsuccessful individuals develop strain that might lead to them committing crimes (Merton 1938).

Merton's strain theory rose to prominence in the 1950s and 1960s, both theoretically and empirically, whereby it was applied to a variety of deviant behaviours, before becoming partially neglected during the following decade (Wortley 2008). Yet it entered a period of resurgence when economic hardship afflicted American urban areas throughout the 1970s and into the 1990s. During this period, the influence of economic hardship and economic inequality on violence again assumed central stage in theoretical frameworks within criminological research (Blau and Blau 1982; Messner 1982a; Messner 1983a; Messner 1983b; Bailey 1984; Land, McCall, and Cohen 1990; McCall, Parker, and MacDonald 2008). During this period, criminologists not only adopted Merton's theory but also expanded upon it and criticized it as well (Wortley 2008).

Cohen (1955) was among the first to reformulate strain theory so that it could include elements of cultural transmission and differential association. Cloward and Ohlin (1960) applied strain theory to the study of youth gangs, positing that delinquency depends not only on blocked legitimate opportunities, but also on available illegitimate opportunities for becoming successful. Blau and Blau (1982) also expanded Merton's (1938) strain theory by arguing that socioeconomic inequality between ethnic groups and economic inequality in general are key explanations for metropolitan violence, above and beyond poverty per se. Following Blaus and Blaus' contribution (1982), Messner (1982a;

1983a; 1983b), Bailey (1984), and Messner and Rosenfeld (1997) also discussed the relevance of inequality and poverty as determinants of homicide rates within cities, metropolitan areas, and nations. Other research, such as that of Elliot and colleagues (1979), and Agnew (1992; 2001), have tried to generalize strain theory by suggesting that the failure to achieve a variety of goals, as opposed to simply wealth, could also generate strain (Brookman 2005). Autonomy and social status among males who seek to be treated as real men are examples of such goals. Taken together, the findings of these studies underline the expedience of both inequality and strain theories for explaining criminological dynamics (Brookman 2005).

The evolution and expansion of strain theory has also involved multiple critiques, the most prominent of which comes from Hirschi (1969), who counterpoised strain theory with his social control theory. Further critiques came from Kornhauser (1978) who was in favour of social control and social disorganization theory, as well as Land, McCall, and Cohen (1990) who questioned the possibility of disentangling the specific effects of absolute and relative deprivation. In their extensive analysis of the determinants of homicide rates across American cities, metropolitan areas, and states at the beginning of the 90s, Land and his colleagues (1990b) questioned the possibility of disentangling the specific effects of absolute and relative deprivation, due to the usual collinearity between the two phenomena.

Strain theory is perhaps the most influential theory of inequality among criminologists; however, as aforesaid, scholars who embrace Marxian theories of violence have also emphasised the integral role of inequality in explaining differences in crime rates across areas (Antonaccio and Tittle 2007). Marx's general idea is that fundamental structural features of the economic system generate inequality, which, in turn, affects societal levels of crime (Greenberg 1993; Hagan 1994). Marx (1859a), in his *Population, Crime, and Pauperism*, states: “There must be something rotten in the very core of a social system which increases its wealth without diminishing its misery, and increases in crimes even more rapidly than in numbers”. According to Bonger (1916), who adopts a Marxist perspective with respect to crime, exploitation and systemic oppression of the poor, allied with the greed inherent to capitalism, are the first cause of crime. The greed and exploitative nature of social relations emerge as a result of the capitalist transformation of labour from use-value to exchange-value. The moment in which we produce more than required marks a distinct turning point in this process. This production of surplus value encourages greed, and at the same time collides with both the traditional social instincts of man and his original comparative character. This dynamic does not only explain deviance and the recourse to violence amongst the lower classes; rather, it also explains crimes committed by the industrial bourgeoisie (Bonger 1916). Following in this Marxist tradition, authors such as Gordon (1971) posit that, in capitalist society, crime is not pathological but rational. Therefore, the radical

change of the relations of production specific to the capitalist system can lead to a significant reduction in the level of crime. Quinney (1974) adopts a similar position, arguing that the contradictions of capitalism which result in a primitive form of insurrection against oppression by the ruling hegemony are the primary determinant of crime. Expanding Gordon's analyses, McDonald (1976) adds that economic and political inequalities are not the only key source of crimes, but, rather, they are a key factor underpinning the shaping of criminal laws, its enforcement, and, consequently, the tangible patterns of criminal behaviours.

Inequality finds a place even in the economic theory of crime as originally conceived by Becker (1968) and subsequently developed by Ehrlich (1973), Block and Heineke (1975). These authors applied a state preference approach to the study of crime and posited that, subsequent to considering the likelihood and severity of punishment, individuals evaluate the expected return of their participation in legal and illegal activities. After doing so, they then allocate their time between the two with the intention of maximizing their utility. Inequality influences this dynamic in two respects: on the one hand, the lower the yield expected from legal activities, the more likely people are to turn to crime; and on the other hand, incentives for delinquency increase in conjunction with the wealth of those who it is possible to victimize. Empirical tests of these theories have for the most part corroborated its central tenet. However, within these models, inequality appears to be more closely correlated with appropriative crimes than violence per se.

As discussed above, theories of inequality in general and strain theory in particular have largely been adopted by scholars interested in explaining differences in the level of homicides across areas (Braithwaite 1979; Messner 1982a; Bailey 1984; Krahn, Hartnagel, and Gartrell 1986; Neuman and Berger 1988; Messner and Rosenfeld 1997; Kelly 2000; Fajnzylber, Lederman, and Loayza 2002b; Poveda 2011). Yet even within the specific context of drug related violence, the etiological power of income and social inequality and the direction of the causality between drug trafficking and violence are still hotly debated, especially among scholars studying drug producing and trafficking countries (Zaluar 2001; Demombynes 2011; Enamorado et al. 2016).

I.2.3.3 Violent subculture theories

As with other socio-cultural theories of crime, cultural explanations for violence emerged during the 1930s in the works of American delinquency theorists, who were interested in the concentration of violence within deprived, urban, African-American neighbourhoods (Wortley 2008). Sellin (1938), Cohen (1955) and Miller (1958) were some of the early pioneers in developing the concept of a criminal subculture, which, following in the tradition of structural theories, they rooted in societal problems, such as absolute and relative deprivation. In the proceeding decades, criminologists have

elaborated a multitude of subcultural explanations of crime and violence. Already in 1960, Yinger (1960) flagged up the extensive use of the concept of subculture in the analysis of delinquency, and other social phenomena. Despite some underlying differences, all subcultural theories of violence and crime assert that violence and crime are the result of socialization and the specific learned values of a subculture that, ultimately, cultivates deviant attitudes and behaviours rejected by mainstream culture (Brookman 2005; Maguire, Morgan, and Reiner 2007; Zembroski 2011). The influential tradition of subcultural theories may have had its apogee in the U.S. during the 1940s and 1950s, but it was only from the late 1960s onwards that youth subcultural studies began to focus its attention on the intimate connection between violence, ethnicity, and poverty (Burke 2009). Even at this historical juncture, the spread of a culture of violence continues to be a stock concept for explicating violent dynamics and violence rates, especially within drug trafficking contexts (Rupesinghe and Rubio 1994; Zaluar 2000; 2001).

Cohen (1955) moved beyond Merton's strain theory for the dual-purpose of finding an explanation for the rise of delinquent subcultures, and to understand how they interact with the social structure (Carrabine et al. 2009; Zembroski 2011). By observing deviant youth subcultures, Cohen argued, contra Merton, that juvenile offending was rarely the consequence of frustrated aspirations for financial success (Burke 2009). Youths growing up in lower-class families tend to follow different socialization processes; on the whole, they have different values and education than their middle class counterparts. Consequently, it is harder for them to match up to the criteria set by the mainstream, respectable, status system and, henceforth, they drift toward a subculture of delinquency, gangs and violence (Cohen 1955). This new set of oppositional values provides them with the opportunity to gain alternative forms of status and respect to the middle-class norms they were taught to desire, which were destined to lay forever out with their grasp (Burke 2009; Shoemaker 2009). Cohen noted that despite the socio-economic stratification of societies, the norms and values of the middle class nevertheless tend to dominate and operate as the measuring stick against which to judge the success and achievements of everybody in society. However, young working class males, in particular, experience a different form of upbringing and socialization which impedes their ability to fully internalize these social values, and, as such, leaves them with a form of status frustration (Cohen 1955). Interaction with other men who suffer from the same profound disorientation may lead them to develop their own subculture with its attendant alternative norms and values. It is in this way that working class men can achieve social status through hedonism, crime, and violence (Burke 2009). Although praised in certain circles, Cohen's theory had just as many critics, most notably because of the difficulties he and his pupils ran into in when attempting to provide empirical support for his theory (Kitsuse and Dietrick 1959).

The subculture of violence theory developed by Wolfgang and Ferracuti (1967) is the first and most widely-known subcultural theory that deals specifically with violence (Brookman 2005; Wortley 2008). Wolfgang and Ferracuti (1967) observed that individuals from the lowest socio-economic social class are more likely to be involved in homicides. In accordance with Cohen's (1955) previous assertion, Wolfgang and Ferracuti (1967) posit that trivial insults and disputes account for a disproportionate number of violent crimes, including homicides. The authors explained that the vast majority of these aggressors share a value system, including an augmented sense of honour, courage, and manliness, which privileges the recourse to violence in the case of insults and torts. Within these subcultures, failing to respond aggressively to any sort of provocation or forgiving the aggressor would lead to denigration from one's immediate peer group (Burke 2009).

Though the subculture of violence theories were developed as explanations for the high levels of violence in socially disadvantaged communities, criminologists have modified this perspective to study other forms of violence (Wortley 2008). Dixon and Lizotte (1987), Cohen and his colleagues (1996), and Hayes and Lee (2005), among others, investigated how violent subcultures can help us understand differences in the level of violence in the North and the South of the US. Felson et al. (1994), Bernburg and Thorlindsson (2005), Ousey and Wilcox (2005), and Brown, Osterman, and Barnes (2009) looked at school violence in the United States and in Europe. Many authors have also widened Wolfgang and Ferracuti's (1967) original focus, and have attempted to verify the existence of an African-American subculture of violence (Cao, Adams, and Jensen 1997; Bruce, Roscigno, and McCall 1998; Anderson 1999; Brezina et al. 2004; Stewart and Simons 2010).

Other authors, such as Leyton (1995), have used subcultural theories to integrate and attempt to move beyond inequality perspectives. Leyton pointed out that structural factors, specifically inequality, are not sufficient in and of themselves for explaining the differences in homicide rates across different countries; indeed, some nations with low homicide rates, such as England, are riven by deep social and economic iniquities (Brookman 2005). However, from the thirteenth century onwards, England undertook a complex process of socializing its population, including the working-class. The transmission of non-violent ideals and behaviours within this process of socialization explains the low level of homicides in the country (Leyton 1995).

Finally, numerous researchers analysing drug markets and violence have observed the emergence of specific subcultures characterized by a rigid code of honour within the drug industry. More specifically, researchers have spotted the development of a specific value system, both in the final markets and among traffickers in large markets and transit countries (Anderson 1994; Castillo, Mejía, and Restrepo 2014).

I.2.3.4 Developmental life course theories

Developmental life-course theories aim to combine elements of the social environment, legitimate and illegitimate opportunities, along with factors related to life events at different ages (Blumstein et al. 1986; Adler, Laufer, and Mueller 2001; Farrington 2003; Zembroski 2011). Developmental life-course theories are thus integrated theories, inasmuch as they assume that an individual will adopt criminal behaviours due to a simultaneous combination of multiple social and individual factors. They thus refuse to explain delinquency in terms of a single main determinant, such as deprivation (Wortley 2008). Researchers who work within this perspective do acknowledge that these factors may have a causal influence on someone's involvement in criminal activity, but this may change across the life-course of the offenders (Farrington 2011). The most widely accepted findings emerging out of developmental life-course theories concern the age of delinquency. Typically, involvement in deviant and criminal activities has been shown to peak between late teens and early twenties, before precipitously declining during the late twenties and steadily decreasing throughout adulthood (Farrington 1986).

However, the relationship between age and crime is by no means a recent trend; Adolphe Quetelet (1831), over a century earlier, had observed that adolescents were more likely to be involved in criminal activities than older people. Despite the proliferation of early studies, it is only really during the seventies and the eighties, when most baby boomers were between 15 and 30 years of age, that scholars' interest in the age-crime nexus truly grew (Maguire, Morgan, and Reiner 2007; McCall, Parker, and MacDonald 2008). Consequently, studies which posited a positive association between a young population, crime, and violence multiplied during this period (Friday and Hage 1976; Greenberg 1977; Cohen and Felson 1979; Cohen, Felson, and Land 1980; Cohen, Kluegel, and Land 1981; Greenberg 1985; Cohen and Land 1987), as the relationship between age and criminal propensity become a pivotal one in criminological literature (Hirschi and Gottfredson 1983; Greenberg 2001; Kyvsgaard 2004; Maguire, Morgan, and Reiner 2007; Ulmer and Steffensmeier 2014). Indeed, Hirschi and Gottfredson (1983, 552) go as far as to suggest that no fact about crime is more widely accepted among criminologists. More specifically, criminologists widely recognize that young men commit the vast majority of violent crimes (Mesquida and Wiener 1996; Neapolitan 1997; Neumayer 2003).

Cohen and Land's (1987) findings that teenagers and young adults are not only more prone to criminality, but also have higher victimization rates adds a further dimension of complexity to the analysis of the crime-age relationship. In so doing, Cohen and Land's (1987) perspective moves beyond the theories of criminal opportunities and routine activities developed by Hindelang, Gottfredson, and Garofalo (1978), Cohen, Felson (1979), Cohen, Felson, and Land (1980), Cohen,

Kluegel, and Land (1981), and Cook (1986) among others. Scholars operating within this perspective explicate higher victimization rates among youths as deriving from their routine participation in risky lifestyles (Cohen and Land 1987; Land, McCall, and Cohen 1990).

Structural criminologists developed two main perspectives through which to understand the connection between age and violence (Maguire, Morgan, and Reiner 2007; Ulmer and Steffensmeier 2014). On one side of the spectrum, there are scholars who consider the age-crime relationship to be constant and universal in nature (Hirschi and Gottfredson 1983), whilst at the other side one finds authors who document variations in this relationship depending on historical periods, the particular society, and the nature of the crimes themselves (Greenberg 1985; Farrington 1986). Greenberg (1977; 1985) noted that, with the advent of the industrialization, the age-based demographics of crime changed markedly, which appeared to lend support to strain theory's explanation of this phenomenon. According to him, the disproportionate involvement of juveniles in major crime categories can be understood as a consequence of the historically changing position of juveniles within industrial societies.

Farrington (1986), in contrast, purports that, on the one hand, a decrease in parental control and power of peer pressure during adolescence, and, on the other, increased family and community controls during adulthood, are the primary explanations for the observed pattern of the age-crime curve. In contradistinction to this, Hirschi and Gottfredson (1983) posit that adolescent and young adults are more susceptible to involvement in criminal activities than their older counterparts regardless of the society and historical period. Authors following in the tradition of Hirschi and Gottfredson argue that the age distribution of crime is invariant with respect to social characteristics, and therefore it is simply not possible to explain it sociologically (Maguire, Morgan, and Reiner 2007; Ulmer and Steffensmeier 2014). Consequently, they consider longitudinal analyses of crime careers to be absolutely unnecessary (Ulmer and Steffensmeier 2014, 380).

When considered as a whole, these perspectives lead to the conclusion that those nations where youths account for a larger share of the population are more likely to have a greater number of potential offenders and potential victims, as well as higher homicide rates (Land, McCall, and Cohen 1990; McCall, Parker, and MacDonald 2008).

I.1 Relevance of the topic

Drug trafficking at all levels is now considered to be a key cause of violence, both in the case of trafficking countries and final markets. The following subsections provide a brief overview of cases of drug related violence. In the United States, levels of consumption of several psychoactive substances are among the highest in the world (UNODC 2016c). It is perhaps unsurprising, then, that the nascent literature investigating the drug/violence nexus was singularly focused on this country. The second subsection depicts the relationship between drug and violence in Colombia and Mexico, the two countries with the most lethal and protracted narcotrafficking related violence (Martínez Ortiz 2001; Rios 2013). The geographical shift from the U.S. to Colombia and Mexico coincides with specific shifts in focus in the study of drug related violence. Indeed, the explosion of violence in Colombia, a key cocaine producing country, and Mexico, the key drug supplier to the U.S. market, forced researchers to shift their analytical gaze from urban settings and drug dealing to large scale drug trafficking between countries. The subsection on Latin America and the Caribbean affords crucial insight into the pervasiveness of drug related violence in countries where drug trafficking has reached relevant proportions. Moreover, the focus on these particular countries also draws attention to the fact that cocaine trafficking is characterised by higher homicide rates than any other illicit market (UNODC 2016c). The final subsection provides evidence about episodes of systemic drug related violence in Europe, Asia, and Africa. This brief excursus on these particular countries is expedient for foregrounding the global nature of the relationship between drug markets and violence. At the same time, it lends anecdotal support to the notion that drug trafficking is a relevant determinant of differences in the level of violence across countries. These two concepts serve to reinforce the importance of conducting studies that both adopt broad approaches, and investigate these dynamics out with the American context.

United States

In the United States, the explosion of crack related violence cast light upon the problematic association between drugs and crime (Goldstein et al. 1989; Fagan and Chin 1990; Klein, Maxson, and Cunningham 1991; Blumstein 1995). Homicide rates rose at the end of the 1970s, peaking at 10.2 per 100,000 inhabitants in 1980; violence decreased in the first half of the 1980s before subsequently rising again and peaking in 1991, when the homicide rate was 9.8 per 100,000 inhabitants (Blumstein and Rosenfeld 1998). This proliferation of violence coincided with the apex of the crack cocaine epidemic, which served to make drug related violence a hotly debated issue within both academic and political debates (Reuter 2009; Powell 2011). The idea of a strong correlation between drugs and violence not only acted as a catalyst for the development of criminological theories; rather, it was also integral in designing America's stringent policies against both drug consumption and selling (Reuter

2009). This hard-line political stance on drugs, despite prolonged, high-profile critiques, remains the predominant paradigm within drug harm reduction policies (Reuter 2009).

While American literature is rich from a theoretical point of view, far less studies have tried to empirically examine the percentage of crimes that are drug related (Disney, Hayward, and LaVallee 2010). Goldstein, Brownstein, and Ryan (1992) followed a group of heroin users in New York City over a 15-year period, noting that a striking 40% of their sample died from homicide during that period of study. In their study, *Costs of alcohol and drug involved crime*, Miller and his colleagues (2006) provide important information about the rate of offenders who were reported to be under the influence of drugs when committing their crime. Data extrapolated form surveys conducted between 1995 and 1997 indicated that 20% of murderers were on drugs at the time of the incident. In the case of Philadelphia, Friedman, Glassman, and Terras (2001) found that 31% of all homicides committed by individuals under the age of 30 could be attributed to illicit drug use. The data discussed above refers to the 1990s, and it must be said that the situation in the United States is now very different. Indeed, even though it remains difficult to reliably identify drug related homicides in the absence of official data, scholars nevertheless agree that drug market related violence has decreased over the last two decades (Ousey and Lee 2007). Yet, somewhat paradoxically, drug related violence remains a tremendous cause of pubic fear in the country (Reuter 2009).

Most of the first-generation studies which investigated the drug/violence nexus concentrated on the American inner cities. Moreover, whenever those studies included analyses of systemic violence in drug markets, they focused on drug dealing rather than the overall system of drug trafficking (Klein, Maxson, and Cunningham 1991; Fagan and Chin 1990; Fagan 1993). When interest in producing and trafficking countries amplified, so did the number of studies looking at high-level markets.

Colombia and Mexico

Systemic violence in Colombia and Mexico has been prominently covered in the press, which has reinforced the already popular notion that drug trafficking causes violence (Reuter 2009). The upsurge in drug related violence in both producing and trafficking countries not only increased academic and popular interest in the drug/violence nexus, it also helped to introduce fresh perspectives from which to study it. For example, studies could no longer focus exclusively on urban dynamics, but instead had to analyse broader regional and national contexts, including the political dimension of the phenomenon (Thoumi 1995; Pecaut and González 1997; Lessing 2012; Snyder and Durán Martínez 2009; Acemoglu, Robinson, and Santos 2013). In conjunction with this evolution, studies also began to focus on the consequences of drug trafficking related violence upon overall economic development (Rubio 1995, 199; Bejarano et al. 1997; Martínez Ortiz 2001; Thoumi 2002; Bejarano 2003; Querubín 2003; Rocha and Martinez 2003; Holmes, Gutiérrez de Piñeres, and Curtin 2006). Moreover, while

most studies attending to the systemic violence connected with drug distribution in U.S. cities are concerned with the dynamics between dealers and local distributors (Smith, et al. 1992; May and Hough 2001; Reuter 2009), studies on Colombia and Mexico concentrated their analytical gaze on violence in high-level markets (Vargas 2005; Reuter 2009). Geographically concentrated rapid increases in homicides in both Mexico and Colombia have significantly augmented interest in the drug/violence nexus, both theoretically speaking, and in terms of the development of effective policies to cope with it (Holmes, Gutiérrez de Piñeres, and Curtin 2006; Carpenter 2010; McCarthy 2011; Rios 2013).

In Colombia, homicides and other violent incidents began to rise in the 1970s and by the early 1990s had more than tripled (Moser et al. 1999; Gaviria 2000). The rate of violence peaked between 1985 and 1991, which is the period when the alliance between drug traffickers and paramilitary groups was consolidated and so-called narco-terrorism proliferated (Bejarano et al. 1997; Chepesiuk 1999; Garfield, Morales, and Patricia 2004; Bello Montes 2008). In some cities, the violent crime figures reached epidemic proportions. During this period the homicide rate of the city of Medellin was over 400 murders per 100,000 inhabitants (Gaviria 2000). Further, systematic drug related violence ranged from fights between criminals and governmental military groups to prevent aerial eradication, violence stemming from drug-distribution among criminal groups, to assassinations of prominent political and judicial figures, as in the case of presidential candidate Luis Carlos Galán who was murdered in 1989 (Restrepo 2015).

The drug/violence nexus has gained even further prominence within both academic debate and political decision-making after the upsurge of violence in Mexico (Chi et al. 2013). In Mexico, the level of violence has dramatically increased in the second half of the 2000s due to structural changes in drug trafficking (Dell 2012; Rios 2013). The sharp spike in homicides began in 2006 and coincided with an aggressive government initiative aimed at dismantling organized crime groups dedicated to drug trafficking to the U.S. (Calderón et al. 2012; Lee 2014). Debates around the causal relationship between the spread of lethal violence and law enforcement strategies are still especially rich and productive (Chabat 2010; Guerrero 2011; Calderón et al. 2012; Lessing 2012; Rios 2013). The major increase in violence came after a dramatic spike in 2008, when homicides related to drug trafficking organizations jumped from 2,826 to 6,837 killings, a 142% surge in comparison to the prior year. After another increase of more than 40%, 9,614 killings were registered in 2009 (Rios and Shirk 2011; Rios 2013). A new deplorable dimension of drug related violence in Mexico emerged during this peak period of homicides, which involved the intentional targeting of civilians (Chalk 2011). On 15 September 2008, for example, during celebrations for Mexican Independence Day in Morelia, Michoacán, members of the infamous group Los Zetas murdered eight people and caused more than

one-hundred injuries by throwing grenades into the celebrating crowds (Lacey 2008). As a result of this escalation of violence, Mexican cities like Ciudad Juárez, a crucial trans-shipment point for the transportation of cocaine into the US, exhibited homicide rates of 216 victims per 100,000 inhabitants in 2010, a casualty rate that is directly comparable to certain war zones (Rios 2013). During that specific time, Ciudad Juarez was the most violent city in the world, whereas it now ranks 37, well behind U.S. cities like New Orleans and Baltimore. According to Governmental sources, between December of 2006 and 2010, 1,132 municipalities had drug trafficking-related homicides, whilst by 2011, 19 out of the 50 most violent cities in the world were in Mexico (Calderón et al. 2012).

Rest of Latin America and Caribbean

The high levels of violence associated with illicit drug trade is not a problem which concerns only particular American suburbs, Colombia, or Mexico. On the contrary, in many countries across South and Central America, as well as within the Caribbean, the problem of drug related violence is acute (Barro and Sala-i-Martin 2004; Briceño-León, Villaveces, and Concha-Eastman 2008; Latin American Commission on Drugs and Democracy 2009; Chalk 2011; UNODC 2012a; Caulkins 2015; Bagley and Rosen 2015). In fact, national homicide rates in Mexico have always remained below the average of Latin American and Caribbean countries, even during the striking upsurge of violence. However, the endemic violence within these countries has attracted far less international attention (UNODC 2010b; Shirk 2011; Shirk and Wallman 2015). In these places, the already alarming crime and violence levels have been consistently rising since the 1970s, with notable exceptions being Argentina, Chile, and Costa Rica (Fajnzylber, Lederman, and Loayza 1998; Heinemann and Verner 2006). In many of these countries with high homicide rates, the root cause of the surge in homicides is often the violence perpetuated by organized criminal groups taking part in drug trafficking (Chalk 2011; UNODC 2011b). Experts explain these trends in terms of fluctuations in cocaine trafficking within the countries in these regions, which can lead to criminal conflicts due to evolving drug market structures (Miroff and Booth 2010; UNODC 2011b). In these countries, border areas, zones ordinarily involved in drug production or serving as trafficking centres, tend to have higher homicide rates (Briceño-León, Villaveces, and Concha-Eastman 2008). The tremendous variability in the levels of violence within these countries verifies the primacy of drug trafficking as an explanation for violence in these areas (Demombynes 2011; UNODC 2011b).

Europe, Asia, and Africa

Many European countries have developed alternative drug policies to the U.S. model, a model which has been adopted by the various United Nations drug conventions (1961; 1971; 1988), Colombian policy makers, and more recently by Mexico (Gratius and Palacios 2012). In contradistinction to these examples, European countries rely far less on criminal sanctions than the

United States for example, focusing more heavily on public health approaches and policies based on harm reduction (Reuter, Falco, and MacCoun 1993; Miron 2001; Gratius and Palacios 2012). In general, the comprehensive approach adopted by European countries has tended to be less inclined toward hard-line interventions than those initiatives proposed by the U.S. and other American countries (Gratius and Palacios 2012). The adoption of these policies, despite some heterogeneity among European countries, has potentially helped to reduce the burden of secondary effects stemming from more harsh policies against drug use and trafficking (EMCDDA and Europol 2013). Nonetheless, one should stress that European countries are not exempt from drug market related violence. Law enforcement agencies, especially in the Netherlands and Belgium, have recorded violent episodes by criminals active in the cultivation and high level trafficking of marijuana (Spapens, van de Bunt, and Rastovac 2007; Vanhove et al. 2012; EMCDDA and Europol 2013; 2016). Forms of competitive violence have also been observed in markets for illicit synthetic substances (EMCDDA and Europol 2013). Moreover, a multitude of studies have underlined the deep involvement of Italian mafia-esque organizations, in collaboration with Colombian syndicates, in the transatlantic trafficking of cocaine (Paoli 1994; 2004; Brunelli 2008; Chalk 2011; Calderoni 2012; Savona 2012; Calderoni et al. 2015). The Calabrian ‘Ndrangheta, in particular, occupies a prominent position in the import of cocaine from South America, both in Italy and Europe more generally. In Italy, ‘Ndrangheta has eclipsed other mafia organisations, such as the Sicilian Cosa Nostra or the Neapolitan Camorra, to become the major player in the direct import of cocaine from Colombia (Brunelli 2008; Chalk 2011; Calderoni 2012). ‘Ndrangheta is a criminal organization with a cell-based structure organized around strong family ties. Although it is worthwhile to mention out that they engage in violence less frequently than other Italian criminal organizations, intimidations, threats and violence are nonetheless still distinctive features of ‘Ndrangheta groups *modi operandi* in the service of a variety of criminal activities, including drug trafficking (Paoli 1994; 2002; 2004; Varese 2006; Chalk 2011; Calderoni 2012; Ernesto Ugo Savona 2012).

Drug trafficking related violence is also a major concern in Asia, with the international markets for amphetamines and opium in Southeast Asia and illicit opiates in Central Asia being the central areas of concern (UNODC 2015k). As in many other regions of the world, Asia exhibits tremendous differences across the manifold levels of drug related violence across its respective countries (e.g., Afghanistan is much more violent than Japan). In Southeast Asia, the prosperous traffic of methamphetamine and illicit opiates engenders instability in the region through funding insurgent groups. For example, since the 1970s, the ethnic minorities Wa and Shan financed a violent insurgency against the ruling military governments of Myanmar largely through the manufacturing and international trafficking of opium and methamphetamine to Thailand, China, and other neighbouring countries (Lintner 1999; Chouvy 2002; Gibson and Haseman 2003; Cornell 2005; 2007).

More recently, conventional drug-market related violence is also on the rise. Policing operations along the Mekong River have increased in response to the escalating violence associated with smuggling into the Golden Triangle, thus leading to more frequent episodes of violence, and, in turn, increased political instability in Myanmar, Laos, Thailand, and Cambodia (IDPC 2016). Central Asian countries, already beset by political and social problems, also now face the heavy burden of drug related violence (Olcott and Udalova 2000). Located between the world's principal opium producer and the European lucrative markets, this region is characterised by endemic levels of corruption and an unstable socio-political milieu, which serves as fertile ground for the proliferation of trade in illicit opiates (Mohapatra 2007). Further, the hegemony of criminals with political connections in high places allied with the deep involvement of the whole administrative apparatus in the drug industry, favours the spread of the drug industry in the entire region, and in Afghanistan in particular (Peyrouse 2012). This is because criminals trafficking in illicit opiates operate within regions controlled by the Taliban and other anti-government forces. In turn, these insurgent forces finance themselves by extracting economic resources from the drug trafficking organizations (UNODC 2010b).

West Africa is another region which has had to face up to major challenges stemming from drug trafficking. West Africa, over the last fifteen years, has emerged as a crucial hub for Colombian traffickers, who ship cocaine to countries in this region as an intermediate point on the way to the lucrative markets of Europe, Russia, and the Middle East (UNODC 2011e). The weak rule of law within particular West African countries, allied with their geographical location, explains their attractiveness to traffickers (Destrebecq and Leggett 2007). Estimates suggest that the value of cocaine flowing through West Africa is worth almost 2 billion USD annually wholesale, and as much as ten times that figure after being distributed to consumers (Destrebecq and Leggett 2007). The manifold impact of cocaine trafficking on the region includes drug-funded violence, political instability, and, above all, corruption (UNODC 2011c). So pervasive are the consequences within the region that some observers have asserted that entire countries, such as Guinea-Bissau, are at risk of being ruled by drug trafficking elites (Destrebecq and Leggett 2007; UNODC 2011e).

This brief excursion on the relationships between drug trafficking and violence in different parts of the world has foregrounded some of the deleterious effects of drug/violence. Some are more obvious and direct than others, such as the death of civilians, whilst others emerge as a consequence of more complex dynamics, such as stunting economic development, or the loss of legitimacy of public institutions. The next section discusses the most pertinent of these consequences, focusing firstly upon the most straightforward kind (i.e., homicides and injuries) before moving onto examine some of the more indirect ones, which involve complex social dynamics.

I.1.1 The consequences of drug related violence

The most obvious and serious consequence of drug related violence may be death (Falk and Falk 1990; Hutson et al. 1995), but it is by no means the sole one. Indeed, drug related violence also causes manifold non-lethal physical harms (Holder et al. 2001), including psychological disorders (Brewin, Andrews, and Valentine 2000), stunting economic development (Pecaut and González 1997; Lind, Moene, and Willumsen 2009; Robles, Calderón, and Magaloni 2013), undermining actual security as well as its perception (Koonings and Krujit 1999; Felbab-Brown 2009; Diaz-Cayeros et al. 2011), not to mention contributing to the dissolution of the institutional and social fabric (Krug, Sharma, and Lozano 2000; Gawryszewski and Rodrigues 2006; Chalk 2011). Each part of the following subsection examines these aforesaid consequences of drug related violence. The severity and the multitude of these negative consequences highlight, yet again, the necessity of developing new policy approaches and theoretical explanations for these dynamics.

Homicides

Homicide is the most serious form of violence (Brookman 2005). The seriousness of homicides does not pertain exclusively to the death of the victim, but, rather, relates to its wider impact on victims' family and friends, the actual offenders, and the community as a whole (Brookman 2005; UNODC 2014b).

Violence is the fourth leading cause of death worldwide for people aged between 15 and 44; more than 1.3 million people die each year because of self-directed, interpersonal and collective modes of violence, accounting for 2.5% of global mortality (WHO 2014). Since 2000, about 6 million people globally have died as a consequence of interpersonal violence; this striking number indicates that homicides account for a higher number of deaths than all of the wars combined over the last fifteen years (WHO 2014). These are general figures, rather than figures which specifically document drug related homicides. Statistics which do specifically focus upon drug related violence are regrettably currently unavailable. Estimating the true total volume of any type of crime is always extremely challenging, and this is especially the case for drug related crime (Bennett and Holloway 2005; Caulkins 2007; EMCDDA 2007). The expressions "drug violence" and "drug related homicides" are widely reproduced by both academics and the media. Yet, in the vast majority of countries criminal law does not provide a formal definition of these terms (Heinle, Molzahn, and Shirk 2015). Therefore, whether a homicide can be considered drug related or not is currently neither assessed nor recorded, henceforth making official statistics on crime of little use when it comes to estimating the size of drug related violence (EMCDDA 2007). The same UNODC, in its Global Study on Homicide (2011b), provides a generic report about the fact that homicides by firearms committed by members of criminal

organizations active in drug trafficking are particularly widespread in those countries with high homicide rates, especially in Central America. Several researchers who have focused on North America came to a similar conclusion in their own studies, suggesting that the relevance of drug trafficking as a motivating factor for homicides varies across the settings covered in the study (Hutson et al. 1995; Decker 2003; Werb et al. 2011). Researchers for the U.S. Bureau of Justice Statistics examined homicides which had occurred in the 75 most populous counties within the United States during 1988. They found that about 16%-18% of the cases considered were due to drug related conflicts. For example, violence emerged as a result of disputes over drug manufacturing, arguments over drugs, due to theft of drugs or drug money, as a result of drug scams, bad drug deals, punishment for drug thefts, or due to the illegal use of drugs (BJS 1994). Caulkins and Kleiman (2011) posited that the one million people who are involved in cocaine trafficking in the U.S. (Caulkins 2002; Caulkins and Reuter 2009) account for much less than 5,000 homicides per year. In their notorious study of drug gangs in Chicago, Levitt and Venkatesh (2000) found the exact opposite to be the case, with as much as 25% of drug dealing gangs activity involved in violent assaults and homicides. Mexico constitutes an important exception in the provision of data on drug related homicides. Indeed, the Mexican government and several newspapers, notably, the Mexico City-based newspapers *Reforma* and *Milenio*, provide estimates about both the number of organized crime-style homicides, and even drug trafficking related homicides (Justice in Mexico 2014). In 2014, the figure for organized-crime-style homicides ranged from between 6,400, according to *Reforma*, to about 8,000 according to both *Milenio* (2016) and Heinle, Molzahn, and Shirk (2015). Despite the abundance of data in Mexico, the available data for evaluating levels of organized crime and violence are highly imprecise, riddled with gaps, distortions, and a general lack of transparency about the origins of the data, and, as such, must be considered as approximations (Heinle, Molzahn, and Shirk 2015).

Spread of fear

Violence does not only affect an individual's psychological health, it also creates a general sense of fear capable of spreading through the entire society (Koonings and Krujit 1999); this is especially the case with communities afflicted by drug related violence (Freeman 2006). The Mexican case is highly exemplificative in this respect. Organized crime groups taking part in drug trafficking signal to the population that they control specific areas, and are effective in punishing anyone who provides support and information to any form of state authority or government (Diaz-Cayeros et al. 2011). Conversely, as drug related violence rages, corruption spreads, and the police cannot control the territory nor even credibly signal that they are capable of doing so (Diaz-Cayeros et al. 2011). Consequently, the population no longer knows who to trust and, in turn, ends up trusting nobody, a dynamic which, ultimately, creates a vicious spiral of distrust and generalized fear (Freeman 2006). The widespread

sense of fear arising out of increased levels of criminal violence and, more generally, due to a deterioration in the quality of life often culminates with people moving away from the afflicted areas (Freeman 2006; Albuja 2014; Gómez-Johnson 2015).

Economic impairments

In addition to the toll of human misery and societal breakdown, the consequences of the spread of drug related violence are also extremely severe in economic terms (Bejarano et al. 1997; WHO 2002; Bejarano 2003; Heinemann and Verner 2006). The spread of violence is the single most quoted mechanism through which drug trafficking affects economic development (Keefer and Loayza 2010; Robles, Calderón, and Magaloni 2013). Drug trafficking may influence the economic development of a country, and, in turn, the quality of life for its inhabitants in a number of ways, both directly and indirectly (INCB 2002; Singer 2008). Many studies posit that drug trafficking, by virtue of rises in violence, common crime, and corruption, causes irreparable damage to human and stock capital, distorts the economic allocation processes, and increases uncertainty within business circles (Buvinic and Morrison 1999; Singer 2008; Robles, Calderón, and Magaloni 2013; Collins 2014). These harmful dynamics in aggregate serve to slow down the economic development of the afflicted countries (Peri 2004; Detotto and Otranto 2010).

Starting in the nineties, a rich body of literature has begun to investigate and measure the impact of drug trafficking and drug trafficking related violence on economic development. The vast majority of these studies focus on Colombia and Mexico, where the spread of drug related violence is more acute than anywhere else (Latin American Commission on Drugs and Democracy 2009; Serrano-Berthet and Lopez 2011; INCB 2013; UNODC 2013d). Taking into account the 1980s and early 1990s, Rubio (1995), a pioneer in this field, proposed an Ordinary Least Squares regression model in order to explore the potential correlation between the aggregate homicide rate and GDP growth in Colombia. He concluded that the persistence of high homicide rates was correlated with a period of stagnation in the economic development of the country. The impact of spreading criminality would be even higher if one takes into account the long-term effects on factory productivity and capital formation.

Focusing on the Colombian context once more, Thoumi (1995) draws attention to the impossibility of conducting land redistribution programs, reallocating funds from development programs, as well as security risks and a volatile macroeconomic climate, as among the key economic consequences of unstable governance. Several studies looking at the Mexican context describe similar dynamics to those previously observed in Colombia (Shelley 2001; Chabat 2006). Bejarano and his colleagues (1997) conducted an analysis on the impact of conflict on the Colombian economy. These particular authors proposed that the costs of conflict in terms of growth did not appear to be as high for two reasons. First, producers and farmers have honed strategies to deal with conflicts, and have thus

developed mechanisms through which to overcome the problems deriving from it. Second, commercial farming areas are poorly integrated within national development centres, making it difficult for the guerrillas to expand further.

Querubín (2003) applies a panel analysis by using departmental data in order to demonstrate that drug trafficking and violence were correlated with the Colombian economic slowdown of the nineties. Querubín takes the first difference of a growth equation to eliminate departmental fixed effects. This method allows him to remove the eventual omitted variable bias for time-invariant controls, but by no means does this solve the reverse-causality issue. He found that an increase of 10 percentage points in the rate of growth in the homicide rate causes the GDP growth rate to reduce by 0.37 percentage points. Increases in the number of kidnappings and attacks conducted by organised crime groups active in the drug trafficking industry are also negatively correlated with GDP growth. Cárdenas (2007) applies a Vector Auto-regression model to study the growth of Colombian GDP between 1950 and 2000. To detect eventual structural changes in economic growth, he uses year specific dummy variables. He concludes that the slowing down of Colombian productivity after 1980 was caused by an increase in income inequality, as well as the expansion of drug trafficking, which diverted capital and labour to unproductive activities.

Cárdenas theorises that crime and violence has dramatically damaged Colombia's social structure, which in turn, acted as a fetter on national productivity. According to him, violence related to the drug industry encourages predatory behaviour, which serves to divert precious capital and labour supplies into unproductive activities. The use of a time series analysis did not allow him to determine the direction of the causality between homicide and economic growth, hence why the author tested it with a Granger causality test, the results of which verified his theory.

Angrist and Kugler (2008) conducted a quasi-experimental research design, taking advantage of the interruption of the Andean air bridge by the United States in 1994. Prior to that, the majority of Colombian traffickers used to refine Bolivian and especially Peruvian coca. The air interdiction forced them to cultivate coca directly in Colombian rural areas. This historical event provided a unique opportunity through which to study the impact of the cultivation of coca on a rural population, and to assess the link between natural resources and violence. Their study concluded that, in the areas where coca cultivation took hold, self-employment income and boys' labour supply saw large and significant increases. However, the likelihood of procuring an income from this source, the overall probability of working, and wages themselves did not increase. Therefore, the living conditions of the general population did not substantially improve either in the area where the cultivation took place. Authors have proposed several potential explanations for this. It could be that the cultivation is extremely spatially concentrated, that the business of coca has very few links with other sectors, or that local

guerrilla groups extorted all of the possible gains. More generally, the study highlights that economic improvement does not in and of itself lead to a reduction in conflict, rather it stokes them. This research is particularly interesting because of its robust and persuasive methodology. However, it focuses purely on the cultivation of coca as opposed to the trafficking of cocaine, and thus fails to provide estimates about the overall economy. The quantitative analysis of the aggregate costs of Mexican drug related violence conducted by Robles, Calderón, and Magaloni (2013) is also of significant interest. The authors use electricity consumption as a proxy for economic activity in Mexico at the municipal level. Through the application of robust empirical strategies, they find that increased violence has negative effects on labour participation and employment and, above a certain threshold, on the consumption of electricity.

These dynamics are stronger in developing countries who have weaker institutions and fragile economies, but are not strictly confined to these socio-economic scenarios (Chalk 2011). Drug trafficking and the attendant violence has obstructed fiscal growth, not to mention the stability of prominent end-user cities, by diverting scarce resources away from more-productive avenues (Chalk 2011).

Social and institutional impairments

Drug related violence, of course, places a heavy burden upon the health and criminal justice systems, on the democratic functioning of countries, and, more generally, on the quality of life of people who are forced to cope with a reduced sense of personal and proprietary security (Krug, Sharma, and Lozano 2000; Fajnzylber, Lederman, and Loayza 2002a; 2002b; Gawryszewski and Rodrigues 2006; Felbab-Brown 2009).

In the context of widespread violence, such as is the case in Mexico, the necessity to guard themselves against attacks by law enforcement agencies and other criminal groups forces drug traffickers to rely on the corruption of public officers and police agents. In this manner, criminals are both able to collect invaluable information and to re-direct corrupted officials towards targeting their enemies (Freeman 2006; Dell 2015). In Mexico, there have been a number of reported cases of municipal cops kidnapping members of rival drug trafficking organizations, and handing them over to

the Zetas[1] from who they were receiving bribes (Freeman 2006). The same organized crime group may also carry out disproportionate displays of violence to intimidate the representatives of public institutions, thus creating an environment more susceptible to future corruption (Beare and Naylor 1999). Consequently, the pervasive corruption of public servants, the judicial system, governments, political system, and especially law enforcement agencies adds further fuel to this vicious circle of violence (Guizado 2005; Latin American Commission on Drugs and Democracy 2009; Chalk 2011).

The inability of governmental institutions to meet the population's needs in terms of security and administration, leads authors such as Felbab-Brown (2009) to predict the proliferation of alternative governance structures. In Latin America and the Caribbean, while upper-class elites can afford to recruit private security agencies, organized crime groups are likely to take responsibility for managing the security of the neighbourhoods populated by the less affluent. The *maras* (youth gangs) in most countries of Central America, *chimères* (street thugs) in Haiti, drug gangs in Brazilian favelas, and politicized insurgent groups are increasingly operating as providers of security services and as depositories of law enforcement (The World Bank 2006; Felbab-Brown 2009; Jütersonke, Muggah, and Rodgers 2009). Mexico provides a clear example of this dynamic; indeed, because of their ability to corrupt and threaten public officials, drug traffickers have become the actual rulers of many Mexican cities (Freeman 2006). Similar patterns have also been observed in other contexts, such as Afghanistan (United Nations 2010). Even in the US, where the spread of drug related violence is in no way comparable with Mexico, the fight against drug trafficking and its attendant violence has been shown time and time again to not be exempt from corruption (Marx 1988; Moore and Kleiman 1989; Carter 1990; Cole 1999).

The same vicious circle of violence, corruption and law enforcement ordinarily infects the upper echelons of the judicial and political apparatus as well. Again, Mexico is an extreme example of these patterns. There, the political and judicial apparatus has been targeted, with public officials facing the same awful choice between bribery and murder (Guizado 2005; Felbab-Brown 2009). High levels of corruption and related distrust in government make it incredibly difficult to develop any effective policy to reduce violence which, in turn, serves to further weaken the public sphere (Chi et al. 2013).

[1] The Zetas (Los Zetas) is a Mexican organised crime group dedicated to drug trafficking, as well as other illicit activities. The group has been active since the 1990s and is considered, by both the Mexican and the U.S. governments, to be the most dangerous among all of the Mexican organised crime groups (Brophy 2008).

The severity of the negative effects stemming from the circuitous pattern of violence, corruption, and impunity is more acute in developing countries with larger drug markets and bourgeoning social democratic institutions. The bulk of available research investigating the effects of drug related violence on social institutions may well be focused on Mexico, Colombia, and Afghanistan (Byrd and Ward 2004; Goodhand 2008), but these are not the only examples. In light of the fact that these patterns contaminate every level of the social fabric their repercussions can be observed even in prosperous countries. Chalk (2011) notes that in American cities where drug markets are larger, drug trafficking and drug use have exacerbated the longstanding breakdown of familial and societal relations. Similarly, in the United Kingdom, the clustering together of drugs, violence and crime within neighbourhoods already experiencing socio-economic hardship, has emerged as a key political priority (Seddon 2006).

The relationship between drug-trafficking induced violence and social and institutional impairment is complex and bidirectional, as the prior analysis of cultural and social theories of violence showed (Fajnzylber, Lederman, and Loayza 1998; Ashcroft, Daniels, and Hart 2003; Heinemann and Verner 2006). Violence occurring as a result of the drug industry is capable of disrupting social institutions, whilst, simultaneously, countries characterised by weak judicial systems or endemic levels of corruption are more susceptible to expansions in the illicit drug industry. Staley (1992) theorized a bidirectional relationship, in which deprivation serves as a breeding-ground for drug markets, violence, and social disorganization. In turn, this dynamic depresses economic development, which kick-starts the whole vicious cycle of deprivation and violence all over again. Moreover, authors like Freeman, Grogger, and Sonstelie (1996) proposed an alternative framework to that which says that drug violence begets more violence. These authors begin from the assumption that a criminal's chances of being captured is a decreasing function of the number of other criminals active in the area. Therefore, criminals make crime more appealing to nearby residents by congesting the law enforcement system and, hence, lowering the probability of punishment – although, one should add, this pertains only to interpersonal violence.

I.2 Research problem

Alongside invaluable socio-cultural explanations, scholars have also identified and tested newer explanations of violence. Illicit drugs and alcohol emerged as key determinants of violence (McBride and McCoy 1982; Harwood et al. 1984; Goldstein 1985; Blumstein et al. 1986; Reuter and Kleiman 1986; Goldstein et al. 1990; Fagan and Chin 1990; Smith, et al. 1992; Roth 1994; Blumstein 1995; Blumstein and Rosenfeld 1998). In 1985, Goldstein (1985) produced a major contribution to the study of the relationship between drugs and violence, concretised in his tripartite schematic framework (psychopharmacological, economic compulsion, and systemic) that provides the connective tissue between drugs and violence. Today, despite its limitations and criticisms, Goldstein's framework is "universally respected and widely considered the accepted means of explaining the connection between drug use and crime" (Bennett and Holloway 2009, 514).

Systemic violence, intended to represent the interpersonal violence emerging out of interactions between those involved in the system of drug distribution and usage, is widely considered to be the most pertinent form of drug related violence (Goldstein 1985; Collins 1990; Miron 2001; Owens 2011). Since its introduction, scholars have predominantly used the concept of systemic violence in an attempt to explain why drug markets are prone to violence (MacCoun, Kilmer, and Reuter 2003). Academic debate has led to the identification of four main characteristics and dynamics capable of explaining the frequent occurence of violence in specific drug markets. Drug markets are characterised by violence due to: the lack of legal instruments to settle disputes (Caulkins and Reuter 1998; Chimeli and Soares 2011; Mejía and Restrepo 2013; Robles, Calderón, and Magaloni 2013); the existence of a retaliatory culture (Bourgois 1995; Topalli, Wright, and Fornango 2002); the forms of interaction between criminals and law enforcement (Benson, Leburn, and Rasmussen 2001; Guerrero 2011; Werb et al. 2011; Rios 2013; Prieger and Kulick 2014); the specific forms of competition inherent to the drug industry (Reuter 1983; Kleiman 1989; Decker, Katz, and Webb 2007; Costa Storti and De Grauwe 2008).

Catastrophic levels of drug related violence within various Latin American countries in the previous decade has engendered a renewed interest in theoretical explanations pertaining to the relationship between drug markets and violence (Bagley and Rosen 2015; Caulkins 2015; Dell 2015; Kleiman et al. 2015; Osorio 2015; Calderón et al. 2015; Copes, Hochstetler, and Sandberg 2015; Cockayne and Walker 2015; Rivera 2016). However, despite the fact Goldstein's (1985) tripartite framework was developed thirty years ago, and the relatively large body of academic research on the topic, "understanding the relationship between illicit drugs and violence is still underdeveloped" (Dickinson 2014, 81). More specifically, a review of extant literature highlights two main limitations: "[…] the lack of a theory that explains variations in levels of violence across different illicit markets

and also within the same market over time" (Snyder and Durán Martínez 2009, 64) and "[…] the relative rarity of actual empirical applications" (MacCoun, Kilmer, and Reuter 2003, 67).

One especially large gap in the literature concerns the effect that fluctuations in the drug market have on violence levels (Chi et al. 2013). Given that the primary motivation for involvement in drug trafficking is an economic one (Reuter and Kleiman 1986; Desroches 2007; Chi et al. 2013), this is a problematic gap in our knowledge about the relationship between drug and violence. Despite the abundant literature, scarce attention has been paid to the consequences of variations of the economic dimension of illicit drug markets, and when it has research has often found contradictory results (Cárdenas 2007; Ousey and Lee 2007; Angrist and Kugler 2008; Robles, Calderón, and Magaloni 2013; Coscia and Rios 2012; Castillo, Mejía, and Restrepo 2014). Moreover, studies have hitherto been unable to directly estimate profits or the economic dimension of the markets. Rather, authors have adopted proxies, such as coca production (Angrist and Kugler 2008), shortages in cocaine supply (Robles, Calderón, and Magaloni 2013; Castillo, Mejía, and Restrepo 2014), prevalence of use, overdose cases (Rios 2012), or arrests (Fajnzylber, Lederman, and Loayza 2002a), which, ultimately, are inadequate for representing the true complexity of the economic dynamics of drug markets. Indeed, while the number of users may decrease in response to a prevention policy targeting drug consumption initiation, total expenditures may, in actual fact, increase due to consumers transitioning into heavier usage, or because of an increase in supply or an increase in prices (Kilmer and Pacula 2009). Similarly, an increase in seizures may not cause the total value of the market to reduce, because such actions may lead to a potential increase in prices or in cutting.

Therefore, estimating the true value of a market is critical for understanding the full impact of interventions targeting demand and/or supply. Moreover, while studies investigating the downsizing of international trafficking are almost completely absent in the literature, the majority of indicators, including cultivations of coca plants, seizures of cocaine, and estimates of prevalence all point towards the fact that the cocaine market overall has reduced. Since the cocaine market has the highest violence rates of illicit markets, exploring this dynamic is now of critical importance (UNODC 2013d). However, systemic violence is not merely an economic matter; it is an economic phenomenon deeply rooted in a political, cultural, and social context (Collins 1990). Henceforth, to understand powerful economic dynamics as an explanation for systemic violence, it is necessary to reconsider and integrate both classic structural theories and more recent explanations of violence, for the strict purpose of assessing the relative explanatory power of economic dynamics (Collins 1990; Dickinson 2014; Castillo, Mejia, and Restrepo 2014). Consequently, the socio-cultural setting of the analysis is integral for understanding the explanatory power of economic dynamics in drug markets.

Most of the studies on systemic violence have investigated its antecedents and its consequences in the context of American cities. Resultantly, scarce attention has been focused on understanding the drivers of systemic violence in different socio-cultural contexts, such as at the supply chain level for example, as opposed to at street dealer levels (Ousey and Lee 2007; Reuter 2009; Collins 2014). Many scholars have advocated for more globalized research on violence, alongside the development of research with a cross-country perspective (Heinemann and Verner 2006; Farrington and Welsh 2007; Murray, Cerqueira, and Kahn 2013). Despite this, most studies still concentrate on individual countries, and thus ignore a cross-national component (McCall and Nieuwbeerta 2007; Collins 2014). A review of ecological research on violence indicates that the bulk of research remains focused on the United States (McCall and Nieuwbeerta 2007; Dills, Miron, and Summers 2010).

The relative dearth of research with a sufficiently geographical scope becomes yet more scarce when one turns the focus onto studies of drug systemic violence, rather than, say, more general explanations of violence (Moeller and Hesse 2013; Collins 2014). In fact, current theoretico-empirical doxa about drug and violence relationship is almost entirely buttressed by studies of drug distribution within disadvantaged American urban neighbourhoods (Ousey and Lee 2002; Moeller and Hesse 2013). Limitations with the availability of data problems of comparability between countries are two factors that restrict cross-national research. However, even in a European context with readily available strong data collection tools, researches into drug market violence are similarly rare (Ousey and Lee 2002). The second consequence stemming from the concentration of research on the urban American context is the singular focus of most studies upon drug related violence at the level of drug dealing (Reuter 2009; Moeller and Hesse 2013). "Precisely because high level drug-market violence is restricted in time and space, it has not been the subject of much policy analysis" (Reuter 2009, 283). The underlying dynamics of the relationship between drug markets and violence are, of course, likely to differ, at least partially, from country to country and between street dealing and international trafficking (Reuter 2009; Moeller and Hesse 2013). That said, developing studies that take into account the global dimension of drug trafficking and the complexity of the drug supply chain can provide new insight into the drug/violence nexus (Dickinson 2014).

As aforementioned, the problems with extant literature do not simply pertain to theoretical blind-spots; rather, aspects of systemic violence are still unclear as a result of the relative scarcity of sound empirical studies capable of verifying theoretical explanations of this phenomenon (MacCoun, Kilmer, and Reuter 2003; Heinemann and Verner 2006; Ousey and Lee 2007; Castillo, Mejía, and Restrepo 2014; McGinty, Choksy, and Wintemute 2016). An empirical approach is pivotal to attempts to add to our current knowledge about the criminal dynamics underpinning drug trafficking. Strong analyses should aspire to improve violence reduction policies that, as it currently stands, rarely rely on sound

evidence and complex inclusive analysis (Latin American Commission on Drugs and Democracy 2009). Indeed, despite a broad range of noteworthy research, most available studies are based on anecdotal evidence and unscrupulous quantitative analyses (Riascos and Vargas 2011).

One notable and recurring shortcoming in extant literature is the use of specious strategies to assess the causal association between violence and drugs, as well as between violence and socio-cultural variables (Markowitz 2005; EMCDDA 2007; Castillo, Mejía, and Restrepo 2014; INCB 2014; McGinty, Choksy, and Wintemute 2016).

Scholars cannot even completely agree upon the actual direction of the causality. Or, phrased otherwise, does drug trafficking lead to an increase in the use of violence, or does widespread violence drive the growth of the drug industry? Most of the available studies are concordant in asserting that drug trafficking triggers violence (Pecaut and González 1997; Thoumi 2002; Mejía and Restrepo 2013). However, other authors suggest that increasing violence helps illicit drug markets to expand (Lind, Moene, and Willumsen 2009). Another perspective yet still posits that a correlation exists for other reasons; for example, the presence of a third omitted variable correlates with both illegal markets and violence (Castillo, Mejía, and Restrepo 2014). We could also add that the degree of simultaneity between the two phenomena may be significant enough to impede attempts to ascertain directionality.

Any sound measurement of the actual association between the two phenomena necessitates consideration of the temporality of all other explanations associated with drug markets and violence (McGinty, Choksy, and Wintemute 2016). Most cross-sectional studies in the field take into account these potentially confounding or mediating factors, but yet cannot adequately establish the direction of the causality between some of these structural factors and the levels of violence (Pecaut and González 1997; Ford and Beveridge 2006; Dell 2015; McGinty, Choksy, and Wintemute 2016). These potentially confounding factors include some of the most pertinent variables identified by socio-cultural theorists of violence, such as economic deprivation, inequality, formal structures of control, and historical levels of violence (INCB 2014). The issue of reverse causality calls for developing ad hoc longitudinal analyses capable of both identifying proper instrumental variables, and accounting, at least partially, for this important source of bias (Fajnzylber, Lederman, Loayza 2002a; Castillo, Mejía, and Restrepo 2014). Solving the problem of identification is crucial for ongoing attempts to design and implement effective policies, which are geared towards solving the roots of the problem as opposed to its symptoms (Miguel, Satyanath, and Sergenti 2004; Núñez 2010).

Informed by the literature review, this study sets out to answer the following primary research question in order to extend academic knowledge on systemic violence:

Research question: Does instability in the value of cocaine markets cause violence?

Informed by the review of extant knowledge on criminological theories of violence, drug markets, systemic violence and economic dynamics in illicit drug markets, this study proposes the following hypothesis:

The hypothesis underpinning the first research question is:

It has been widely observed that people are likely to get involved in drug trafficking for various subsidiary reasons (e.g., to experience a sense of excitement, to achieve or maintain a dominant position within existing political structures, and, more generally, to achieve social power) (Violante 1987; Arlacchi 1988; Adler 1993; Marks 1997; Dorn, Oette, and White 1998; Dorn, Levi, and King 2005). However, there is an emergent consensus in the literature that economic incentives are the principle driving force behind drug trafficking (Arlacchi and Lewis 1990; Desroches 2007; Kenney 2007; Chi et al. 2013). That is to say, people active within the drug markets aim to maximize their economic utility and minimize their risks, which they achieve through modifying their behaviours in relation to external stimuli (Reuter and Kleiman 1986; Benson and Decker 2010; Caulkins and Reuter 2010; Che and Benson 2014).

Even in more structured drug markets, a multitude of factors may cause important fluctuations in economic opportunities for traffickers and drug dealers. For example, arrests may cause an increase in the value of drug markets as prices rise in response to the higher risks of running an illegal business (Reuter and Kleiman 1986; Caulkins and Reuter 1998; Kuziemko and Levitt 2004). Drug seizures similarly can lead to a rise in the value of drug markets by shifting the supply curve in a market where the demand is, instead, relatively stable (Castillo, Mejía, and Restrepo 2014). Alternatively, a contraction in the availability of a particular drug may lead to an overall reduction in the value of the illicit market by reducing its size. Both disruptions in drug dealing markets and reducing the availability of a drug can reduce the number of drug transactions, thus reducing the total value of the market (Kleiman 1992; Caulkins 1993; Hough and Natarajan 2000; Kerr, Small, and Wood 2005; Kleiman, Caulkins, and Hawken 2011). Given that there are multiple potential dynamics and simultaneous combinations of different factors this is evidently incredibly difficult to measure (Kilmer and Hoorens 2010; Kilmer, Reuter, and Giommoni 2015; UNODC 2015k).

Fluctuations in the value of drug markets are likely to modify the competitive environment in which traffickers operate, regardless of the specific reasons underlying the changes (Miron 2001; Kleiman 2004; Robles, Calderón, and Magaloni 2013; Castillo, Mejía, and Restrepo 2014). In the event of such a scenario, drug traffickers have an opportunity to either increase their gains or lose part

of their income, which, in turn, further affects the balance of anticipated rewards and costs (Nettler 1978).

There are three main aspects stemming from the illegality of their business which impede upon their ability to peacefully handle the transformation of the market. Firstly, due to their status as criminals, drug traffickers are unable to rely upon the institutions that make up the legal system to help settle their disputes and enforce contracts (Caulkins and Reuter 1998; Jacques and Wright 2011; Chimeli and Soares 2011; Mejía and Restrepo 2013; Robles, Calderón, and Magaloni 2013). Secondly, business people who operate in illicit markets cannot rely upon traditional practises available to their legal entrepreneurial counterparts; they are unable to utilise advertising and branding to gain market share and increase profits (Gambetta 2009; Che and Benson 2014). Finally, during tough periods for the drug industry it is difficult for traffickers to liquidate their businesses and find alternative employment which offers a similar income, not even if they remain engaged in illegality (Collins 1990; Reuter et al. 1990; Count the Costs 2013). Therefore, the recourse to violence in this instance can be understood as a potential substitute for legal practices in response to changes in the value of drug markets (Kleiman 1989; Rasmussen, Benson, and Sollars 1993; Rasmussen and Benson 1994; Desroches 2007; Costa Storti and De Grauwe 2008; Moeller and Hesse 2013; Rios 2013). Given that it is changes in market dynamics which influence the recourse to violence, we can say that both expansions and contractions in drug trafficking profits determine levels of interpersonal violence (Kleiman 2004).

II Chapter: Empirical methodology

The study develops a series of econometric models, for the purposes of testing the effects of fluctuations in economic incentives generated by cocaine trafficking on the recourse to lethal violence. The study does not consider the joint impact of markets for each possible illicit drug due to the exponential increase in the number of assumptions that would be necessary to merge different estimates for each single market. The amount of data covering prevalence of use, prices, seizures, and so on, is higher for cocaine, heroin, and marijuana than it is for all other substances (Boivin 2011; 2013). Furthermore, this is a cross-national study, and the data on cocaine, in particular, is both richer and in far greater abundance, as it is possible to utilise UNODC databases (2014a; 2014c). The available information about cocaine markets allows for an estimation of fluctuations in the value of the cocaine market during the period 1999-2013; The study produces, with varying levels of reliability, an estimate of the cocaine market indicators for 151 countries identified as part of the worldwide trafficking network. Therefore, the sample of countries included in the regressions would have a limit of 151 countries. However, the availability of data to proxy for structural factors potentially correlated with the use of violence reduces this number. Having said this, the cocaine market is currently the most prone to violence of all illicit markets. Previous studies have verified this assertion with respect to both drug dealing and international trafficking (Moore and Stuart 2005; Bean 2008; Reuter 2009; UNODC 2013d; 2016c). The atypical level of violence inherent to the cocaine market imposes particular restraints with regards to extrapolating any findings from this specific context to other illicit markets in which the use of violence is less common.

The proposed econometric methodology relies on the use of the system generalized mixed model (GMM) estimators, as developed by Blundell and Bond (1998). This econometric device is particularly convincing as it pertains to controlling unobserved country specific effects, and in terms of managing the potential joint endogeneity of the explanatory variables (Greene 2011). The study adopts countries as units of analysis. The sample includes 63 countries, located in Asia (10), the Americas (17), Europe (34), as well as Oceanic (2) (see Figure 1). National data are organized in a panel data form that covers the period spanning from 1999 to 2013. Countries have been included in the analysis according to the availability of data on structural determinants of violence.

Figure 1. The sample of 63 countries used for the econometric analysis

Note: author's elaboration.

All econometric models in this study use the logarithm of the national homicide rate as the dependent variable, as in accordance with almost the totality of cross-national studies investigating the structural determinants of violence (Avison and Loring 1986; Fiala and LaFree 1988; Bennett and Lynch 1990; Bennett 1991a; 1991b; Gartner 1991; Fajnzylber, Lederman, and Loayza 2002b), as well as the majority of cross-national studies on drug systemic violence (Goldstein et al. 1989; Brownstein et al. 1992; Cohen et al. 1998; Cork 1999; Rios and Shirk 2011; Castillo, Mejía, and Restrepo 2014; Dell 2015). Homicide rates are regressed on different sets of variables describing drug markets and socio-cultural potential determinants of violence.

The core explanatory variables are the variation of the gross value added generated by the cocaine markets and a dummy, which identifies shrinking markets. The use of these estimates to analyse the economic patterns of cocaine markets directly instead of using proxies like retail or wholesale prices, volume or number of seizures, prevalence of consumption, represents an original contribution of this study to the field. The study develops a methodology to estimate the gross value added that combines insights from the drug/monetary flow approach to the study of drug markets (Paoli, Greenfield, and Reuter 2009; Walker and Unger 2009), along with data generation techniques developed in the field of criminal network analysis (Boivin 2013; 2014b; Chandra and Barkell 2013; 2015; 2016). The following subsections in this chapter present the background to these studies and set out the procedure adopted to perform the estimate (see subsection II.3).

The overall gross value added in national cocaine markets, an original estimate of the interception rate of cocaine, the size of cocaine consumption in each country, and the share of gross value added generated within the transnational trafficking network are the other cocaine market indicators used in the econometric analysis. Regressions also control for alcohol consumption and episodes of political violence. Section II.4 of this chapter describes the selected variables, the sources of data, and provides summary statistics about them. The regressors used to test the explanatory power of structural theories are selected in accordance with extant literature on the topic and the availability of data. The variables included in the analyses are a synthetic index of probity and rule of law, police rate, infant mortality, GDP per capita, the logged value of homicide rates, the share of the population living in an urban context, and a proxy of the demographic structures within the country.

It is important to stress that both the econometric analysis and the underlying estimates of the gross value added have specific limitations, which must be taken into account when interpreting the results. Firstly, the illegality of cocaine market itself makes it extremely difficult to collect reliable information on a variety of crucial features, such as the number of users or prices (Reuter and Greenfield 2001). Data collection and validation issues are amplified when extended to cross-country analyses. Hence, although estimates may truly reflect differences in cocaine markets between countries, this might also be a consequence of countries' idiosyncratic data collection methods (Kilmer, Reuter, and Giommoni 2015).

Despite developing a strategy to reduce the burden stemming from omitting key variables, with country specific fixed effects, the numerosity of the potential determinants of violence suggests that they may be omitted variables that are not stable in the period under analysis. A second relevant issue concerns the capability of the model itself to identify the direction of the causality in each of the analysed relationships by constructing instrumental variables based on previous values of the variable under analysis. System GMM is likely to be effective in solving this issue for the two variables representing fluctuation in the value of the cocaine market, because their evolution depends on supply shortages, changes in trafficking routes, and others factors that can change in a relatively short span of time. This issue, on the contrary, might be more relevant for certain structural determinants of violence, such as the economic wealth. The Discussion chapter addresses these concerns in greater detail.

II.3 Illicit profits estimation strategy

This study quantifies the gross value added of cocaine markets, utilising a method that aims to address, as far as possible, the numerous weaknesses in the available data and the fragility of certain assumptions. The following subsections delineate this approach, while Annex I presents the calculi behind each estimate.

This study proposes an approach that combines all of the features of available estimates to provide a longitudinal and cross-sectional estimate of the gross value added generated by cocaine trafficking and dealing. The resulting estimate is not entirely without its limitations, but nevertheless it is a unique instrument through which to comprehend the relationship between the profitability of drug trafficking and the recourse to lethal violence. The cross-sectional and longitudinal nature of the estimate allows for the implementation of sound panel data analyses to test this relationship, which is absent in extant literature.

The study conceives of international drug trafficking as a network of trading relationships among countries, and national drug distribution as a series of transactions that allow cocaine to pass from international drug traffickers to final consumers. Conceptualising cocaine trafficking in this way is in line with the estimate of the gross value added related to national and international cocaine trafficking for each country. The terminology 'gross value added' is proposed by Pedroni and Verdugo (2011), who define gross value added as the estimated tonnage of coca production multiplied by price per ton, minus costs of intermediate inputs, which are referred to as consumption. In this study, gross value added denotes the revenues emerging from the international trade, national distribution, and retail sales of cocaine minus the cost of goods sold, which includes the costs incurred from purchasing the cocaine that traffickers resell within the supply chain, as well as losses due to interceptions by law enforcement agencies. Other research has defined gross value added as the gross income received from the international trade, national distribution, and retail sales of illicit opiates, minus the costs necessary to buy and/or produce them (UNODC 2015a).

Labour costs are not included in the estimate of gross value added. In the same manner, the estimate does not account for costs related to violence and conviction, which are key components of costs within the drug trafficking industry (Reuter and Kleiman 1986; Reuter and Greenfield 2001). Labour costs tend to be especially high, because illegality forces the distribution system to operate in inefficient ways at retail, wholesale and international levels. The constant risk of suffering losses to law enforcement agencies acts as a disincentive to invest in machinery and other instruments that could be confiscated from the traffickers. Although the proliferation of new communication technologies such as mobile phones and encrypted chatting services have transformed drug dealing,

final distribution still requires far more personnel than what is required in a licit environment (Caulkins and Reuter 1998).

The study aims to understand the impact of fluctuations in the monetary value of cocaine trafficking on the use of violence and the proposed estimate is functional to this. Indeed, the distribution of the gross value added between illicit entrepreneurs and salaried criminals is not fundamental when it comes to examining the effects of fluctuations in the value of the market on lethal violence. Both categories of actors are expected to react in a similar manner to variations in the profitability of the cocaine business. The potential costs related to drug interception and incarceration, which are relevant for investigating the relationship between the value of the cocaine market and the overall level of lethal violence, are instead included in the analysis. The estimate of the value of cocaine markets incorporates the value of seizures, while the econometric model designed to investigate this relationship includes controls for the level of enforcement in each country, thus eradicating this potentially confounding factor from the analysis.

The methodology underpinning the estimate of gross value added has four steps. The first step involves identifying the cocaine trafficking flows among countries by using information about seizures. The second step consists of sizing each national market. The third step involves calculating the quantity of cocaine trafficked between any pair of countries by combining the estimates which emerged from conducting the first two steps. Once the volumes of national markets and international flows have been established, the fourth step then combines volumes with cocaine prices and costs at different steps of the supply chain, which enables the determination of national and international profits. The proceeding section unpacks how the use of flow and network analysis is an expedient means through which to estimate international drug markets.

II.3.1 Identifying and weighting the cocaine flows (Step 1)

The existence of organized drug flows between countries is a widely accepted concept, as testified by the work of Farrell, Mansur, and Tullis (1996), Anthony and Fries (2004), and Gootenberg (2006) among the others. However, the first to propose a broad description of the international trafficking routes along which illicit drugs flow from producing countries to their final markets have been international institutions, such as the UNODC (2007b; 2008c) and EMCDDA (2008a; 2008a). Having said this, these models are merely descriptive and do not explicitly discuss the idea of a network, nor the idea of trading partnership between countries (Trumbore and Woo 2014).

Paoli, Greenfield, and Reuter (2009) do conceptualize transnational drug trafficking as a trade network, although it should be said that these authors neither map any network nor use network analysis techniques, despite the fact that, in their extensive analysis of heroin trafficking across the

globe, they employ a framework and terminology that has parallels to this approach. The work by Paoli, Greenfield, and Reuter (2009) definitively reveals that drug flows are relational in nature, and, as such, they are ideally suited for the application of social network conceptualisations and analysis (Boivin 2013). Consequently, over the last five years scholars have begun to use proper social network approaches to study national (e.g., Chandra, Yu, and Bihani 2016) and transnational drug trafficking (e.g., Boivin 2011; 2013; 2014a; 2014b; Chandra, Barkell, and Steffen 2011; Chandra and Joba 2015).

Allied with a more mature understanding of the nature of transnational drug trafficking, the increase in the number of studies reflects the growing availability of data, not to mention researchers' emergent capacity to analyse data in the form of a network (see Carrington 2011; Haynie and Soller 2014 for a review). Historically, the lack of data has been a crucial factor hindering quantitative studies in this field. However, over the last decade governments and international institutions have collected and provided a considerable amount of data concerning transnational drug trafficking, such as wholesale prices, seizures, and purity (e.g., EMCDDA 2008; UNODC 2013c; 2015f; United States Department of Justice 2014). Parallel to this, records have emerged showing the level of state involvement in all aspects of the transnational drug trade, from production to final consumption (e.g., Law Enforcement Affairs of the United States Department of State 2015; 2016). These datasets represent an unprecedented source of information that scholars have begun to use in order to understand how illicit drugs move across countries (Chandra and Joba 2015).

Viewing international drug markets as a chain of economic exchanges between countries may sound overly simplistic at first, however some of the more peculiar features of drug trafficking actually lends support to this perspective (Giommoni, Aziani, and Berlusconi 2016). All of the major illicit drugs like cocaine, illicit opiates, amphetamine-type drugs, are commodities whose commerce is primarily international in scope (Trumbore and Woo 2014; Caulkins 2015). Indeed, whilst the production of these illicit substances is spatially bound to specific regions, their consumption is unquestionably global (Caulkins 2015; UNODC 2016c). This is most certainly the case with respect to cocaine.

Erythroxylum coca, the coca plant, is traditionally found in wet, tropical mountain-forests, more specifically, valleys with between 500 and 1,500 metres elevation (Plowman 1979, 105–6). Today, seven Latin American countries report some form of coca cultivation, but almost all coca cultivation is concentrated in specific valleys in Peru, Colombia, and Bolivia (UNODC 2015f; 2015g; 2015l; 2016b). What this means is that, except for cocaine which is consumed in Andean countries, all remaining cocaine must cross at least one international border before it is consumed (Caulkins 2015). The other aspect that makes most drug markets global is the relative ease of transportation. Cocaine is a compact good, and thus to ship it around the world is relatively straightforward from a logistical

point of view (Caulkins 2015). Therefore, whenever cocaine is available in one country, it is likely to soon be available in other countries (Caulkins 2015). These features of the cocaine market underpin the rationale in this study to conceptualise cocaine trafficking as a chain of transactions leading drugs from producing areas to final consumers.

Two main contributions to the modelling of transnational drug trafficking as a network can be identified in the literature. The first one stems from a series of studies by Boivin (2011; 2013; 2014a; 2014b), who used macrosocial network analysis to both identify the position of countries with respect to drug flows, and so as to understand the structural properties of heroin, cocaine, and cannabis trafficking networks. Chandra and colleagues developed the second main branch of research in the field of network analysis of drug trafficking flows (Chandra, Barkell, and Steffen 2011; Chandra and Barkell 2013; Chandra and Joba 2015).

Boivin (2011b; 2011a; 2013) constructed his transnational drug trafficking network out of information from seizure cases between the period 1998-2007 that were collected from databases on "significant" drug seizures by the UNODC. Since this data provides only a partial picture of international drug trafficking network, the author integrated data on seizures with additional information. In particular, Boivin (2011b; 2011a) used anecdotal evidence reported by international organizations dealing with drug trafficking, such as the BINLEA, the EMCDDA, the INCB, and the UNODC in order to complete the network. Experts from these agencies usually have an in-depth knowledge of international trafficking routes; thus, including specific connections highlighted in these studies afforded the production of a more comprehensive network that involved countries for which seizure data were not available (Boivin 2011b; 2011a).

Boivin's principal contributions to the development of a drug trafficking network are the systematic use of information about seizures, and the in-depth analysis of the limitations and pitfalls of such an approach. The construction of the network in this study is deeply indebted to Boivin's (2011a) work, and thus shares, to a large extent, some of its limitations, which are discussed extensively in the description of each step of the proposed estimation methodology.

In addition to methodological innovation, Boivin's studies provide interesting findings with respect to the structure of transnational drug trafficking networks. First, Boivin (2013) discovers that the network of trafficking of illicit drugs has a looser structure compared to, say, the trade of legal agricultural commodities such as coffee or chocolate which, much like cocaine, are plant-based products that require few transformations and are mainly grown in tropical countries. Second, he notes that countries at the centre of the global legal economy are more likely to occupy peripheral positions within the transnational trafficking of illicit drugs (Boivin 2013).

Chandra and colleagues estimated the directions of transnational cocaine (Chandra, Barkell, and Steffen 2011) and heroin flows (Chandra and Barkell 2013) to European countries. To construct these networks, the authors analyse and compare the wholesale prices for heroin and cocaine between 2000 and 2008, as reported by the UNODC. Using anecdotal information collected from the *World Drug Report*, the authors assumed a link between any pair of countries for which the drug price correlation exceeded a certain threshold that is determined to maximize the correspondence between flows, which were identified by looking at price increases and flow (Chandra, Barkell, and Steffen 2011). By stating that the price of a drug increases with a new transaction, they were able to estimate the directions of the flow, thus constructing directed binary-networks of the international trafficking of heroin and cocaine in Europe (Chandra and Joba 2015).

Mapping the flows by looking at prices is an elegant manoeuvre, which relies upon a solid theoretical base: drug prices increase with the number of transactions from producing to destination countries (Caulkins 1995b; Caulkins and Reuter 1998; Caulkins and Bond 2012; Reuter 2014). However, the use of prices to weight the flows requires formulating a complex assumption concerning the relationship between prices and volumes for which data are not currently available. Moreover, by working on single prices rather than ranges, Chandra and colleagues had to exclude any form of reciprocity in the relationships between countries within the drug trafficking network. While this is likely to be valid in most of the cases, it is not always the case, as studies on drug seizures have documented (UNODC 2015b) and as the same authors have themselves discussed (Chandra and Joba 2015). With respect to the construction of their trafficking network, Chandra and colleagues assumed the demand for cocaine to be inelastic with respect to price variations, thus ascribing changes in drug prices to shifts in its supply (Chandra, Barkell, and Steffen 2011). Most scholars argue the opposite of this, positing that both cocaine trafficking and cocaine consumption are influenced by the price of the substance (Kleiman 1992; Caulkins and Reuter 1998; MacCoun, Kilmer, and Reuter 2003). In light of this potential limitation, for the purposes of this study cocaine prices are utilised in order to check the meaningfulness of connections found through information on seizures, as opposed to identifying them.

Both branches of research developed by Boivin and Chandra model international drug trafficking as a binary network in which connections between countries can be present or absent, but do not have different dimensions, weight, or relevance. Boivin and Chandra's networks provide information about whether or not two countries are connected by drug trafficking activities, as well as in which direction(s) the drug flow goes. Indeed, using a definition of a network proposed by De Benedictis and Tajoli (2011), the networks produced by Boivin (2011a; 2011b; 2013; 2014) and by Chandra and colleagues (2011; 2015) may be classified as "the graph $G = (V, L)$, where $V = \{2, 3,..., n\}$ is a set of vertices (countries) and $L = \{0, 1,..., m)$ is a set of links (flows) between pair of vertices" (2011, 6). *G*

= *(V, L)* is a simple directed graph, where the links $L_{ij} \in [0, 1]$ originate from the exporting country (exp_i) and are directed to the importing country (imp_j). In this directed graph, the degree of a vertex is defined as the total number of the vertices $j \neq i$ to which i is connected (De Benedictis and Tajoli 2011).

The reasoning behind these authors' decision to exclude the edge weights from their analysis of drug trade networks are twofold. Firstly, including information on the quantity of drug traded between any two countries requires an estimation of the size of illicit drug markets for each country (UNODC 2015e). This exercise is extremely challenging and forces researchers to accept particularly strong assumptions given the paucity of certain classes of fundamental data, especially when focusing on multiple countries (Kilmer et al. 2011; Kilmer, Reuter, and Giommoni 2015). Secondly, in order to develop drug trafficking weighted networks it is necessary to weight the relevance of each drug flow with respect to all the other flows targeting the same market (UNODC 2015e). This second task also presents numerous difficulties and calls for the acceptance of rigid assumptions, which limit the reliability of the estimate itself (UNODC 2015e). However, drug trafficking networks are intrinsically weighted, and, thus, ignoring the dimension of the flows result in a loss of relevant information when it comes to analyse the flows (Newman 2004).

The third main contribution to the field of international networks of drug trafficking comes from the work of Reuter (2014). In parallel with the emergence of more quantitative literature, Reuter expands and recalibrates theoretical knowledge on the main factors influencing drug routes. According to Reuter, there are three factors determining the geopolitical structure of international trafficking network. The first factor, deriving from the *risk and price* approach to the study of drug trafficking developed by Reuter and Kleiman (1986), is the ratio between expected returns and expected costs of shipping drug to a certain country being the principal costs incurred by traffickers, other than those imposed by law enforcement authorities (Miron and Zwiebel 1995; Jenner 2011). If law enforcement increases these costs or if cocaine prices decrease, then other countries become more attractive (Reuter 2014). The second factor is geographical proximity. Long journeys increase transportation costs along with the risk of interception and arrest for traffickers. Therefore, close proximity to either a main producer or consumer country may lead to a country becoming an important transhipment country for illicit drugs (Reuter 2014). Reuter considers social phenomena, such as migration flows, to be the third key factor affecting drug trafficking routes. Examining the drug trade in Western Europe for example, he finds that Turkish and Albanians dominate both the import and retail distribution of heroin, while Colombians have a leading role in the import of cocaine from South America (Paoli and Reuter 2008). What these ethnic groups have in common, besides a relative proximity to production or key trafficking countries, is a relatively large diffusion in these main destination countries. Reuter's

analysis, whilst not providing direct methodological instructions for the construction of the trafficking network, nevertheless provides crucial insights about the general criteria around which the network is to be developed.

Building on this established foundation of knowledge provided by these aforementioned authors, the study *Drug Money: the illicit proceeds of opiates trafficked on the Balkan route* by the UNODC (2015e) introduced methodological considerations that led directly to the development of the estimation approach utilised in this study. While the networks produced by previous research analysed the presence or the absence of connections, UNODC's (2015e) study expanded upon this reasoning by estimating volumes of drug shipments and monetary flows along the heroin supply chain of the extended Balkan route, all the way from production in Afghanistan to consumer markets in Western Europe. Moving on from the opiate business model presented by the FATF/OECD/UNODC (2014), which identified in production, manufacturing, distribution, and retail sale the fundamental steps of the illicit industry in opiates, UNODC's (2015e) study estimated the gross profit emerging from Afghan opium.

Their methodology consists of three main components. First, UNODC estimated the total quantity of illicit opiates available along the extended Balkan route by considering annual seizures and annual consumption of illicit opiates in all of the countries included in their analysis. The second step concerned the tracking of flows of the illicit opiates across these countries. Adopting the method proposed by Boivin (2011a), UNODC (2015e) reconstructed the heroin trafficking network by involving countries along the Balkan route. In particular, drug flows were identified through studying seizure cases and anecdotal evidence from reports produced by international institutions studying drug trafficking. After identifying the network, it was necessary to weight the relevance of each connection within it. The UNODC (2015e) estimated the volume of the flows by confronting the volume of opiates seized between two countries with the total volume of seizure at entrance performed by the importing country. The higher the seizures of illicit opiates coming from that specific origin, then the higher the flow from there. Finally, by combining information on the size of the flows with that on prices of illicit opiates, they estimated the gross profit generated by the trafficking of illicit opiates. Subsequent studies followed in the footsteps of these analyses in order to investigate the determinants of the geopolitical configuration of international trafficking of heroin (e.g., Berlusconi, Aziani, and Giommoni 2016).

This study embraces the techniques adopted by the UNODC (2015f). However, it expands upon them by producing a network with minimal geographical boundaries, not to mention tempering some of the limitations of the original method, such as drawing upon anecdotal evidence to construct the network, or using information on seizures provided by both importing and exporting countries.

Nonetheless, the main innovation with respect to currently available methods is the introduction of the temporal dimension. The estimate of gross value added across multiple points in time permits the use of an econometric longitudinal analysis. At the same time, since drug trafficking routes are marked by constant changes (UNODC 2015k), through attempting to model their evolution, it is also possible to expand our knowledge of the drug-trafficking phenomenon itself.

II.3.1.1 Constructing the cocaine trafficking network

The global trafficking network on cocaine, as per the methodology proposed by Boivin (2011a), is built using information from seizure cases reported by the UNODC individual drug seizure (IDS) databases, which cover the period 1997-2014. The availability of data on a specific route is adopted as a criterion for inclusion in the network. That is to say, the cocaine trade network includes all countries for which data are available, according to seizures which occurred in this period. No other criteria for defining the network boundaries are established. Original information on seizures are stored in the IDS online databases of the UNODC (2014c) and in the IDS databases of the Drug Monitoring Platform (DMP), which is an online tool for collecting, monitoring and sharing a wide range of drug related data, and which features an interactive online mapping resource (UNODC, Afghan Opiate Trade Project, and Paris Pact 2014). UNODC collects information on drug seizures by inviting all United Nations Member States to provide information on IDS through the Annual Report Questionnaire (ARQ) and the Drug Monitoring Platform (UNODC 2016a). Member states are solicited to transmit to the UNODC a variety of information on significant seizure cases, such as the date and the place of seizures, the type of drug, the seized quantity, the mode of transportation, and several other factors, including the origin, transit, and destination of the seized shipments, which are the most important for the construction of the trafficking network.

In general, the quantity of information provided on seizures of drug loads is more abundant than that provided on other aspects of drug trafficking and consumption. Analysis of responses to Part IV of the ARQ concerning drug seizures, indicates that 73 per cent of them are substantially completed compared, for example, to 67 per cent of Part III concerning “Extent and patterns of and trends in drug use” (UNODC 2016a). However, it is important to note that national institutions submit this information on a voluntary basis, and, as such, some countries may not report information, which can lead to a lack of certain connections in the network, as well as potential bias in estimates (Boivin 2011a; 2011b; 2013; UNODC 2015d). To increase the completeness of the database, UNODC primarily complements seizure data made available to UNODC via the ARQ with data from other government sources, such as official national publications, as well as data provided to UNODC by the Heads of National Law Enforcement Agencies (HONLEA). UNODC integrates its final databases also

with data published by international and regional organisations, such as Interpol/ICPO, World Customs Organization (WCO), European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) and the Inter-American Drug Abuse Control Commission (CICAD) (UNODC 2016a).

There remain challenges when using information provided by the UNODC, because of gaps in the data and the varying quality of available data, despite the fact UNODC collects information from a variety of sources. The irregularity and incompleteness in ARQ reporting by Members may also result in the absence of seizure data for particular years. Further, submitted questionnaires are not always complete or comprehensive. Even if UNODC closely oversees data collection and performs several checks to improve data reliability (Caulkins 2007; UNODC 2009), much of the data collected are subject to limitations and biases that UNODC are unable to fully solve. These issues undoubtedly affect the reliability, quality, and comparability of the available information.

For the purposes of constructing the network, data are gathered from the IDS databases uploaded on the statistical section of the web site of the UNODC. If a country included in these databases fails to provide information for a specific year but that data is available in the DMP databases, then the data is gathered from this second source. The databases available on the websites of UNODC and the DMP share the exact same structure, and the combination of information coming from these two sources has already been undertaken by UNODC in their study of heroin flows along the Balkan route (2015d). This procedure, to be clear, does not fully resolve the issue of missing information, but it does temper its severity somewhat.

Information on seizures allows for the identification of pairs of countries exporting and importing cocaine with each other, as well as establishing the position of each country in the international cocaine network (Boivin 2011; 2013; 2014b; UNODC 2015e). At certain points, depending on the occurrence of the seizures, law enforcement agents are able to trace the movements of drug shipments between countries. For instance, the interception of a load of cocaine destined for Canada on the border between Mexico and the U.S. suggests the existence of a path from Mexico to the U.S. and continuing on to Canada (Boivin 2013). In some cases, the dyad may be even more obvious; for example, if the seizure takes place on a commercial plane travelling direct from Argentina to Spain, then it would be reasonable to assume that cocaine routinely made the same trip, especially if it is discovered on a passenger or in his/her luggage (Boivin 2011). In less simple cases, information on seizures can emerge later after more sophisticated investigations, or, alternatively, may remain unknown to law enforcement agencies (Boivin 2011). When information on the movements of drug loads are missing, the seizure case is worthless in terms of reconstructing the structure of the network; nonetheless, data on seizures are crucial to determining the weight of cocaine flows.

The transformation of available information into dyads is straightforward, involving the origin, transit, and destination data being put into a relationship with the reporting countries, thus mapping the connection between those countries. By replicating the same procedure for all the countries, it is possible to map the entire network. As seen in the first example, a single seizure case can provide evidence of two dyads: Mexico-United States and United States-Mexico. In this study, the construction of the network adopts the perspective of importing countries. That is, information provided by exporting countries is used only to identify the connections of those countries that do not pass seizure information on to the UNODC. In other words, if a country does not provide information on entering shipments, then entry connections are determined by using information on destinations provided by third countries.

The identification of the connections between 105 countries included in the network, then, relies exclusively on information provided by importing countries.[2] The construction of the network of the remaining 46 countries depends on information emerging from the analysis of seizure cases reported by third countries.[3] Since the United States provides information on seizures, in the case of the aforesaid example the study would consider the dyad Mexico-United States, while ignoring the information suggestive of a connection between the U.S. and Canada. In the event that Canada would

[2] The following represents the list of countries in which seizure cases allow for the identification of the last step of the path through which cocaine enters into the country: Afghanistan, Angola, Argentina, Australia, Austria, Bahamas, Belarus, Belgium, Benin, Bolivarian Republic of Venezuela, Bosnia, Brazil, Bulgaria, Burkina Faso, Canada, Cape Verde, Chile, China, Colombia, Congo Brazzaville, Congo Kinshasa, Costa Rica, Cote d´Ivoire, Croatia, Cuba, Curacao, Cyprus, Czech Republic, Denmark, Dominican Rep, Ecuador, El Salvador, Estonia, Ethiopia, Fiji, Former Yugoslav Republic of Macedonia, the, France, Gambia, Germany, Ghana, Greece, Guatemala, Guinea, Guinea-Bissau, Honduras, Hungary, India, Indonesia, Ireland, Italy, Jamaica, Japan, Kenya, Korea, Latvia, Lebanon, Lithuania, Luxembourg, Malawi, Mali, Malta, Mauritania, Mexico, Morocco, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Poland, Portugal, Puerto Rico, Romania, Russia, Saint Lucia, Saint Vincent & Grenadines, Senegal, Serbia, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Suriname, Sweden, Switzerland, Syria, Tanzania, Thailand, Togo, Trinidad, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Vietnam, Zambia.

[3] The following list includes those countries for which connections are exclusively based on information provided by other countries: Albania, Algeria, Andorra, Armenia, Aruba, Bahrain, Bangladesh, Barbados, Bermuda, Cambodia, Cameroon, China, Hong Kong SAR, Dominica, East Timor, Egypt, Equatorial Guinea, Finland, Gabon, Georgia, Gibraltar, Guyana, Haiti, Iceland, Iran, Iraq, Israel, Jordan, Kuwait, Lao PDR, Lesotho, Liberia, Libya, Malaysia, Monaco, Mozambique, Namibia, Philippines, Qatar, Sao Tome & Principe, Saudi Arabia, Sierra Leone, Singapore, Swaziland, Taiwan, Turks and Caicos Islands, Zimbabwe.

not have provided the information, then the dyad United States-Canada would have also been included in the network. The preferential use of the information provided by importing countries allows for a reduction in the potential bias in estimates of the size of flows due to asymmetries in interception rates.

Law enforcement attention to drug trafficking issues varies among countries, as does the effectiveness of their actions; this is particularly the case with cocaine trafficking (UNODC 2010c). In addition to the fact that economically developed countries tend to be more effective in intercepting drug shipments than, say, developing countries where there is widespread corruption, cocaine interceptions make up a large proportion of seizures made in or close to the source countries (UNODC 2010c).

When it comes to weighting the dyads, disparities in the level of seizures are likely to inflate the relevance in international cocaine trafficking of those countries exporting cocaine to destinations that are characterized by effective border patrols or, more likely, by high interception rates. Conversely, the role of countries exporting to destinations where law enforcement is more relaxed would be unduly downsized. This bias is potentially severe when taking into consideration a global network in which interacting countries have extremely heterogeneous counter drug policies, levels of corruption, and law enforcement agencies.

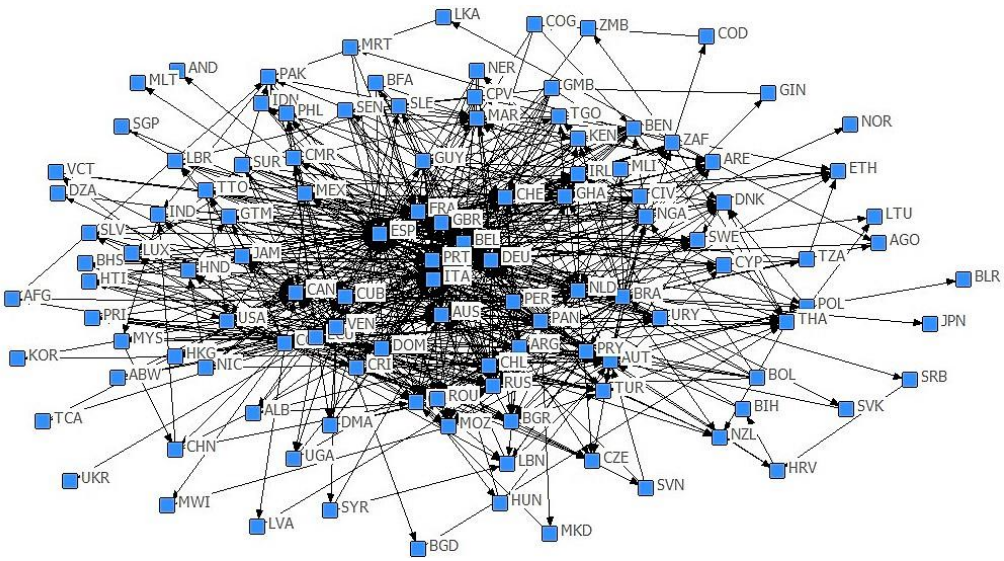
This approach increases the robustness of the estimates of the weights of the shipments, albeit detrimentally affecting the number of observations and leading to the potential loss of specific connections. While for countries involved in large cocaine flows, all major connections emerge when only taking into consideration their seizures, but this might not be the case for more peripheral countries that perform less seizures; given the lower number of seizures, the likelihood of missing some connections is far greater. Indeed, even if UNODC databases are complemented by supplementary information, the reports from international organizations that are used to supplement actual data on seizures are often selective and tend to focus on the most used routes, thus overlooking minor connections. The centrality of the estimates of volumes for the entire analysis, allied with the minimum impact that the choices have on countries providing large amounts of information, gives credence to the adoption of this strategy.

Further potential biases may also stem from misunderstandings in the compilation of the IDS on the behalf of officials of the UN member states. With respect to origin of drug shipments, UNODC's guidelines invite officers to indicate the "producing/manufacturing country" referring to "[…] countries where the drug crop was cultivated or the drug was manufactured" and the "country of departure" meaning the "[…] countries […] that were the point of departure for drug traffickers, or unaccompanied shipments of drugs, reaching your country" (UNODC 2015a, 10–11). The

combination of this information should allow UNODC to provide a point of origin for drug shipments. Although if one looks carefully enough the two meanings are different, one can easily foresee occurrences when the terms are treated as synonymous with one another. The same form invites officers to provide information regarding transit countries. More specifically, transit is defined as "[…] the last country through which the drugs transited before reaching your country. This could be a neighbouring country, if the drugs were transported by land, or any other country, if the drugs were transported by air" (UNODC 2015a). Yet again, the two meanings are different, but just as before the terms are often interpreted as synonyms. For instance, the definition of transit country is different from country of departure; the former means the last country through which the drug passed before entering into the country reporting the data, whereas the latter refers to the first country from which the drug shipments departed.

Moreover, officers, on occasion, appear to simply report the last country to which they can track back the shipment, which, of course, can differ from the last country from which the cocaine actually flowed (Boivin 2011). With respect to certain years and specific countries, data referring to origin and destination were clearly inverted; for example, there are cases of information provided by African countries which locate the origin as Europe and the destination as Colombia or in Brazil. Methodically checking the information on each seizure case strengthens both the validity and richness of the analysis, but it cannot guarantee the complete reliability of the original information. The various shortcomings of the UNODC's database of seizure cases have already been discussed. Despite these limitations, the UNODC database remains the best available option, because they provide conveniently accessed information unavailable anywhere else (Caulkins 2007; Boivin 2014b).

Figure 2. Global cocaine trafficking network



Note: author's elaboration on UNODC data.

Finally, the economic feasibility of all the transactions identified is checked for purity-adjusted trade prices, but not for the purchasing power of the two countries. The assumption is that both counterparts must gain from the trade (Caulkins 1995b; Caulkins and Bond 2012; Chandra, Barkell, and Steffen 2011; Reuter 2014). Therefore, the structure of trade prices has to allow traffickers from the exporting country to sell the drug at a price higher than the price they paid for their loads. At the same time, traffickers who operate in the importing country have to pay a price that allows them to make a margin from selling the cocaine down the supply chain, or further within the international market. Whenever this criterion is not satisfied, the rationale here is that the transaction will not occur, hence why the final network does not include this specific dyad. Dyads conflicting with trade prices may emerge due to problems in the data (e.g., wrongly reported information on seizures, weak estimates of prices), may represent minor flows, which are not systemic but occasional. In both these cases, it makes sense to exclude them from the network. The estimate of purity-adjusted trade prices is presented in the section describing the approach to the quantification of monetary values of cocaine trafficking. Annex I presents the procedure for the price checking formulas.

In total, these databases catalogue 133,090 seizure cases. 35,102 of them provide useful information for identifying the international cocaine trafficking network. The analysis determines 1,142 different dyads between 151 countries around the world, some spanning across the entire period 1997-2014, while others are identifiable for only one year. 39 of the 151 countries are located in Africa, 35 in the Americas, 34 in Asia, 40 in Europe, and 3 in Oceania. The structure of the network confirms the global dimension of the phenomenon, and thus justifies a global approach to studying the phenomenon.

II.3.2 Sizing the markets (Step 2)

The second step in estimating the profits generated by cocaine trafficking involves quantifying the amount of cocaine consumed in the countries under analysis. While the number of studies estimating the economic dimension of drug markets are still limited, the literature on sizing drug markets is more abundant, especially in developed countries.

The series of studies promoted by the ONDCP's *What America's Users Spend on Illegal Drugs* (Rhodes and McDonald 1991; Rhodes et al. 1997; 2001; 2012; Kilmer et al. 2014) has improved, edition by edition, the methodology for sizing drug markets. Other rigorous studies which focus on the U.S. are those by Kilmer and Pacula (2009), Kilmer et al. (2011), Kilmer, Caulkins, et al. (2013). As noted by Kilmer and his colleagues (2014, 7–8), outside the United States scholars have principally focused on sizing marijuana illicit markets (e.g., Wilkins, Bhatta, and Casswell 2002; Wilkins et al. 2005; Bouchard 2007; 2008; Jansen 2012). However, non-American literature includes estimates for

other illicit drugs (including cocaine). Authors and institutions like Connolly (2005), Pudney et al. (2006), Rossi and Ricci (2009), van Nuijs et al. (2011), KLPD (2012), Kilmer, Taylor, et al. 2013, Giommoni (2014; 2015), EMCDDA (2015), and others have produced estimates of the scale of the market for cocaine in European countries. Examples of estimates of the size of cocaine markets outside the U.S. are also available for Australia (e.g., Ryan and Griffiths 2013)and Canada (e.g., Lippert and Walker 1997).The *World Drug Report* by the UNODC provides worldwide estimates of the size of illicit markets by macro regions (UNODC 2006; 2007b; 2008c; 2009; 2010c; 2011e; 2012b; 2013d; 2014e; 2015k; 2016c). Other research adopts a multinational perspective, such as the work of Kilmer and Pacula (2009) and UNODC (2015d).

Researchers have produced estimates on the value of cocaine markets in Colombia (Bagley 1988; Kalmanovitz 1990; Thoumi 1995; Clawson and Lee 1996; Rocha 1997), Bolivia (Nadelmann 1989; De Franco and Godoy 1992; Shams 1992; Painter 1994), Peru (Shams 1992; Thobani 1992; Alvarez 1995; Pedroni and Verdugo 2011), as well as Mexico (Resa Nestares 2003; Barro and Sala-i-Martin 2004; Rios 2008). In all of these studies, however, the adopted methodology does not allow for the estimate of the size of the market. Generally speaking, understanding the size of illicit drug markets is pivotal for developing and monitoring policies aimed at reducing the negative effects of drugs (Kilmer and Pacula 2009, 1). Quantifying the consumption of cocaine is the first step in estimating both the value of the market at retail level, and the volumes of international shipments of cocaine. Indeed, this study assumes that 1) the value at retail of the cocaine market is equal to the total consumed volume multiplied by price of cocaine at a retail level and 2) that the quantity of cocaine entering into a country in any given year corresponds with the sum of internal consumption, national seizures, and exports to third countries.

II.3.2.1 Methods to size drug markets

The size of the national markets for drugs can be estimated by using information on the supply or on the demand of drugs. Seizure-based and production-based estimates are the principal approaches on the supply-side, whereas consumption-based and expenditure-based are the principal forms of demand-side estimates (Hickman and Taylor 2002; Kilmer et al. 2014).

The most straightforward supply-side estimate is the seizure-based one. Seizure-based estimates multiply the quantity of drug seized by an estimated interception rate, which helps us ascertain the volume of drugs available. While this approach is simple to implement and relies on readily available data (i.e., seizures data), it tends to provide unreliable estimates because there are no a priori information on interception rates (Kilmer et al. 2011; Parey and Rasul 2015). Seizures simultaneously reflect the dimension of the drug flows, law enforcement resources and priorities, and the strategies

adopted by criminals to avoid interdictions (Reuter 1996; Kilmer and Hoorens 2010). At present, it is ordinarily impossible to disentangle these three factors (Kilmer, Reuter, and Giommoni 2015). Moreover, not all of the drugs available in the market are consumed locally; in many cases, a portion is exported to a third country. Therefore, to estimate the level of national consumption, it is also necessary to determine the volumes which are exported abroad (Reuter and Majmundar 2015). It is these limitations which have restricted the widespread adoption of this method (Pudney et al. 2006; Tonry 2015; Parey and Rasul 2015).

Production estimates are the principal supply-side approach to sizing cocaine markets. Production-based estimates begin with an evaluation of the soil used to grow coca; then, the potential production of cocaine is quantified considering yields per hectare, eradications, laboratory efficiency, seizures (UNODC 2015l). The estimate of the cultivated lands derives from the analysis of a combination of satellite images, aerial photographs, field observations, and interviews on the ground (UNODC 2010a; Kilmer et al. 2011). The acquisition and use of these data are undoubtedly complex, requiring corrections that take into account cloud cover, eradications, spraying, dates of acquisition, etc. (UNODC 2013a; 2013b; 2014d). The calculation of the effective production of coca leaves is perhaps even more complex than estimating the total area under cultivation (Thoumi 2002). Indeed, it requires considering variables, such as the age of the plants, the number of plants per hectare, the techniques used to cultivate coca, the concentration of alkaloids in the leaves which differs according to the altitude of the fields, the climate, the number of harvests per year, and the typology of the plants (UNODC 2011d). After estimating the total production, researchers use a series of conversion factors (e.g. dry weight per unit weight harvested, kilos of coca base per coca paste) to pass from volumes of coca leaves to the potential production of cocaine (Kilmer et al. 2011).

These steps also rely on a series of assumptions with respect to the techniques used to transform it, such as the precursors used, the kind of laboratory where the process takes place, the ability of the chemists, and so forth (Thoumi 2002; UNODC 2011d; 2013a; 2013d). Researchers, indeed, have to consider alkaloid contents, laboratory efficiency, consumption of intermediate products, purity levels of the final substances, and many other factors (Casale and Klein 1993; Johnson and Emche 1994; Reuter 1996; UNODC 2010a). Seizures and other law enforcement interventions, which can reduce the amount of available coca-derivatives, must also be included in this estimate (UNODC 2006).

After determining the total production in the source countries (i.e., Bolivia, Colombia, and Peru), the consumption of cocaine in any given country is estimated by making assumptions about the share of potential production that is successfully exported to that particular destination. These assumptions mainly concern the volumes of seizures that occurred in prior stages of the supply chain, the level of consumption occurring in other markets, and the quantity of cocaine stockpiled in producing countries

(Reuter 1996; RAND Corporation 2014). A further factor to take into account is the time lag between harvesting the coca bush, cocaine processing and trafficking. Cocaine produced in a given year might take up to a year or more to reach consumer markets (UNODC 2010c; Ehleringer et al. 2011).

Criticalities regarding the estimate of the area under coca-cultivation, the efficiency of all the chemical processes, and the assumptions about the directions of drug flows characterize production-based estimates (Reuter 1996; UNODC 2010a; 2010c Kilmer et al. 2014; UNODC 2016c). These concerns, together with a long series of inconsistent reporting by governmental agencies and international organizations, have led to several authors expressing scepticism toward this method.

Taking into consideration these limitations, this study adopts a consumption-based approach, which is the most widely used demand-side estimate method, and the only one which allows for reasonable country-specific estimates given the available data (Johnson 2014; UNODC 2015f). The consumption-based approach is far from being perfect for a number of reasons that will be outlined in the following subsections. The expectation is that all the analyses presented in this study will be replicated once better data on national cocaine markets becomes available.

Consumption-based models combine the prevalence of cocaine use with information on the typical number of days of consumption, and the consumed amount per use-day, by user type in order to estimate the total consumption of a given population (UNODC 2002; Kilmer and Pacula 2009). The fundamental strength of these approaches is that, taking the destination country as a starting point, they permit the production of country-specific estimates all across the world. Producing estimates about the prevalence of use among the general population is thus the key opening task of most drug-information systems. Various methods are available to collect information on prevalence rates; population surveys are the most common for the study of cocaine use (UNODC 2002; UNODC 2011e). Indeed, prevalence rates are available from population surveys in a large number of countries (Hickman and Taylor 2002; Wilkins and Sweetsur 2007; Kilmer et al. 2011).

Having said this, population surveys have well-known limitations with respect to validity and reliability, and, in fact, tend to deflate the actual level of consumption (Fendrich et al. 2004; Turner et al. 2005; Johnson 2014). An unwillingness to report, non-response by heavy users, and misreporting of frequency of use are the most common issues when dealing with expensive drugs such as cocaine (Kilmer, Reuter, and Giommoni 2015).

A number of studies have asserted that respondents are unwilling to report their drug consumption because of the stigma associated with it (Fendrich et al. 1999; Colón, Robles, and Sahai 2001; Richter and Johnson 2001; Harrison et al. 2007). The scale of the underreporting is inversely related to the level of social condemnation and legal penalties associated with the specific drug. Hence, tobacco smokers tend to be more honest than smokers of marijuana, who, in turn, are more honest than cocaine

users (Harrison et al. 2007; Johnson 2014; Kilmer, Reuter, and Giommoni 2015). A veritable plethora of research has shown that even anonymous surveys about licit substances, such as alcohol and tobacco, tend to underestimate the actual consumption of these substances (Gmel 2000; Merriman 2002; Rehm et al. 2004; Johnson 2014). Both Knibbe and Bloomfield (2001) and Gmel and Rehm (2004) observe that most survey-based estimates of alcohol consumption underestimate actual consumption by anywhere between 30% and 70%, when cross-checked with sales data or other aggregate statistics. The widely accepted conclusion stemming from these findings is that surveys underestimate actual consumption (Midanik 1982; Alanko 1984; Cook and Moore 1993; 2002).

On the contrary, in environments where drug consumption may be perceived as admirable conduct, it has been found that respondents might exaggerate their substance use. For example, surveys of adolescents conducted in classroom settings, whereby peers might be aware of each other's answers, might lead to inflated results (Fendrich and Rosenbaum 2003; Johnson 2014). The propensity of people with low self-control to consume drugs and yet provide false information about their attitudes and behaviour is another potential source of bias stemming from statistical estimates in survey-based research (Meldrum, Piquero, and Clark 2013).

Misreporting the frequency of use is the second problem associated with surveys. Misreporting concerns the fact that, even though users are admitting their consumption, they often misreport, usually downward, the number of days of use in the past month or year (Kilmer, Reuter, and Giommoni 2015). The extent of under-reporting is, of course, almost completely unknown, which makes it difficult to correct the estimates for it (Kilmer, Caulkins, et al. 2013).

The third, and likely most severe, issue concerns non-response. High using groups, in particular, have high non-response rates (Kilmer, Reuter, and Giommoni 2015). This potential source of bias is due to the difficulties in reaching the relevant sub-population of illicit drug users in the original survey data, especially if the primary purpose of the survey is not directly related to the consumption of illicit substances. The number of intensive users is relatively small, thus requiring a large sample to intercept them. More problematically, surveys tend to overlook people who are in treatment or incarcerated, all of whom are expected to have higher prevalence rates (Hickman and Taylor 2002; Parey and Rasul 2015).

In addition to this, surveys are conducted in a variety of different ways across different countries (e.g., self-administered paper-and-pencil or electronic questionnaires, telephone or face-to-face interviews, etc.). In contemporary society, a number of studies have documented the dependence of surveys' findings on administration techniques. Survey modes that rely on respondent self-administration are found to obtain greater reports of drug use than those based on face-to-face interviews (Gfroerer and Hughes 1991; Aquilino 1994; Turner et al. 2005; Johnson 2014).

Discrepancies in the techniques of data collection across countries also negatively impact on cross-country analyses and estimates. Indeed, what could be seen as differences in drug use levels may, in fact, stem from the use of different survey techniques (Kilmer, Reuter, and Giommoni 2015).

Despite these problems, the UNODC, from which the vast majority of data on prevalence has been collected, considers population surveys to be reasonably good approaches for estimating cocaine use among the general population in most countries, and tends to give priority to nationally representative household surveys over other sources of prevalence estimates (UNODC 2016b, 4). The use of these estimates to assess the epidemiology of drug misuse and method of abuse does not concern the UNODC, only a multitude of other researchers (Colón, Robles, and Sahai 2001).

Indirect estimation methods (capture-recapture methods, multiplier methods, benchmark methods, event-based multipliers, Truncated Poisson, etc.) are the other suite of techniques used to estimate the prevalence of cocaine use that scholars have developed to overcome the inherent issues with using population surveys (Castiglioni et al. 2006). Starting with a sample of drug users, the indirect methods identify the proportion of the targeted population with problematic use in the general population (Hickman and Taylor 2002). *UNODC Toolkit Module: Estimating Prevalence: Indirect Methods for Estimating the Size of the Drug Problem* provides further details about indirect methods (UNODC 2003a). However, these methods are rarely employed, and do not allow for collecting information on the frequency of use.

Grams consumed per use day, the third value necessary for performing consumption-based estimates, is much harder to come by than prevalence rates. In an ideal scenario, surveys would provide separate information for occasional and heavy users, and investigate the days of use per group of users (Everingham and Rydell 1994; Fendrich et al. 2004; RAND Corporation 2014; Johnson 2014). In reality, almost all large surveys do not inquire about this, whilst, simultaneously, most respondents are either ignorant about the exact weight of the cocaine they consume or are reticent about discussing it (Caulkins 2007; RAND Corporation 2014). Researchers have pointed out that interviewees tend to underreport their consumption, even in anonymous surveys about alcohol and tobacco (Gmel 2000; Merriman 2002; Rehm et al. 2004; Johnson 2014). Such underreporting is even more severe when it comes to consumers reporting consumption of illicit substances (ONDCP 2012; Johnson 2014). The shortage of information on a crucial dimension of drug consumption makes it extremely difficult to size markets of illicit substances, even in countries that have relatively developed monitoring systems (Kilmer and Pacula 2009; Kilmer, Reuter, and Giommoni 2015).

In an attempt to side-step some of these potential sources of bias, expenditure-based estimates combine the number of users with their expenditure, rather than the amount consumed. Then, the consumed volume is deduced by using purity-adjusted prices. The advantage of this is that users are

more likely to know how much they spend on drugs than they are to provide reliable information about how much they consume (Kilmer et al. 2011).

However, heavy users of expensive drugs are often impoverished and unable to maintain inventories of either cash or drugs (RAND Corporation 2014). Other aspects that increase the difficulties in performing expenditure-based estimates are payments in kind for drugs, as well as drugs passed as gifts between friends. The literature identifies three main forms of bartering for drugs: sex for drugs, stolen goods for drugs, and drug dealers being paid in drugs for their activity. Payments in kind make it more uncertain yet still to estimate the quantities consumed from expenditure on drug. Friends and acquaintances sharing drugs for free also poses challenges for the use of expenditure-based estimates (Caulkins 2007; Kleiman, Caulkins, and Hawken 2011). The consumption of drugs obtained for free is a fundamental issue for marijuana, but less so for more expensive substances (Caulkins and Pacula 2006; Caulkins 2007; Kleiman, Caulkins, and Hawken 2011). Moreover, expenditure-based estimates introduce the necessity of collecting information about purity and prices (RAND Corporation 2014). While information about the price per pure gram is becoming more readily available (Caulkins, Pacula, et al. 2004; ONDCP 2008; EMCDDA 2015; UNODC 2015i), most cocaine users do not purchase in units of pure grams, rather, transactions are often smaller and impure, which requires making additional adjustments (Caulkins and Padman 1993; RAND Corporation 2014). Furthermore, at present, surveys focusing on illicit drug expenditure are still at an embryonic stage of development, both in problematic markets and in countries with a generally rich availability of data (Wilkins and Sweetsur 2007).

Besides these primary methods, there is a growing interest in sewage epidemiology, which involves analysing wastewater to determine the amount of consumption of illicit drugs at the local level (Prichard et al. 2014; Kilmer, Reuter, and Giommoni 2015a). Sewage tests appear to have real potential to become a powerful instrument for collecting epidemiological information (Castiglioni et al. 2006; Banta-Green and Field 2011; van Nuijs et al. 2011; Zuccato and Castiglioni 2012; Castiglioni et al. 2014). Nonetheless, very little data is available at present, and their efficacy for sizing drug markets for an entire country remains unproven (RAND Corporation 2014).

As one can see, then, estimating the size of illicit drug markets is a challenging task. Moreover, moving away from an approach based on the number of users, expenditure, quantity consumed, seizures, or areas under cultivation to other approaches does not resolve all of the potential problems, as all of the described methods have their respective limitations and uncertainties (Kilmer et al. 2011; Kleiman, Caulkins, and Hawken 2011). The impossibility of solving all of these issues results from the fact that the principal difficulties are not conceptual in nature. Uncertainty tends not to emerge from sampling variability, and therefore cannot be managed through statistical methods; rather, the problem

is mainly with the available raw data (Kilmer et al. 2014). Unreliable answers to questionnaires, lack of information about the sophistication or otherwise of clandestine labs, are just two of the possible shortcomings emerging out of trying to study hidden markets and illicit behaviours. Consequently, the best strategy for estimating the size of drug markets depends on the availability of data, on the specific dimension of the market under analysis, and on the final purpose of the estimate (Kilmer et al. 2014). This study adopts the mostly widely used consumption-based method approach, which is the only one that allows for country-specific estimates given the available data (Johnson 2014; UNODC 2015f).

The adoption of the demand side approach leads to the assumption that the overall quantity of cocaine circulating within countries is equal to the overall quantity of cocaine consumed plus seizures. In turn, the volume of drug entering any specific country has to be equal to internal consumption, seizures, and exports to third countries, as modelled by the Paoli, Greenfield, and Reuter (2009) and implemented by the UNODC (2015f). Losses and stockpiles are other components of the quantity of coca derivatives available in a country or, more likely, flowing from country to country (UNODC 2010c; Ehleringer et al. 2012). None of these two elements is included in the estimate proposed by this study.

To assume that accidental losses would be a trivial share of the total of the cocaine available in any market should not introduce any major bias into the estimate (UNODC 2010c; 2015e). The high value of cocaine leads every person taking part in its trafficking to pay especial attention when managing it. Some analysts suggest that traffickers may even manage eventual shortages in the supply of cocaine by stockpiling it (Madeira, Laurent, and Roque 2011; Mazzitelli 2011). However, evidence about cocaine stockpiles are particularly scant in the literature (Ehleringer et al. 2012), and tend to indicate that stockpiles in consumer markets are negligible (Hughes et al. 2012). By assuming that stockpiles are in producing countries, where they are more likely to be, as opposed to elsewhere, it is possible to ignore them in the estimate of the value of the cocaine market for any given country.

The reconstruction of the cocaine trafficking network includes almost all relevant countries; therefore, no further assumption is required to model imports from and exports to countries not included in the analysis. The demand of cocaine in other countries allied with the structure of the network determines the volumes of cocaine transiting in a country, only to be later exported to a third one. Indeed, the model assumes that exports depend on the volumes of cocaine consumed and seized in the next country in the trafficking network.

The following subsections present the data and the methodology mobilised to estimate the total consumption and the purity-adjusted seizures of the countries under analysis. The size of the exported volumes depends on the structure of the trafficking network; therefore, its estimate is presented within the description of the method to size the flows in section II.3.3.

II.3.2.2 Calculating the consumption of cocaine

In every country, the overall consumption of cocaine is obtained by combining the data on adjusted prevalence-rates with the number of days cocaine is typically consumed, and the quantity of pure cocaine consumed per use-day by user type, as suggested by Kilmer and Pacula (2009), Frijns and van Laar (2013), and Kilmer and colleagues (2014). The adopted methodology allows for obtaining most-plausible consumption ranges rather than point estimates. These consumption estimates are produced using country-specific data for Australia, the United States and several European countries, for which data are available. For all other countries, the estimate relies on country-specific prevalence and region-specific assumptions about days of consumption and quantities consumed. Several authors have utilised similar methods to produce estimates of national consumption of illicit substances, despite limitations pertaining to the uncertain reliability of part of the underlying data (e.g., Paoli, Greenfield, and Zoutendijk 2013; Baldassarini and Sallusti 2014; Giommoni 2014; 2015; Kilmer et al. 2014; UNODC 2015c). The next subsections present each step of the methodology used to estimate the annual consumption of cocaine.

Number of users

UNODC and the EMCDDA are the primary providers of estimates on the prevalence of cocaine use amongst the general population. Data comes from both online databases and the annual publications of the two international institutions (UNODC 2005; 2007b; 2015j; 2015i; EMCDDA 2013; 2014; 2015). Caulkins et al. (2004) provides further information, which affords the extension of the U.S. time series.

Prevalence data collected by both UNODC and the EMCDDA come from a variety of sources and may be adjusted to account for age groups, geographical areas, youths or treatment surveys, and others to increase their comparability. The documents presenting the databases specify sources and eventual adjustments of the estimates (UNODC 2005; 2007b; 2015j; 2015i; EMCDDA 2013; 2014; 2015). The Secretariat of the UNODC, in particular, requires that all United Nations Member States provide national drug related information annually. For this purpose, officials of the different countries fill out the Annual Report Questionnaire (ARQ), which forms the basis of the information in the World Drug Reports, as it does in many other publications. The toolkit *Developing an Integrated Drug Information System* provides a multitude of information about the ARQ (UNODC 2002)

In order to increase the comparability of the diverse estimates, UNODC standardized the data set. The different national statistics were transformed into a single indicator: annual prevalence among the general population aged between 15 and 64. Adjustments were made to homogenize, as far as possible, age groups, youth and general population surveys, prior year and lifetime prevalence, among

other discrepancies (UNODC 2010c). Moreover, UNODC (2010a) adjust alternative indicators to annual prevalence rates if annual prevalence is not available. Alternative indicators can be national estimates of lifetime prevalence, as well as adjustment factors constructed on the base of available information from neighbouring countries with similar cultural, social, and economic characteristics.

Data on annual prevalence of cocaine use provided by UNODC includes and, in most of the cases, does not differentiate between cocaine salt, crack cocaine and other coca derivatives such as coca paste, cocaine base, basuco, paco, and merla (UNODC 2016c, xv). Most other data on cocaine market are concerned specifically with cocaine salt. Since prices, purity levels, and patterns of consumption are different for powder cocaine and other coca derivatives, the use of generic prevalence rates thus raises a potential bias when other information specifically concerns cocaine salt; the higher the prevalence of cocaine in forms other than salt, then the higher the bias. This study uses profit estimates in a cross-sectional panel model; therefore, what really matters is the difference in the prevalence of these drugs across countries and over time.

Extant studies indicate that the consumption of coca derivatives other than powder cocaine is not homogeneous across countries. The North American and European cocaine markets mainly concern cocaine powder (EMCDDA and Europol 2010; UNODC 2016c). According to Fryer and his colleagues (2013), who constructed a “crack index” in the U.S. based on several proxies such as cocaine arrests, references to crack in newspapers and grey literature, cocaine-induced drug deaths, and others, crack consumption slowly declined after its peak at the end of the 80s but still remained at 60-75 per cent of its peak level in 2000. The prevalence of crack cocaine use in the U.S. has remained stable at around 0.6 per cent of the population aged 12 and older through the 2000s, according to the adjusted results of a national survey (OAS 2008). This group of researchers posited that crack use was concentrated in central cities, especially those with large Black and Hispanic populations like Newark, New York, San Francisco, Philadelphia, and Atlanta. The consumption of crack cocaine is also present in most European markets, but it tends to be circumscribed to certain marginalized subpopulations in specific cities. Therefore, crack accounts for a small fraction of the whole market, with the UK and the Netherlands notable exceptions (Pudney et al. 2006; EMCDDA 2007; EMCDDA and Europol 2010; Reid et al. 2012; Frijns and van Laar 2013; UNODC 2016a).

It is worthwhile noting that surveys are severely limited when it comes to estimating the prevalence of more marginalised forms of drug use, such as crack, which further complicates the production of reliable figures on the consumption of this substance (Fendrich and Xu 1994; Lu, Taylor, and Riley 2001). This is due to low prevalence figures, but mostly down to probabilistic errors, such as exclusion from the sampling frame, absence of household, non-response (Mieczkowski 1996; Davis et al. 2004; EMCDDA 2007; 2014; Trautmann, Kilmer, and Turnbull 2013). Problems in identifying key

characteristics of the crack using population also undermine other data gathering methods; for example, medical death certificates do not distinguish between powder cocaine and crack cocaine (Schifano and Corkery 2008).

Crack cocaine ordinarily generates very little cross-border or long-distance trafficking, at least in Europe. This is due to the fact that crack tends to be manufactured from cocaine hydrochloride close to its retail and use locations (EMCDDA and Europol 2010, 8). Moreover, purity adjusted prices for cocaine salt and for crack are similar. A study, based on data covering cities across the US, determined that, in purity-adjusted terms, there were no consistent differences between the respective prices of crack and cocaine salt (Caulkins 1998). Data from an altogether more recent study, also focusing on the United States, confirmed that the median costs of crack and cocaine transactions are comparable and track closely, though not perfectly, over time (Kilmer et al. 2014). The similarity between the prices of these two substances reduces the distortions introduced by not considering all markets separately. With respect to these factors, most studies sizing cocaine markets jointly consider both powder cocaine and crack cocaine (e.g., Baldassarini and Sallusti 2014; Kilmer et al. 2014; Giommoni 2015).

In South America, as well as cocaine powder and crack cocaine other coca derivatives, such as basuco or merla are consumed (UNODC 2016c). However, according to a survey based on 61,607 interviewees, which represented a total of 43 million people between the age of 15 and 64 from six South American countries, even in those countries where the consumption of these coca derivatives is more widespread, their market share remains marginal (UNODC 2008a, 11).

Information on prevalence is available for Canada, United States, and Bermuda in North America, 41 countries in Europe, 8 countries in Central America, 12 countries in South America, 13 countries in the Caribbean region, the 4 countries in the Oceania region, as well as for some of the countries in Asia (36) and Africa (36). Data on prevalence presents substantial uncertainty in every country in the world. This is due to all the aforementioned issues that plague population surveys, the most widespread method for estimating use prevalence for cocaine, and the relative dearth of estimates based on more-sophisticated methods. Asian and African estimates, above all, remain tentative and have substantial levels of uncertainty (UNODC 2010c). Determining the precise extent of cocaine consumption in Africa and Asia is thus difficult. However, the two macro-areas are believed to account for a relatively small fraction of global cocaine consumption (UNODC 2010c; 2014e; 2015k), with Africa accounting for around 5 per cent and Asia around 3 per cent (UNODC 2011e, 71). If this conventional wisdom is true, then errors in the sizing of African and Asian countries do not overly impact upon the calculation of the cocaine flows in relation to all other countries. Moreover, African markets tend to import cocaine directly from major South American players like Colombia and Brazil

(Ellis 2009; UNODC 2013c; 2016c); resultantly, any bias in the estimate of the prevalence of African countries would be projected onto the volume exported by these countries without affecting estimates concerning other areas.

In some countries data on prevalence rates are produced annually, while in the majority of cases they are less frequent (e.g., roughly every 2–5 years) (Kilmer, Reuter, and Giommoni 2015, 240; UNODC 2016b, 4). Several developing countries, however, reported very few estimates during the period 1997-2014, whilst others failed to provide prevalence rates at all (UNODC 2015i). In the absence of a precise function capable of describing the evolution of prevalence rates over time, missing data are estimated using a linear interpolation technique. Whenever the prevalence figures for extreme years are missing, the value is assumed to be equal to the data referring to the prior or following year. The fact that, at a global level, the annual prevalence of cocaine use remained largely stable over the course of the period 1998-2014 legitimates the adoption of this strategy to deal with missing data (UNODC 2016c, xiii). Average regional prevalence rates are used for the few countries not collecting any data required by UNODC as part of its attempt to estimate the global cocaine market (UNODC 2010a). The definition of regions is in accordance with the macro geographic regions used by the UN (2015b).[4]

[4] *Eastern Africa*: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mayotte, Mozambique, Réunion, Rwanda, Seychelles, Somalia, South Sudan, Uganda, United Republic of Tanzania, Zambia, Zimbabwe. *Middle Africa*: Angola, Cameroon. Central African Republic, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Sao Tome and Principe. *Northern Africa*: Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, Western Sahara. *Southern Africa*: Botswana, Lesotho, Namibia, South Africa, Swaziland. *Western Africa*:, Benin, Burkina Faso, Cape Verde, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Saint Helena, Senegal, Sierra Leone, Togo. *Caribbean*: Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Bonaire, Sint Eustatius and Saba, British Virgin Islands, Cayman Islands, Cuba, Curaçao, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint-Barthélemy, Saint Kitts and Nevis, Saint Lucia, Saint Martin (French part), Saint Vincent and the Grenadines, Sint Maarten (Dutch part), Trinidad and Tobago, Turks and Caicos Islands, United States Virgin Islands. *Central America*: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama. *South America*: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Falkland Islands (Malvinas), French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela. *Northern America*: Bermuda, Canada, Greenland, Saint Pierre and Miquelon, United States of America. *Central Asia*: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan. *Eastern Asia*: China, China, Hong Kong Special Administrative Region, China, Macao Special Administrative Region, Democratic People's Republic of Korea, Japan, Mongolia, Republic of Korea. *Southern Asia*: Afghanistan, Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan, Sri Lanka. *South-Eastern Asia*: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, Viet Nam. *Western*

An abundance of literature discusses the evolution of cocaine use initiation rates (e.g., Kleiman 1992; 1997; Everingham and Rydell 1994; Everingham, Rydell, and Caulkins 1995; Behrens et al. 1999; Behrens and Tragler 2001; Caulkins, Behrens, et al. 2004). Contrary to the popular image of the entrepreneurial drug dealer who reels in new addicts through aggressive salesmanship, it is now clear that almost all first experiences are the result of being offered the drug by a friend or sibling (Kaplan 1983; Caulkins, Behrens, et al. 2004). The spread of drug use can be represented in terms of the diffusion of communicable diseases, that is, users are contagious and people beside them may get infected (Paoli, Greenfield, and Reuter 2009). That said, there is little agreement about which factors counteract initiation from spreading from friend to friend to the entire population. Musto (1973), Kleiman (1992), Behrens and her colleagues (1999; 2000; 2002), and Caulkins (2001) put forward different hypotheses.

Considering these dynamics, Caulkins et al. (2004) conceive of a model that allows for translating historical initiation data into prevalence of heavy and light users, after having estimated a few parameters explaining the flow of consumers from low intensity of use to high intensity of use. Yet, when extending the production of estimates from the U.S. to countries with lower data availability, any straightforward replication of this type of model is unfeasible. The high interdependence of prevalence rates across years makes linear interpolation results a simple alternative to deal with gaps in the original data.

In order to address the limitations of extent data on prevalence, the study considers the lower and higher estimates available in the UNODC's databases along with the best estimate of the prevalence. The construction of a lower and upper estimate in each step of the methodology finally affords for the

---

Asia:, Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, State of Palestine, Syrian Arab Republic, Turkey, United Arab Emirates, Yemen. *Eastern Europe*:, Belarus, Bulgaria, Czech Republic, Hungary, Poland, Republic of Moldova, Romania, Russian Federation, Slovakia, Ukraine. *Northern Europe*: Åland Islands, Channel Islands, Denmark, Estonia, Faeroe Islands, Finland, Guernsey, Iceland, Ireland, Isle of Man, Jersey, Latvia, Lithuania, Norway, Sark, Svalbard and Jan Mayen Islands, Sweden, United Kingdom. *Southern Europe*: Albania, Andorra, Bosnia and Herzegovina, Croatia, Gibraltar, Greece, Holy See, Italy, Malta, Montenegro, Portugal, San Marino, Serbia, Slovenia, Spain, The former Yugoslav Republic of Macedonia. *Western Europe*: Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Monaco, Netherlands, Switzerland. *Australia and New Zealand*: Australia, New Zealand, Norfolk Island. *Melanesia*: Fiji, New Caledonia, Papua New Guinea, Solomon Islands, Vanuatu. *Micronesia*: Guam, Kiribati, Marshall Islands, Micronesia, Nauru, Northern Mariana Islands, Palau. *Polynesia*: American Samoa, Cook Islands, French Polynesia, Niue, Pitcairn, Samoa, Tokelau, Tonga, Tuvalu, Wallis and Futuna Islands.

generation of an upper and a lower estimate of the profits, as suggested by Thoumi (2005). The high uncertainty embodied in several data suggests considering the lower and upper estimates as indicators of the range in which the plausible value of profit is more likely to be, not its true possible extreme values, nor a classical statistical confidence interval (Reuter and Greenfield 2001). Within the econometric analysis investigating the determinants of lethal violence, the study uses the lower and the upper estimates to test the robustness of the main models. Finally, multiplying the adjusted prevalence levels by the population aged between 15 and 64 generates the number of users per year for each country. Both total population and share of population aged between 15 and 64 have been gathered from the World Bank open database (The World Bank 2015).

Underreporting and uncertainty in the estimates

Researchers have developed a variety of methods through which to estimate the extent of illicit, deviant, or simply stigmatized behaviours. Most estimates on the prevalence of use of cocaine are based on population surveys (UNODC 2002; UNODC 2011e). However, as already discussed, population surveys run into several difficulties: consumers may hide, may not be available for interview, and have reasons not to be honest when providing their answers (Fendrich et al. 2004; Turner et al. 2005; Johnson 2014). Furthermore, general surveys under-represent heavy use consumers, who are more difficult to reach (Kilmer et al. 2010; UNODC 2015f). This is particularly true for more stigmatized drugs such as heroin, but may also be the case for powder cocaine and crack, at least in those countries where the population perceives these substances as hard drugs.

For example, Lu, Taylor, and Riley (2001) compare the results of an urine test with face-to-face interviews with 2,327 arrestees in the US. Using urinalysis results as a validity check for interviews, the researchers found an significant amount of underreporting with respect to all of the tested substances. Marijuana smokers were found to be the most honest in declaring their habit (36.4% of underreporting), followed by methamphetamine consumers (43.9% of underreporting), while opiates users were the least honest (54.1% of underreporting). Just over half of crack users (51.9% of underreporting) lied about their consumption, while the urine test failed to detect cocaine consumption. Pudney et al. (2006) report that, according to a survey conducted in England in 2003/2004 among arrestees, 40% of those who tested positive for cocaine did not report using crack or powder cocaine within 48 hours of arrest. The results of similar studies demonstrated that the rate of underreporting for cocaine and crack use ranges somewhere between 16% to more than 50% (Fendrich and Xu 1994; Magura and Kang 1997; Fendrich et al. 1999; Hser, Maglione, and Boyle 1999; Taylor and Bennett 1999).

Given that most of the countries included in this analysis were in a state of potential epidemic during the period under analysis, this source of bias is moderately attenuated (Kilmer and Pacula

2009). It is different for countries such as the United States where the proportion of heavy users was large during the year covered by this study (Kilmer and Pacula 2009). For these reasons, available data on prevalence rates should be viewed as conservative at best.

The study corrects the number of users to account for underreporting as done in previous studies (e.g., Kilmer and Pacula 2009). Even if researchers recognise underreporting as a major issue when estimating prevalence via population surveys, available data makes it impossible to calculate a specific denial rate for each country (Kilmer and Pacula 2009; Frijns and van Laar 2013). Consequently, a homogeneous correction parameter is applied to all countries. Following Kilmer and Pacula's (2009) approach, the best estimate of the number of users is multiplied by 1.5 so as to obtain an adjusted best estimate. This is equal to asserting that two thirds of cocaine consumers truly report their behaviour while a third of them disguise their consumption, which is similar to the findings of several aforementioned studies (e.g., Magura and Kang 1997; Abt 2001; Fendrich et al. 2004; Pudney et al. 2006). These studies obtained an underreporting rate close to a third in different years, which suggests that the phenomena may be relatively stable over time. However, it is important to note that this research was conducted in very few countries (i.e., Magura and Kang 1997; Abt 2001; Fendrich et al. 2004 in the U.S.; Pudney et al. 2006 in the United Kingdom), and, as such, the underreporting rate might be significantly different in other contexts.

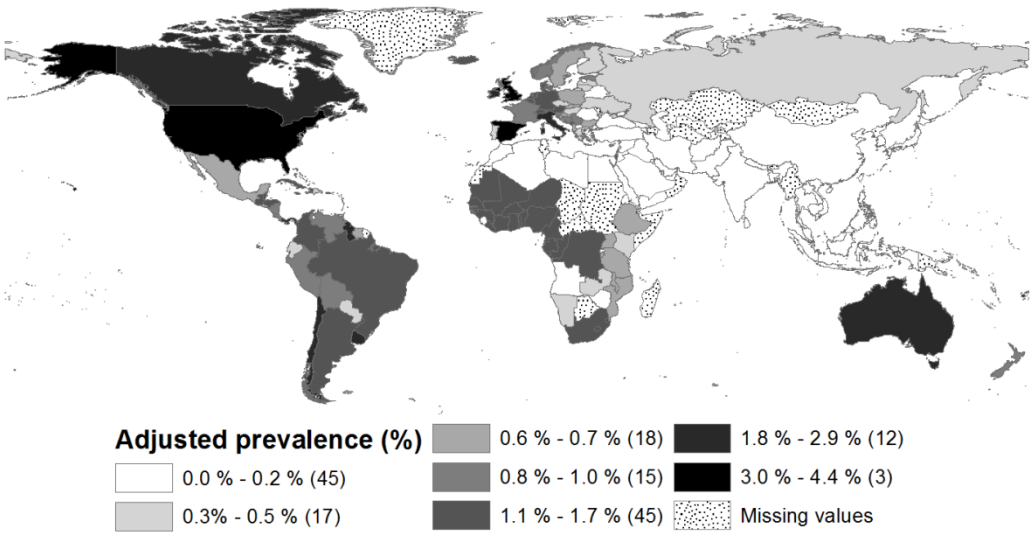
The proposed study takes the highest value between the double of the best estimate and the highest original estimate of the UNODC in order to determine the higher estimate of the adjusted prevalence rate. The lower estimate is equal to the lowest estimate of the UNODC when available, and the original best estimate when it is not. Kilmer and Pacula (2009) and Kilmer et al. (2014) already proposed this construction of the lower (100% honest responses) and higher (50% of honest responses) bounds. Subsection a.i.ii of Annex I presents the adjustment with formulas. The adoption of asymmetric multipliers enlarges the gap between the lower and higher estimates, thus improving the capacity of the final estimates to account for uncertainties in the original data.

Despite UNODC's effort to homogenize the original estimates, national surveys are likely to be different in their effectiveness of depicting the true diffusion of cocaine consumption. This is because of the different methods on which they rely, the different levels of stigmatization, variations in rates of heavy and light users, and other reasons (Leeuw, Hox, and Dillman 2008). Consequently, the adjusted numbers of consumers are better than original estimates in describing the phenomenon at a national level, but only partially increase the comparability of prevalence rates across countries.

It should be said that these multipliers are tentative and not firm estimates, and are likely to be improved upon once better information on underreporting of cocaine consumption is produced. Still,

the introduction of these corrections permits the generation of estimates that are reasonably close to that which is already available in both peer-reviewed and grey literature (Kilmer and Pacula 2009).

Figure 3. Best estimate of the adjusted prevalence, 1997-2014 average



Note: author's elaboration.

Heavy versus light users

In cocaine markets, usually the total number of users is dominated by occasional users, whilst the relatively small share of heavy-users accounts for the bulk of total consumption (Reuter 1996; Rhodes et al. 1997; Anthony and Fries 2004; Kleiman 2004; Bouchard 2008; ONDCP 2008; UNODC 2010; Kilmer et al. 2014). In their renowned study, Everingham and Rydell (1994) estimated that 22% of American cocaine users account for 70% of total consumption. According to a 2010 update, 18% of American cocaine users use cocaine more than once a week and accounts for two thirds of the total U.S. consumption of cocaine (Kilmer et al. 2014). Other estimates, such as that by Anthony and Fries (2004), are available in extant literature, and whilst figures vary from author to author nobody questions the overall validity of Everingham and Rydell's (1994) observation. While studies concerning the distribution of light and heavy users in the consumer population have focused mainly on North America, more recently researchers have begun to conduct similar research both in several European countries (Frijns and van Laar 2013; Škařupová 2014) and Australia (AIHW 2014), ultimately obtaining similar results.

Given the unequal consumption habits among different classes of consumers, a more accurate sizing of the cocaine market depends on the ability to estimate the size of these groups and to account in different ways for their specific behaviour (Kilmer et al. 2014). Population surveys rarely provide specific information regarding the intensity or the frequency of drug use in the past year or months,

even in countries with sophisticated data collection structures, which prevents country specific data for most of the countries (Kilmer and Pacula 2009; Kilmer, Reuter, and Giommoni 2015). One challenge involved with measuring the share of heavy drug users is that, in most cases, they tend to have a low prevalence, whilst their behaviour is usually hidden, the result of which being that they are poorly covered by general population estimates (UNODC 2010a; Frijns and Van Laar 2013).

At the same time, since estimates of the prevalence of use are based on general population surveys, data regarding frequency of use that is based on different targeted populations might inflate the overall estimates, as shown by the comparison of frequency of use in the Netherlands proposed by Van der Poel et al. (2010). Therefore, for this study the estimate of the shares of light and heavy-users relies on information from general population surveys, wherever reliable national estimates are available. In all of the countries that lack specific estimates, the distribution of heavy and light users is based upon information from third countries, which is in line with Kilmer and Pacula (2009) and what UNODC have done in several of its reports.

The United States has been the most relevant market for cocaine in the period spanning 1997 to 2014, despite the increased relevance of other markets in Europe, not to mention South America (UNODC 2010c; 2016b). To this today, while prevalence and overall consumption are diminishing, the United States remains the world's largest single market for cocaine (UNODC 2011e). Given the size of its population, Canada does not rank among the largest cocaine markets, but prevalence in Canada is also high and has often presented similar trends to America. The U.S. market is not only the world's largest, it is also one of the first to have emerged. Due to the early and vast spread of cocaine consumption, the population of consumers in the United States is different from those in other countries; in fact, the U.S. is characterised by a larger share of experienced heavy users. Because of these specificities, Kilmer and Pacula (2009), in their study on the size of the global drug market, advocated for a separation of North American estimates of cocaine consumption.

The contemporary relevance of the topic, allied with a generalized sensibility toward data and statistics within North American culture, has culminated in a larger availability of data in the US. These data permit ad hoc estimates about the distribution of heavy and light users within the North American market. Relying on the data and the model proposed by Everingham and Rydell (1994), Abt (2001), Caulkins and colleagues (2004), Kilmer and Pacula (2009), and Kilmer et al. (2014), it is possible to estimate the share of heavy and light users by year in the US. The same estimate is then combined with the prevalence rates within Canada and Bermuda also.

Data availability on European markets is not as rich as it is for the US, although several general population surveys are available for a range of countries. Due to this information, it is possible to subdivide the consumer population into heavy and light users within several countries in order to have

better data with which to infer the distribution within the entire area. To subdivide consumers according to the intensity of their consumption, this study adopts the modelling convention introduced by Everingham and Rydell (1994) and endorsed by many subsequent scholars, such as Reuter (1996), Silverman (1998), Behrens et al. (1999), Caulkins et al. (2004), Kilmer and Pacula (2009), and others. Those who use cocaine less than three times a month are defined as light users, whilst everyone else is considered a heavy user (Everingham and Rydell 1994). Then, following the calculus proposed by Kilmer and Pacula (2009), available information on frequency of use are adapted to estimate the relevance of the two types of users in each country.

In 2012, in an attempt to enhance knowledge about the demand and supply of illicit drugs in Europe, Trautmann, Kilmer, and Turnbull (2013) produced an online survey targeting both the general population and conducted face-to-face interviews with frequent (problem) users of cocaine, who, as aforesaid, are ordinarily hard to reach. Trautmann, Kilmer, and Turnbull's (2013) data gathering method comes with numerous limitations that the authors themselves discuss in their report, first of which is the disproportionate share of people with a higher socio-economic status among the interviewees. As stated by the authors, the survey was specifically intended to obtain a better insight into use patterns and characteristics of different types of users, which would then allow for more precise consumption estimates (Van Laar, Trautmann, and Frijns 2013, 59). A sample of seven countries (i.e., Bulgaria, the Czech Republic, Italy, the Netherlands, Portugal, Sweden and England and Wales) was selected by the researchers, because of gaps in the available data for most other markets.

On the basis of the previous year's use frequency, the authors divided users of each drug into three user types: infrequent, occasional, and frequent users (Frijns and van Laar 2013, 183). Infrequent users are those who use cocaine less than 11 days per year; occasional users are the ones who use cocaine between 11 and 50 times per year, which means they ingest the substance at least once a month, but less than once a week; whilst frequent users are those who consume cocaine more than 50 days out of the year. Infrequent users are light users according to Everingham and Rydell's (1994) classification, while frequent users are heavy users according to their classification; indeed; the authors consider those who use cocaine less than three times a month as light users and everyone else to be a heavy user. The frequency of consumption of occasional users adopted in the survey by Trautmann, Kilmer, and Turnbull's (2013) does not fit neatly into any of the categories proposed by Everingham and Rydell (1994). To disentangle the share of light and heavy users from occasional users, the current study assumes a uniform distribution of frequency of consumption between 11 and 50 days per year as proposed by Kilmer and Pacula (2009). Then, those who are assumed to consume cocaine less than three times a month (up to 35 days) are defined as light users, whilst everyone else is considered a

heavy user (36 to 50 days). The assumption of uniform distribution leads to the assignation of 61% of occasional users as estimated by Trautmann, Kilmer, and Turnbull (2013) to light users and the remaining 39% to heavy users.

The authors collected additional primary data consisting of expert interviews with respect to supply, consumption and other drug related activities. Nonetheless, according to the same authors, further research is needed to improve the data on the frequency of use of the less common drugs including cocaine. In light of this, data on Italy is used to test estimates produced by Trautmann, Kilmer, and Turnbull (2013), as Italy is the only country included in the sample where national institutions have produced alternative estimates.

The 2003 Italian household survey indicates that 78% of past-year cocaine users had cocaine once or less per month, 13% used cocaine between 2 and 4 times a month, 6% used cocaine between 2-3 times a week, and 4% used cocaine 4 or more times a week. It is worth reaffirming that general population surveys almost certainly fail to providing estimates capable of depicting the behaviours of the overall population of any given country. This limitation is due to false responses, and difficulties in reaching marginalised populations whose consumption patterns are likely to be different from those interviewed. Since frequency of drug use is likely to be higher among more marginalised populations, the results of these surveys underestimate the actual frequency of cocaine consumption. Nevertheless, the results of household surveys might be expedient when, as is the case with this study, data on prevalence is collected in the general population. That said, Italian observations do not exactly mirror the categories originally used by Everingham and Rydell (1994); Kilmer and Pacula (2009), who use this data in their study, propose two methods via which to translate this Italian data within Everingham and Rydell's scheme. First, they assume a uniform distribution for those users who declare using on 2 to 4 occasions a month. Consequently, the share of users labelled as light users, according to Everingham and Rydell's model, is 82.3% and 17.7% represents the share of heavy users of past year users (light 82.3% = 78% + 1/3 of 13%, heavy 17.7% = 10% + 2/3 of 13%). Second, they propose a more conservative interpretation of the data, assuming that half of the respondents who reported in the 2-4 times category actually use cocaine twice a month. Through this manoeuvre, they obtain a higher estimate of light users (about 83.5%) and a lower estimate of heavy users (about 16.5%). Since the two estimates provide similar results, Kilmer and Pacula (2009) assume 17% to be the share of heavy drug users, and, given the dichotomy of the categories, light users correspond to 83% of the user population.

These estimates are consistent with those obtained using information provided by Trautmann, Kilmer, and Turnbull (2013), and, as such, corroborate the quality of the data despite the small numbers of interviewed people. The results of this test also provides support for the use of the

punctual data provided by Trautmann, Kilmer, and Turnbull (2013) for the entire period under analysis. Indeed, even if the proportion of heavy and light consumers is known to change over time (Kleiman 1992; Kraus et al. 2003; Caulkins, Pacula, et al. 2004; Kilmer and Pacula 2009), the limited available data, concerning Italy, does not show any significant evolution between 2003 and 2012.

Table 1. Proportions of cocaine users by user group and country in Trautmann, Kilmer, and Turnbull (2013) and as reaggregated according to Everingham and Rydell's (1994)

		Infrequent	Occasional	Frequent
Bulgaria	Number	13	4	3
Trautmann et al.	%	65%	20%	15%
		Light		Heavy
Final estimate		79%		21%
Czech Republic	Number	54	8	5
Trautmann et al.	%	81%	12%	7%
		Light		Heavy
Final estimate		89%		11%
Italy	Number	69	20	9
Trautmann et al.	%	70%	20%	9%
		Light		Heavy
Final estimate		84%		16%
Netherlands	Number	427	159	68
Trautmann et al.	%	65%	24%	10%
		Light		Heavy
Final estimate		83%		17%
Portugal	Number	17	6	5
Trautmann et al.	%	61%	21%	18%
		Light		Heavy
Final estimate		75%		25%
Sweden	Number	83	13	8
Trautmann, Kilmer, and Turnbull	%	80%	13%	8%
		Light		Heavy
Final estimate		88%		12%
England and Wales	Number	37	7	0
Trautmann et al.	%	84%	16%	0%
		Light		Heavy
Final estimate		95%		5%
All countries	Number	700	217	98
Trautmann et al.	%	69%	21%	10%
		Light		Heavy
Final estimate		83%		17%

Note: in Trautmann, Kilmer, and Turnbull (2013), infrequent users are those who use cocaine less than 11 days per year; occasional users are those who use cocaine between 11 and 50 times per year (at least once a month, but less than once a week); frequent users are those who consume cocaine more than 50 days per year. To adapt

this data to Everingham and Rydell's (1994) taxonomy, infrequent users and 61% of occasional users have been classified as light users; 39% of occasional users and frequent users have been classified as heavy users.

In the last decade, the Australian Institute of Health and Welfare (2005; 2008; 2011; 2014; 2016) has produced a series of reports based on household surveys, which collect information from about 23,000/24,000 Australians about their tobacco, alcohol and illicit drug use, attitudes and opinions. In 2010 and in 2013, cocaine consumers had been asked about their frequency of use. Frequencies of consumption in these surveys (i.e., at least once a month, every few months, once or twice a year) do not coincide with those modelled by Everingham and Rydell (1994). As for other countries, it is then necessary to adapt information coming from these general population surveys to the adopted categories of light and heavy users. People declaring to consume cocaine either once or twice a year or every few months are catalogued as light users, whilst the share of people consuming cocaine at least once a month is, instead, divided between light and heavy users assuming a uniform distribution of frequency of use between 12 and 365. Consequently, 7% of people consuming cocaine at least one day of every month are assumed to be light users, whereas the remaining 93% are considered to be heavy users. These calculi lead to an estimated share of Australian light users of 88% in 2010 and of 90% in 2013. The 2010 estimate is adopted for all the years between 1997 and 2010. The two figures are interpolated to get 2011 and 2012 values.

Approximating the distribution of light to heavy users of any country with the available information referring to country in the same region, it is possible to estimate the distribution of heavy and light users for those countries where data is not yet available. Then, it becomes possible to use this fraction of past year users as parameters to determine the number of light and heavy users in each country using the country-specific annual prevalence rate for cocaine. Relying on the macro geographic regions used by the UN (2015b), North America (based on the US), Eastern Europe (based on the geometric mean of data on Bulgaria and Czech Republic), Western Europe (based on the Netherlands), Northern Europe (based on the geometric mean of data on the United Kingdom and Sweden), Southern Europe (based on the geometric mean of data on Italy and Portugal), Australia and New Zealand (based on Australia) are the regions for which information on frequency of use are available in a country. The same Kilmer and Pacula (2009) use the Italian portion of heavy and light users as a proxy for the distribution of light to heavy users for all the other European countries included in their study.

In North America, in all European regions, and in Oceania a minimum number of surveys investigated the frequency of cocaine consumption within the general population. As seen, these data allow for estimating the national share of heavy and light users relying directly on national surveys or on information coming from nearby countries. Data pertaining to the frequency of use are not

available in Asia, Africa or even Latin America, where a multitude of household surveys on drug consumption have been performed. The share of consumers living in these macro areas has monotonically increased during the period under analysis. According to all available estimates, these three macro regions once jointly accounted for 33% of global cocaine users in 2000 (United Nations 2000). The relevance of these areas declined to 24% in 2004/2005 due to the spread of consumption across Europe, before rising again in 2008 to about a third of the global consumption user population. A more recent estimate suggests that the relevance of these areas has continued to grow after 2005; in 2011 for example, 44% of cocaine users were from Africa, Asia, Latin America and the Caribbean (UNODC 2011; 2013). The number and relevance of the countries located in regions for which no specific surveys are currently available necessitates estimating a share of light and heavy users for these countries also.

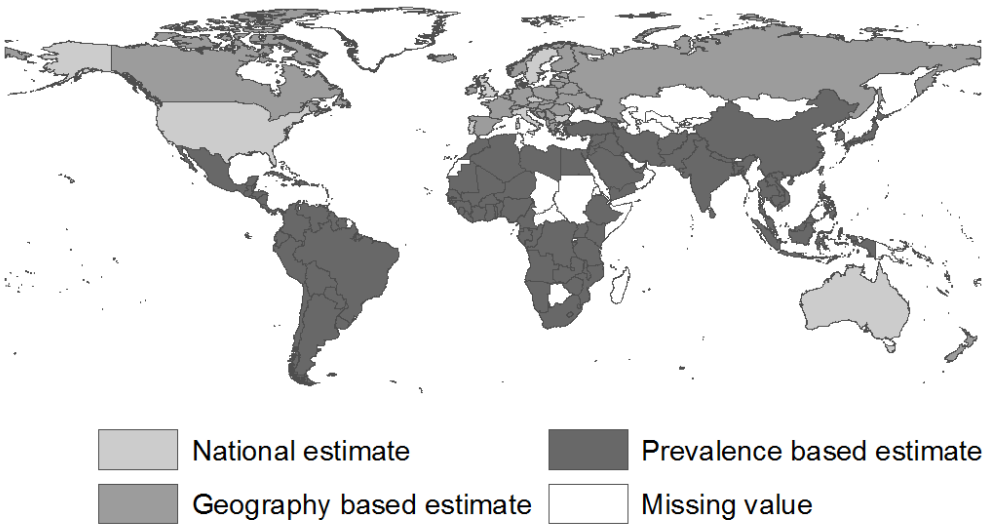
The present study takes into account the basic scheme of the epidemic cycle of drug consumption so as to identify a better proxy for the distribution of the categories of consumers for Asian, Africa, Latina American, and Caribbean countries. Drug epidemic cycles are usually characterized by an initial moment in which, starting from a low level, drug initiation and use grow rapidly. Successively, initiation peaks, and shortly thereafter prevalence and light do the same (Winkler et al. 2004). Later on, a portion of light users might escalate to heavy consumption, while total prevalence tends to decrease. The addiction problems stemming from the increasing share of heavy users then serve to operate as a negative advertisement for the drug, which depresses initiation (Musto 1973; Kleiman 1992). At this point, the epidemic evolves into its endemic stage; the overall level of initiation and light drug use go down, and, consequently, heavy drug users increase their relative relevance (Hamid 1992).

Taking this dynamic into consideration, the distribution of heavy and light users in the country with the closest trend in the prevalence of use during the period under analysis is adopted as a proxy for countries in those regions where no surveys are available. This strategy relies at first on the fact that scholars are concordant in indicating that infrequent users comprise the largest group in every market. Second, it is known that frequency of use, number of users, and the amount consumed per occasion of use are also related. In particular, the frequency of consumption is inversely proportional to the number of users (Anthony and Fries 2004). Despite this, the assumption remains strong; it will be possible to perform better estimates only when country-specific data on the frequency of cocaine use is available for a larger number of countries.

Finally, by multiplying the shares of light and heavy consumers by country-specific annual adjusted prevalence rate for cocaine, it is possible to obtain the distribution of light to heavy users within the overall population of all of the respective countries. The total number of users in the two

categories ($U\_ADJ\_he_i$, $U\_ADJ\_he_i$) is simply obtained by multiplying the two parameters for the overall number of users (U_ADJ_i): $[U\_ADJ_i = U\_ADJ\_he_i + U\_ADJ\_li_i = (U\_ADJ_i \cdot he\_u_i) + (U\_ADJ_i \cdot li\_u)]$. The same methodology applies for best, low, and high estimate.

Figure 4. Adopted approach to estimate the share of heavy and light users



Note: author's elaboration.

Consumption days for heavy and light users

As seen, misreporting the frequency of use is the second problem related to the use of surveys (Kilmer, Caulkins, et al. 2013; Kilmer, Reuter, and Giommoni 2015a). While it is relatively simple to collect information about the share of past-year users who have used in the past month, obtaining detailed information about the frequency of drug use in the past year or month is extremely difficult (Kilmer and Pacula 2009). The strategy of this study is to readapt and merge estimates available in the literature in to a single one. In particular, the estimate produced by Kilmer and Pacula (2009) is combined with an original estimate based on the result of the survey developed by Trautmann, Kilmer, and Turnbull (2013). The resulting number of consumption-days is then used to calculate the consumption of cocaine of all countries, excluding North America, where data on consumption per year of heavy and light users are directly available (Caulkins et al. 2004; Kilmer and Pacula 2009; Kilmer et al. 2014).

A study of cocaine use in Europe inquired about cocaine consumption days for those in drug treatment facilities, socially marginalized users who were not in treatment, and socially integrated users not in treatment within nine European cities (Prinzleve et al. 2004). Researchers found that the

mean number of use days in the previous month was 11.2 for those in treatment facilities, 13.9 for marginalized users, and 7.0 for socially integrated users (Prinzleve et al. 2004). The sample for the nine cities was relatively considerable (roughly 600 people in each group), but the estimates are neither representative nor precise; the standard for the number of days is 11.1 for those in treatment, 12.6 for the marginalized population, and 6.7 for the socially integrated consumers. Nonetheless, these estimates can be projected over a year to get a range (from 85 to 169) of annual use days. Kilmer and Pacula (2009) rely on the data by Prinzleve et al. (2004) for their estimates, due to the lack of better information about days of use. Since the data provided by Prinzleve et al. (2004) are mean values, Kilmer and Pacula (2009) assumed that the average number of use-days for a heavy user is distributed uniformly between 85 and 169 days, with a midrange estimate of 125 days.

The paucity of information is even more acute in the case of light users. This is particularly problematic because lighter users account for the largest share of cocaine consumption in various countries in the early stages of the drug epidemic. The study adopts the value presented by Kilmer and Pacula, who speculated a uniform distribution between once a year and twice a month (Kilmer and Pacula 2009).

Trautmann, Kilmer, and Turnbull (2013)'s online survey also investigates the typical number of consumption days of interviewed cocaine users (see Table 2). The authors proposed twelve different ranges of frequency of consumption and, for each category, indicated the number of responders who declared that particular frequency. People consuming cocaine between 1 and 20 times per year are labelled infrequent users; people declaring 21-50 consumption-days are labelled as occasional users; finally, users using cocaine on more than 50 occasions in a year are considered to be frequent users. This study reclassifies infrequent users as light users and frequent users as heavy users; 69% of occasional users are then attributed to light users and the remaining 31% to heavy users (more than three times per month), as done for the estimate of the number of heavy and light users. Then, using the extremes of the ranges of the number of days for each group, we can construct a low and a high estimate of the number of use days for both light (4.8 to 10.3 days, mid-range 7.6) and heavy users (93.0 to 122.8 days, mid-range 107.9). The average between these estimates and that produced by Kilmer and Pacula (2009) are then used to estimate the total consumption of cocaine in each country - excluding those in North America.

Not accounting for the plausible differences in the number of consumption-days across countries inevitably introduces some biases into the final estimates, whose size and direction vary from market to market and are difficult to address. To mitigate this source of concern, a regional correction factor is subsequently introduced to take into account the different amount of cocaine consumed around the world, irrespective of the number of days in which it is used.

Table 2. Estimate of the number of consumption-days in the past 12 months

Trautmann, Kilmer, and Turnbull's categories	N. of use-days in the past 12 months, ranges	N. of Respondents	Everingham and Rydell's categories	N. of use-days in the past 12 months, reaggregated ranges		Reaggregated N. of Respondents	N. of use-days in the past 12 months, total by frequency [low]	N. of use-days in the past 12 months, total by frequency [high]	N. of use-days in the past 12 months, total by frequency [mid-range]
Infrequent	1-5	540	Light	1	5	540	540	2,700	1,620
	6-10	160		6	10	160	960	1,600	1,280
	11-20	115		11	20	115	1,265	2,300	1,783
Occasional	21-50	102		21	36	70	1,478	2,534	2,006
			Sum, L.			*885*	*4,243*	*9,134*	*6,688*
			Average, L.				*4.8*	*10.3*	*7.6*
			Kilmer & Pacula				*1.0*	*24.0*	*12.5*
			Adopted estimate L.				**3**	**17**	**10**
Frequent	51-80	42	Heavy	37	50	32	1,170	1,581	1,375
	81-100	13		51	80	42	2,142	3,360	2,751
	101-150	19		81	100	13	1,053	1,300	1,177
	151-200	5		101	150	19	1,919	2,850	2,385
	201-250	7		151	200	5	755	1,000	878
	251-300	5		201	250	7	1,407	1,750	1,579
	301-350	2		251	300	5	1,255	1,500	1,378
	>350	5		301	350	2	602	700	651
				350	375	5	1,750	1,875	1,813
			Sum, H.			*130*	*12,053*	*15,916*	*13,984*
			Average, H.				*93.0*	*122.8*	*107.9*
			Kilmer & Pacula				*85.0*	*169.0*	*125.0*
			Adopted estimate H.				**89**	**146**	**116**

Note: author's elaboration on estimates by Trautmann, Kilmer, and Turnbull (2013), Everingham and Rydell (1994), and Kilmern and Pacula (2009). Data on infrequent, occasional, and frequent users are adapted to fit into Everingham and Rydell's taxonomy. After having estimated the number of consumption-days using data from the online survey conducted by Trautmann, Kilmer, and Turnbull (2013), a final estimate is produced combining this estimate with that of (Kilmern and Pacula (2009).

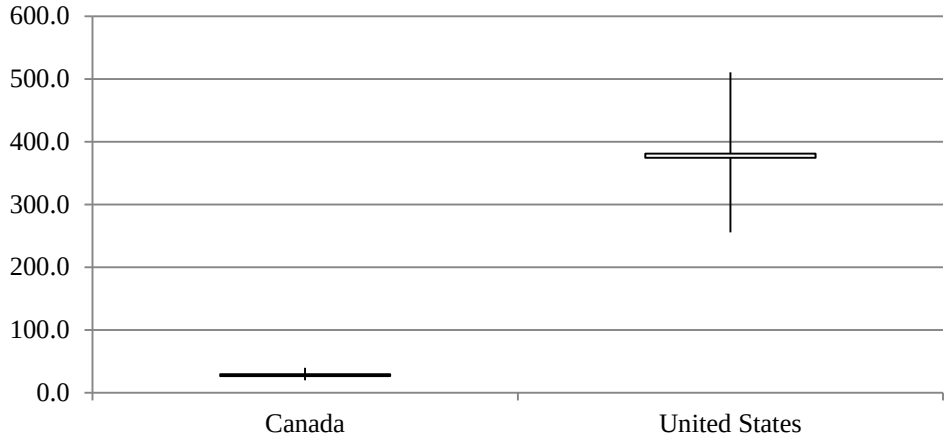
Quantity consumed per use day

As mentioned above, little is known about the typical quantities of cocaine consumed per occasion (Kilmer and Pacula 2009). The scarcity of information undoubtedly diminishes the quality of the estimates and of the analysis of drug markets (Reuter and Greenfield 2001; UNODC 2015e). It is widely known that the amount of cocaine assumed per single occasion increases together with the frequency of use (Anthony and Fries 2004; Frijns and van Laar 2013). Authors have modelled these dynamics, but data capable of depicting the phenomenon are extremely rare due to the difficulties involved in their collection. The main problem in providing consumption estimates relate to the fact that it is difficult for users to report precisely how much of an illegal drug they normally consume or purchase, nor can they necessarily state its quality (Caulkins and Reuter 1998; UNODC 2015f). The literature also indicates that patterns of consumption of cocaine present important differences across the globe (UNODC 2010a). In Africa, Asia, and Oceania the consumption of cocaine is generally on the increase, yet in these macro regions consumers still tend to consume less cocaine than Europeans

and Americans (UNODC 2010b; 2016c). To correct for this aspect it is thus crucial to have reliable estimates.

As for other information, data on quantity consumed per use day are more abundant in the U.S. than any other country. Consequently, it is possible to produce an ad hoc estimate for the U.S. by exploiting the data and the model by Caulkins and colleagues (2004), and Kilmer et al. (2014). The emerging estimate based on U.S. data is also adopted for Canada. Data are not equally rich in other regions.

Figure 5. Comparison with Kilmer and Pacula's (2009) estimate of cocaine consumption in 2005 in Canada and in the United States (metric tons)



Note: the graph represents the best estimate of cocaine consumption in metric tons of pure cocaine proposed by this study together with the best, low, and high estimates of Kilmer and Pacula (2009) for the U.S. and Canada. The black lines indicate the range of the estimates by Kilmer and Pacula (2009). The grey boxes represent the discrepancies in the estimate between this study's estimate and Kilmer and Pacula's (2009) estimate. Kilmer and Pacula's (2009) estimate is slightly higher for both the U.S. and Canada.

Because of the dearth of data on the topic, available studies have mostly produced their estimates without taking into consideration national differences in the level of consumption per user (e.g., Kilmer and Pacula 2009; UNODC 2015d). The current study borrows from extant literature the available estimates of the amount of cocaine consumed per use day. The estimates are then exploited for the countries located in the different regions (i.e., North America, Europe, Oceania). In Asia, Africa, Caribbean, and Latin America no national estimates of the consumption per occasion of use were available. To account for differences in the level of consumption in these regions, the study uses regional estimates of consumption per user. The described methodology affords a best estimate together with a lower and a higher estimate for the consumption of cocaine of heavy and light users.

Pudney et al. (2006) provide one of the few estimates of the average consumption per occasion of use per heavy and light consumers. In their study, the authors define as an intensive user someone who

used cocaine in the previous week, whilst light users included everyone else. Their operational definition of heavy users does not exactly match up with Everingham and Rydell's (1994) definition that is adopted in this study – more than 2 occasions per month – but it is close enough to be adapted to it (Kilmer and Pacula 2009).

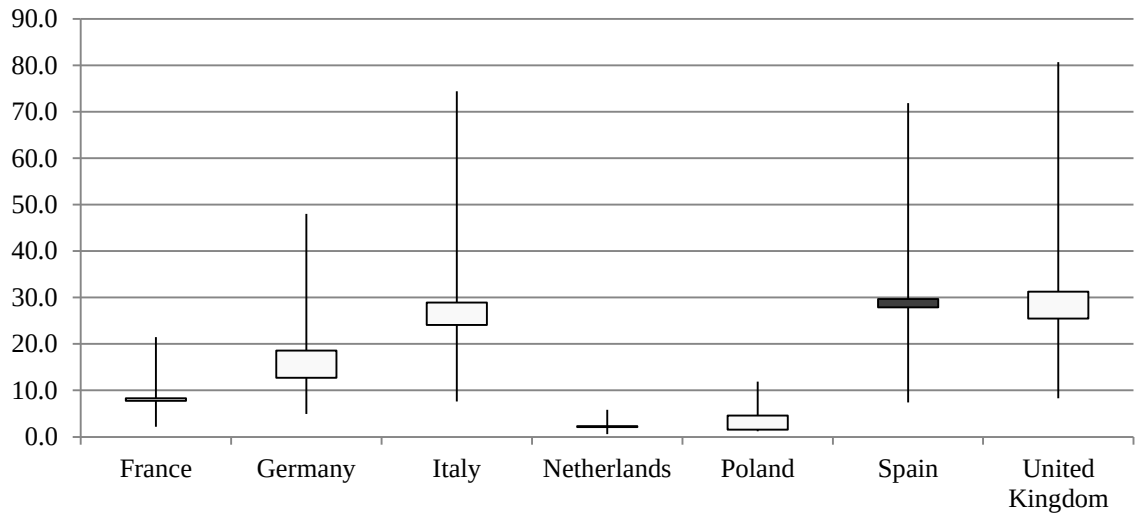
Combining data from Australian household information, personal communication with the NCIS, and data from the Drugscope website, Pudney and his colleagues proposed, in the context of the United Kingdom, an estimate of 0.80 raw grams per use-day per heavy users and 0.55 raw grams per use-day for light users. For both the categories, they posited a margin of uncertainty equal to 0.20 grams upwards and downwards (Pudney et al. 2006; Kilmer and Pacula 2009). With respect to crack cocaine, Pudney and colleagues argued that there is little systematic evidence about quantity consumed and that unreliable arrestee evidence "suggests a level only slightly lower than that for powder cocaine". Gossop (2006) conducted a survey among past-month cocaine users in both clinical and non-clinical settings in London, the results of which corroborated those of Pudney and colleagues (2006). Gossop's study demonstrated that, among people who can be considered heavy users, the typical amount consumed is about 0.90 gram per occasion. Their finding corroborates the use of 0.80 +/-0.20 gram as best estimate of the consumption of heavy users.

In their survey, Trautmann, Kilmer, and Turnbull (2013) investigate the grams of cocaine consumed on a typical consumption day in the aforementioned sample of seven European countries. Jointly considering all the seven countries, the authors proposed a mean estimate of 0.49 grams of cocaine consumed on a typical consumption day for infrequent users (median 0.25 grams), 0.82 grams for occasional users (median 0.50), and 1.18 grams for frequent users (median 1.00 grams). Survey responses do not allow for country specific estimates of the cocaine consumed on a typical consumption day per user group. However, the aggregated figures emerging from the survey confirm the validity of the estimate by Kilmer and Pacula (2009) regarding typical consumption volumes within European countries. The ranges 0.55 +/-0.20 gram and 0.80 +/-0.20 grams are then used to estimate the level of consumption in all European countries. The aforementioned Australian household survey provides the data for Oceania.

The UNODC provided an estimate of the annual consumption per user, per year, per macro area during 2008 (2010c). Because of this information, it is possible to calculate the relative differences in the consumed volumes across areas, and to use these differences to adjust the levels of consumption previously obtained for Africa, Asia, the Caribbean, and Latin America. Since the data of Pudney and colleagues (2006), Kilmer and Pacula (2009), and Trautmann, Kilmer, and Turnbull (2013) act as a proxy for European countries, the regional correction is the ratio between the consumption per user in Europe and the consumption per user of the region to which the specific country belongs. Given that

UNODC presents annual consumption data as opposed to estimates of the volume of consumption per occasion of use, this correction also enables us to partially account for macro regional differences in the frequency of use.

Figure 6. Comparison with Kilmer and Pacula's (2009) estimate of adulterated cocaine consumption in 2005 (metric tons)



Note: the graph represents the best estimate of cocaine consumption in metric tons of adulterated cocaine produced by this study together with the best, low, and high estimates by Kilmer and Pacula (2009) for the seven European countries included within their study. The black lines indicate the range of the estimates by Kilmer and Pacula (2009). The boxes represent the discrepancies in the estimate between my estimate and Kilmer and Pacula's (2009) estimate. Kilmer and Pacula's (2009) estimate is higher for Germany, Italy, and the UK (light grey boxes) and lower for France, the Netherlands, and Spain (dark grey boxes).

Drug users cannot reliably report on the purity of the cocaine they consume; therefore, data on consumption per occasion of use refer to raw amounts of cocaine. Nonetheless, the flow model requires adjusting raw volumes for purity levels. UNODC (2014a) provides national estimates of purity levels, so by correcting for purity at retail level, the study allows for comparing volumes across countries and along the supply chain, whilst, simultaneously, introducing a relevant country specific correction.

Purity adjustment

Most drugs are not consumed in their pure form, and cocaine is no exception in this regard; it is usually mixed or cut with other substances before being ingested. Traffickers and dealers may mix additional substances with cocaine in order to inflate its volume, and to complement or enhance the effects of the drug (Cole et al. 2010). Different substances are used, depending on the purpose of the cut (Brunt et al. 2009; Cole et al. 2010; UNODC 2015f). Benzocaine, lidocaine, levamisole, naphyrone, phenacetine, procaine, methylphenidate, ephedrine, mannitol, inositol, pectin, glucose,

maltodrextrin, lactose, saccharin, acetylsalicylic, ketamine, amphetamine, methylamphetamine, paracetamol, atropine, atropine are all agents commonly found in cocaine samples, but the list of potential cutting agents runs into infinity. Other adulterants such as alkaloids, microorganisms or other biological and infectious agents are the result of manufacturing, production, or storage techniques, for example (Cole et al. 2010).

Final users are usually unaware of the actual composition of street cocaine and tend to base their judgement of quality on place of purchase, price per gram, and certain administration modes (Evrard, Legleye, and Cadet-Taïrou 2010). Consequently, consumption estimates are also based on raw grams, as that is what consumers are able to report (Kilmer and Pacula 2009). Even those consumers who are able to report how much they spend or how frequently they use drugs, are usually unaware of the purity of the substances they purchase, thus making surveys useless with respect to this issue (Paoli, Greenfield, and Reuter 2009).

Since consumption figures are based on raw grams, as that is all cocaine users are able to report (RAND Corporation 2014), it becomes necessary to adjust final estimates of total consumption for purity levels.[5] The correction for purity levels introduces national specificities into the estimates (i.e., the purity level itself), but, most importantly, allows for a comparison and a combination of volumes and monetary values at different levels of the supply chain. Drug purity varies across countries, along the supply chain, as well as over time; thus, by only correcting volumes and prices for levels of purity it is possible to make volumes and monetary values actually comparable. Purity levels are fundamental for estimating the size of the cocaine market, and for understanding their functioning. Despite the centrality of this class of data for the comprehension of drug production and trafficking, complete purity series are not available in most countries (Kilmer and Pacula 2009).

The UNODC provides the most comprehensive series of estimates on typical cocaine purity available. Hence, data on the purity levels for this study are taken from databases and publications of the UNODC (2005; 2007b; 2014a; 2015j; 2015i). Ideally, the *Delta ARQ* database of the UNODC (2014a) provides six estimates of the level of cocaine purity per country per year (i.e., minimum, typical, and maximum price at street and at wholesale levels). It so happens that the UNODC releases the data without further testing its validity (Boivin 2014a). Consequently, before using UNODC's data, it is necessary to check them for macro incongruities and errors in compiling. The study assumes

[5] North American markets constitute an exception; indeed, the methodology and the data underpinning this consumption estimate are different for this area, as they directly lead to purity-adjusted volumes which do not require further refinement.

that whenever drug purity at retail level is higher than purity at wholesale level, then the two have been switched. In the same way, typical purity level is required to be higher than minimum purity level and lower than maximum purity level; when it is not, the values are inverted in order. Missing values are imputed by linearly interpolating purity levels of previous and following years. Whenever an extreme value is missing, it is imputed using the value of the closest available year. For the countries for which no data on purity of cocaine are available at retail level, purities are imputed by using the average purity level of the region.

Original data come from national institutions, in particular, law enforcement agencies that estimate these figures using information from laboratories and cocaine shipment seizures in producer and transit countries, as well as information from the retail level through street seizures in consumer countries (UNODC 2002; Mejía and Posada 2008). The analysis of seizures occurring at retail level introduces a high level of variability even when comparing only a specific year, a specific place, or a specific transaction size (Caulkins 1995a). Moreover, as shown by several researchers, there is important within-countries variation with respect to purity. Using average measures fails to accurately take in to account these differences. Nonetheless, it is common practice to use estimates of the overall level of drug purity in a market when it comes to estimating its size or value (e.g., Reuter and Greenfield 2001; Kilmer and Pacula 2009; Giommoni 2014).

The transformation of the raw quantities into pure quantities poses a problem. Indeed, it is possible to argue that the average purity of cocaine consumed may present some slight differences between light and heavy users. This is due to the fact that heavy users tend to purchase product of a higher quality, due to the fact they rely on selected sellers that provide them with purer products, or because they are more discerning consumers and can thus inspect the product (Anthony and Fries 2004; Kilmer and Pacula 2009; Kilmer et al. 2014). Despite this reasoning and anecdotal evidence about potential differences in the level of purity for the two categories of consumers, by all accounts, information about the levels of purity of cocaine consumed by light and heavy users does not exist, which means that this aspect cannot be included within the final estimates. However, using the lower and higher levels of purity of cocaine at retail level makes it possible to integrate this consideration within the analysis. Annex I retraces this same methodology along with the use of formulas.

II.3.2.3 Calculating purity-adjusted seizures

The study assumes that each country imports a volume of cocaine equal to consumption, seizure, and exports of cocaine. The inclusion of the seizures in the estimate of the import is straightforward: the cocaine seized in a certain country, at a certain moment in time, arrived in that country. While it is simple to include seized volumes in the estimates of the imports, the model lacks the capacity to adjust

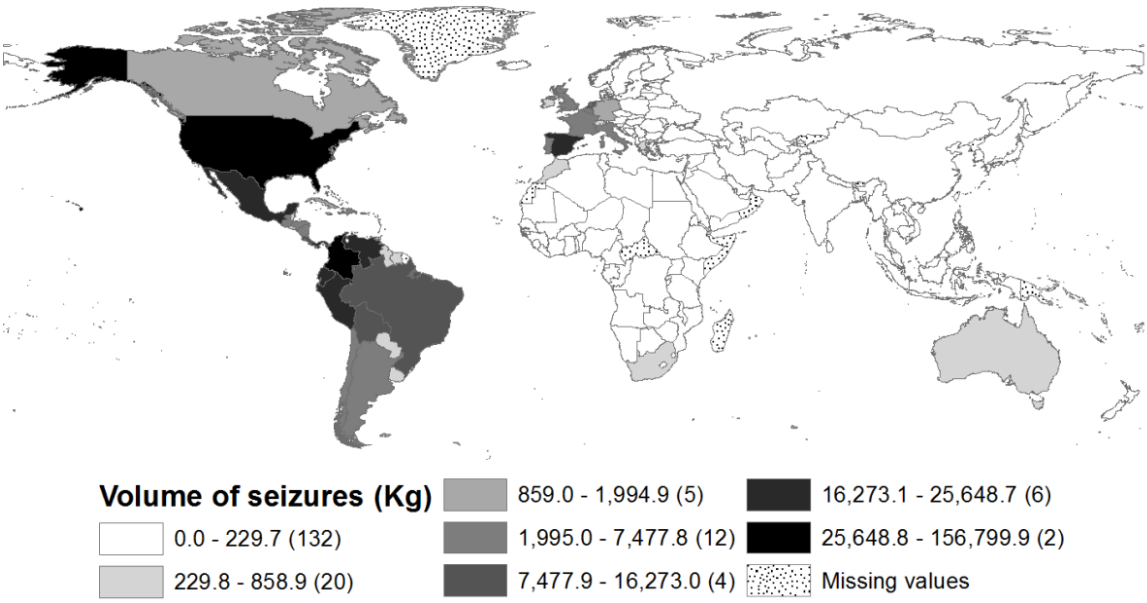
the levels of consumption according to variations in seizures. Even though authors such as Reuter and Kleiman (1986) assert that the data indicates that dramatic increases in levels of enforcement have not affected the availability of drugs, consumption is likely to decrease as a consequence of intense variation in interdiction rates. Other studies estimating the economic dimension of drug trafficking do not model this dynamic (e.g., Baldassarini and Sallusti 2014; UNODC 2015d).

UNODC directly collected seizure data from UN member states. UN Member States report amounts of seized drugs on a yearly basis. Since not all countries report their seizures to the UNODC, the UN supplement their databases with information provided by the ICPO-Interpol, the World Custom Organization (WCO), UNODC Field Offices, National Police agencies, and other institutions (Farrell 1995; UNODC 2007a). The combination of national data and information coming from these key international law enforcement agencies makes the UNODC database the most complete for dealing with global seizures (Farrell 1995). The UNODC presents these data in the *Annual Drug Seizures* (ADS) database, in the *World Drug Report*, and in other public documents.[6] In this study, eventual gaps in the time series of total seizures are filled by interpolating the data of available years.

Overall, data on total seizures of cocaine for a given country in a given year are more robust than most other data pertaining to cocaine markets. Nonetheless, seized volumes reported by the UNODC may not be fully representative of the actual amount of cocaine intercepted in a country. First, seizures may not be fully announced or complete information might not be carefully recorded nor transmitted to the UNODC (UNODC 2015b). Second, anecdotal evidence indicates that total figures might be inflated by double counting of interception by different national law enforcement agencies, as well as by different countries (UNODC 2010). Despite these potential sources of bias, data on seizures remains one the most commonly adopted measures in the study of drug markets and drug policies.

[6] UNODC, *Annual Drug Seizures* and UNODC, *World Drug Report*, various years. Data available at https://data.unodc.org.

Figure 7. Volume of seizures, average 1997-2014



Note: author's elaboration on UNODC data.

Reported seizures are for impure cocaine. The purity degree differs between countries and within the same country; moreover, seizures that take place at different levels of the supply chain (i.e., retail, transnational, etc.) tend to differ in their purity level (UNODC 2010c). Cocaine seized at wholesale are said to be of a higher purity than seizures at retail level (Caulkins and Reuter 1998).

The volume of pure cocaine seized is determined by taking into account the purity of seizures, which varies considerably across countries and according to the level of the supply chain. Overall, national seizures are divided into three hypothetical levels of the supply chain (i.e., international trade, intermediate distribution, and retail level) in order to take into account different purity levels along the supply chain. The relative relevance of the seizures occurring at the different level of the supply chain is determined by observing the distribution of the seizures as reported by the law enforcement agencies to the UNODC (2014a; 2014c).

For each country, there have been collected all seizure cases regarding coca derivatives available in the IDS databases, resulting in a total of 133,090 cases. Following the instructions provided by the *Notes On Illicit Drug Seizure Reports* (UNODC 2007a), seizures reported in litres and units are converted into kilograms using the following conversion factors. One litre of seizures is assumed to be equivalent to 1.0 kg. The conversion factors per unit are instead: cocaine (base and salts) 0.1 kg per unit, coca leaf 10 kg per unit, crack 0.1 kg per unit, other coca type 0.1 kg per unit. Seizures of coca seeds (39 cases) have not been considered.

For each country, seizure cases have been divided into three groups according to the volume of the seizure. If the seizure has a volume smaller than 1.0 kg, then it is assumed to concern retail low-level trafficking; if the seizure has a volume between 1.0 kg and 10 kg, then it is considered to concern intermediate distribution; finally, if the seizure load is more than 10 kg, then it is assumed to concern high-level trafficking. UNODC (2015d) developed these weight ranges by adjusting and combining information provided by Rossi and Ricci (2009) and the EMCDDA (2011), exploiting them to adjust the purity of seizure cases of heroin. These ranges are intended to accommodate the characteristics of different national drug markets (UNODC 2015d). In reality, the volume traded at different stages of the supply chain is likely to differ from country to country according to the total volume of coca derivatives circulating in the country. However, precise information on the size of transactions is hard to collect (UNODC 2015d).

Over the last few years, the average size of seizures of cocaine has been about 5.0 kg. This value is the highest of all drugs, but it also represents a decline from the past decade from 6.2 kg to 4.6 kg. These differences may stem from variations in trafficking modus operandi across time and with respect to different drugs, as well as developments in law enforcement strategies and priorities, but they also may be a consequence of improved reporting of small seizure cases in certain regions. Today, the available information does not allow for the disentangling of the relevance of these explanations (UNODC 2015k). Both an underreporting of smaller seizure cases and an increase in the precision of reporting minor seizures would compromise the reliability of the estimate. In any case, small seizures are contemporaneously more likely to be left out from reports, and less influential for the calculus of the three categories, thus prospecting a certain efficacy of the methodology despite the possible omissions.

After attributing seizure cases to one of the three level of the national supply, the relative weight of the three groups is then calculated for each county. In particular, the share of seizures occurring at retail level (sr_i) is equal to the ratio between the sum of seizure cases whose volume is smaller than a kilogram (SCL_{il}) and the total of seizure cases (SCT_{is}): [$sr_i = \sum_{l=1}^{L}(SCL^l{}_i / \sum_{s=1}^{S}(SCT_{is})$].

Using the three shares, it is now possible to divide the total volumes of seizures as reported by the UNODC in the three categories, and adjust each for specific purity levels. The volume of seizures occurring at retail level (Sr_{it}) is obtained by multiplying the relative parameter (sr_i) by the total raw volume of cocaine intercepted in country *i* in year *t* ($Sraw_{it}$): [$\mathrm{Sr_{it}} = \mathrm{Sraw_{it}} \cdot sr_i$]. Using the same procedure, it is possible to estimate the volume of seizures taking place at a distribution level (Sd_{it}) and at a high-level (Sh_{it}). Missing information on national estimates of total seizures of raw cocaine ($Sraw_{it}$) for a given year are imputed by linearly interpolation the closest available data: [$Sraw_{it} = \overline{Sraw_{it-1}; Sraw_{it+1}}$]. After estimating the volume of seizures occurring at each step of the supply

chain (Sr_{it}, Sd_{it}, Sh_{it}), it is possible to adjust each of them for the corresponding estimated purity level ($p_{it\ l}$) and to recalculate them again to obtain the total of purity adjusted seizures (S_{it}): [$S_i = \sum_{l=1}^{3}(Sraw_{it} \cdot sl_{i\,l} \cdot p_{it\,l})$], where *l* represents the three levels of the supply chain.

Whenever seizure cases for a given country are not available, the average values of the country in the same region are considered to be the best available proxy to overcome the lack of data. The double step procedure of 1) calculating the relevance of the categories using seizure cases (IDS) and then 2) projecting them on the total of seizures (ADS) is necessary because national institutions do not report all seizure cases to the UNODC. Therefore, the sum of seizure cases (IDS) does not correspond with the total amount of seizures in a country (ADS). Purity adjusted volumes are added together to obtain the final estimate of the seizures in the country. Annex a.ii presents this methodology in formulas.

II.3.3 Sizing the cocaine flows (Step 3)

Following this, it is necessary to weigh the quantity of cocaine flowing through each connection. This requires (1) estimating the relative weight of each link detected with respect to the other links connecting the same importing country (2) transforming into volumes the relative weight of each connection. To estimate the parameter representing the relative weight of the dyad between the two countries (drw_{ijt}), the volume of the seizures from a country to another one (SMA_{ijt}) is divided by the total volume of seizures concerning the importer ($\Sigma^{J}_{j=1}SMA_{ijt}$) [$\mathrm{drw_{ijt}} = \mathrm{SMA_{ijt}}/\sum_{j=1}^{J}\mathrm{SMA_{ijt}}$], where *J* is the total number of *j* countries exporting cocaine to *i*.

To accomplish the second and final step, the size of flows is calculated, starting from the estimated size of the importing market. The model assumes that every country imports a volume of cocaine (I_{it}) equal to the sum of consumed cocaine (C_{it}), national seizures (S_{it}), and exports (E_{it}): [$I_{it} = C_{it} + S_{it} + E_{it}$]. Once the estimates of the imported volumes (I_{it}) and of the relative weights of the connections (drw_{it}) are known, the product of the two provides the estimate of the volume of cocaine flowing from country *j* to country *i* [$\mathrm{F_{ijt}} = \mathrm{drw_{ijt}} \cdot \mathrm{I_{it}}$]. In turn, the amount of cocaine exported by country *i* (E_{it}) is equal to the sum of the cocaine imported by all other countries *J* from *i* (I_{jit}) [$E_{it} = \sum_{j=1}^{J}(I_{jit})$].

II.3.3.1 Weighting the dyads

Information on seizure cases provided by the UNODC always includes the mass of the seizures. This data permits the estimation of the relevance of the trafficking between two countries with respect to others. The basic rationale here is that the volumes of seizures may be indicators of the volumes of drug flows (UNODC 2010; 2015k). In its simplest form, the idea is that, considering any importing country, if seizures of drugs coming from a specific country are more abundant than seizures along

another connection, then drug trafficking along the first connection is likely to be more copious than along the second one.

In reality, other factors than the actual dimension of the flow influence this relationship; one route might be more successfully targeted by law enforcement for example, or it may be that the data reporting systems of countries along the first route are comparatively more efficient than the data reporting of countries along the second route (UNODC 2015k).

It follows, that it is preferable to estimate the relative weight of drug flows on a country-by-county basis. This study divides the amount of seizures intercepted while flowing between two countries by the total seizures referring to the importing country, thus obtaining an estimate of the relevance of that connection for that specific importing country. By replicating the procedure for every year (1997-2014), it then becomes possible to understand how the importance of different trafficking routes has evolved over time.

In the vast majority of the cases (86%), only information provided by the importing country enter into the calculation of the weight of the links, in turn, reducing the biases of different law enforcement and reporting systems. Even within a single country, however, law enforcement agencies might be more concerned about some specific routes or means of transport, thus inflating the perceived relevance of these connections. This kind of situation, however, is unlikely to last over time in the absence of structured corruption schemes, because the imbalance of the law enforcement actions would lead traffickers to move their shipments to less enforced paths.

Law enforcement agencies mainly intercept cocaine hydrochloride, but they also seize coca leaves, coca paste, cocaine base, and crack cocaine (UNODC 2016b). Volumes of different coca derivatives are converted into cocaine hydrochloride volume equivalents according to conversion rates, in order to make them comparable in terms of psychoactive substance volumes.[7] Volumes of seizures are not purity adjusted when used to construct the network. The purity of different drug flows originating from different countries is not likely to have the exact same level of purity. Not accounting for purity levels may inflate the relevance of flows occurring between downstream countries, where cocaine is likely to be cut more (Paoli, Greenfield, and Reuter 2009, 92). However, since information on seizures refers to coca derivatives entering into the same country during the same year, it is reasonable to

[7] Coca leaf-cocaine HCl: 256-1; cocaine base-cocaine HCl: 1.11-1; coca paste-cocaine HCl: 1.19:1; crack cocaine-cocaine HCl: 0.91-1 (UNODC 2010a; 2011d).

expect that these differences would not be dramatic. The model does not include any parameter to model the possibility that some seizures may re-enter the global market, because of corruption in law enforcement agencies. UNODC (2015d) makes the same assumptions when estimating the size of heroin flows moving along the Balkan route.

After having recorded the volume of seizures among each pair of countries over all the available years, volumes of seizure occurring along each connection are then interpolated in order to produce the estimates, whenever the importing country has not provided any data for a given year. Interpolated data enter in both the numerator and the denominator of the estimate of trafficking connections. For every year, the final estimate of the relative relevance of the specific connection is provided by the ratio between the three years moving average of the volume of seizures between a specific dyad, and the moving average of total seizures relative to the importing country. Seizure volume enters into the calculus of the moving average with a weight that halves the values referring to the previous and next year with respect to the one of the estimate. The use of moving averages leads to the loss of extreme years (i.e., 1997 and 2014), for which it is not possible to construct the estimate; however, it helps in reducing the risk of distortion produced by particularly massive seizure cases in a specific year. One shortcoming of this approach, of course, is that the interception of particularly large loads may distort the estimates if they are far from being proportional to actual drug flows. While for land and air routes this is rarely the case because volumes are smaller, it may happen with interceptions on sea routes, whose shipments are usually larger. To fully disentangle the extent to which larger seizures depict larger shipments or luckier operations is not possible; therefore, the use of moving averages is a prudent approach through which to calculate the final estimate.

From the analysis of the IDS databases emerge 35,102 seizure cases containing useful information for the estimate of the weight of each connection. These seizure cases refer to 11,306 dyads. Interpolation leads to the estimate of the weight of 17,376 connections, which correspond to 1,806 connections among 105 countries over a period of 16 years from 1998 to 2014.

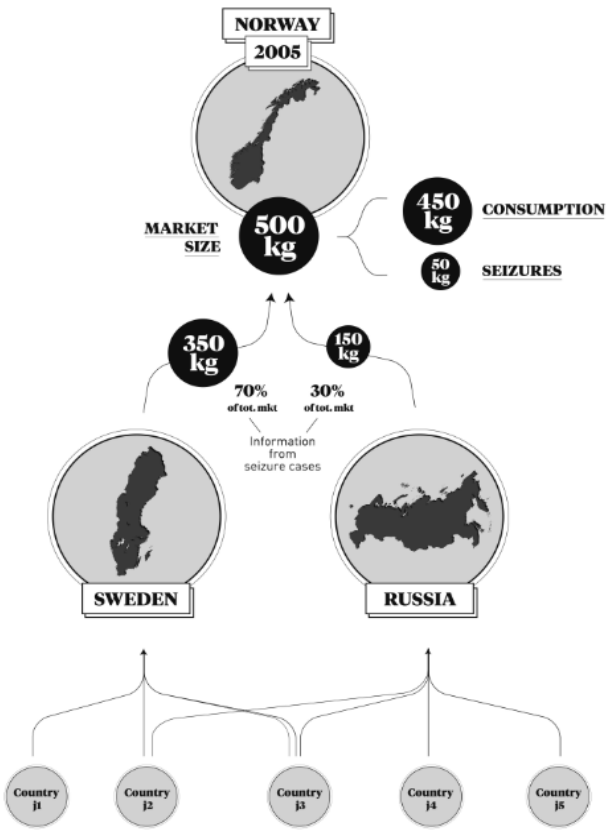
II.3.3.2 Sizing the flows

In the previously discussed study by Paoli, Greenfield, and Reuter (2009), the authors developed a so-called global distribution model to track opium flows. Their contention is that drugs that are produced must at some point either be consumed or seized. Therefore, setting out from the estimate of drug production in source countries, by subtracting seizures and consumptions country by country it is possible to infer the amounts of drugs flowing along the international supply chain (Paoli, Greenfield, and Reuter 2009, 87). The current study applies the same general principle, but instead relies upon demand-side estimates, which the literature considers more robust than supply side ones; cocaine that

has been seized or consumed in a certain country had to be imported from somewhere, with countries that host coca cultivations being the obvious exception.

Therefore, by combining the network of trafficking with the size of the market of cocaine in each country, it is possible to estimate the quantity trafficked through each link. The model assumes that every country imports a volume of cocaine (I_{it}) equal to the sum of consumed cocaine (C_{it}), national seizures (S_{it}), and exports (E_{it}) [$I_{it} = C_{it} + S_{it} + E_{it}$]. In turn, the volume of exports by country *i* (E_{it}) depends on the imports of all other countries (*j*) of the network from *i* (I_{jit}) [$E_{it} = \sum_{j=1}^{J}(I_{jit})$]. Therefore, it is possible to calculate backwards the volumes trafficked between each pair of countries, once the relative relevance of each connection and the volume of the imports of the final destination markets are known.

Figure 8. A graphic representation of the sizing of the flows



Note: for example, the structure of the network might show that Norway, in 2005, has no export connections and half of its cocaine imports come from Sweden and half from Russia. At the same time, the seizing of the market might indicate that, in the same year, the Norwegian market accounted for 500 kg of cocaine, of which about 10% were seizures. Then, by combining the two indications it emerges that cocaine flows from Sweden to Norway and from Russia to Norway account respectively for 350 kg and 150 kg of cocaine in 2005. In turn, the model registers the information that through both Sweden and Russia have to flow at least 250 kg of cocaine destined to Norway, in addition to the satisfaction of their national markets. The estimate of the volumes flowing

along each connection comes from the simultaneous combination of these calculi for all the countries of the network.

Part of the cocaine consumed in a given year is likely to have entered into its final market the previous year. However, all available data, with the exception of seizure cases, are annual, which makes it extremely challenging to estimate the share of cocaine consumed in a given year that has been imported prior to this. The use of moving averages, explained in the previous subsection, partially relaxes the rigidity of the annual boundaries; further studies should develop methods to address this issue in a more sophisticated manner. In any case, since data on homicides are also annual the current estimate may be well suited for its scope.

II.3.4 Estimating the gross value added (Step 4)

By c the information and the estimates on consumption, seizures, and structure of the network with a supply chain model and prices it is now possible to obtain the final estimate of the gross value added produced in each country. Monetary and cocaine flows may be partly disconnected; part of the actors operating in any country are unlikely to be citizens of that country, nor of a country immediately connected to it in the trafficking network. These traffickers might repatriate part of their profits, thus generating a misalignment between drugs and monetary flows. Money laundering techniques based on the exploitation of banking secrecy in financial havens is another dynamic which causes drug flows and monetary flows to not fully overlap. The current study investigates the relationship between profits generated by drug trafficking and systemic violence. Therefore, where profits are reinvested or concealed is largely irrelevant; what matters is where they are generated.

Subsection II.3.4.1 explains the modelling of the drug trafficking supply chain. Subsection II.3.4.2 presents available estimates on prices and the adopted methodology to combine and use them. The remaining three subsections delineate how the study estimates the gross value added at each step of the supply chain.

II.3.4.1 Supply chain

Whilst scholars agree on the existence of multiple stages in the supply chain of cocaine between production and the final consumers, their number and their true nature are hotly debated (UNODC 2015a; Caulkins et al. 2016). There is no clear consensus as to what constitutes upper-level drug trafficking. Terms used in the literature include upper-level and higher-level drug traffickers, importers, smugglers, middle-level dealers, distributors, suppliers, wholesalers, drug-brokers, go-betweens, and facilitators.

There are four distinct types of sellers, with systematic differences across types in the proportion of sales revenue retained. Entrepreneurs who own the drugs they sell retain the largest share (about 50%). Independent consignment sellers retain less (about 25%). Consignment sellers who operate within fixed selling locations or "spots" retain less (10%), and the sellers who are paid hourly and sell from spots retain the smallest proportion (3%) (Caulkins et al. 1999).

Much like there is no definitive definition of the different levels of the drug markets, there is no overarching consensus as to how revenues should be divided among these levels (UNDCP 1998; UNODC 2005; Moore et al. 2005; Desroches 2007; Bouchard and Wilkins 2010; Bright, Hughes, and Chalmers 2011; EMCDDA 2011; FATF/OECD 2014; UNODC 2015d). It is known that most of the value added in the supply chain is accrued when drugs are distributed within consuming countries (Reuter and Kleiman 1986; Reuter and Greenfield 2001). On the contrary, farmers cultivating coca plants get just a minuscule fraction of the final retail value of cocaine. The most significant increases in value occur when smuggling the drug across national borders. However, the largest absolute increase occurs within final importing markets. This is because at the end of the distribution chain the risks per gram are greatest (Reuter and Greenfield 2001, 166). Therefore, most of the money in consumer markets flows to domestic distributors, only some of whom are foreign nationals (Reuter and Greenfield 2001). This important knowledge base about the distribution of the revenues within the supply chain should aid the design of the model. However, it does not offer punctual indications on how to precisely structure the supply chain, because it explicates dynamics in terms of revenues rather than profits.

Therefore, the current study schematizes the supply chain in such a way that is not capable of precisely representing the cocaine supply chain. The model is instead guiding the estimation of complex data, such as profits emerging from the trade of cocaine. This study divides the cocaine supply chain into three main blocks or components: high/international level, intermediate-distribution level, and retail level.

In the literature, the expression "high level traffickers" has referred to a variety of roles and situations; importers, growers, manufacturers, or wholesalers who market large quantities of illicit drugs to other dealers, who have been labelled high-level actors (Desroches 2007, 828). This study designates high-international level to signify the trafficking of large loads of cocaine across national borders, allied with high-level sales to national distributors (Executive Office of the President Office of National Drug Control Policy 2004; FATF/OECD 2014; UNODC 2015d).

Intermediate national actors or distributors are the second category of actors in this model. Intermediate-distribution level refers to drug traffickers, who purchase cocaine from international traffickers and distribute it to local retailers without taking part in international transactions or

interacting with consumers (Pearsons and Hobbs 2001; EMCDDA 2011; Baldassarini and Sallusti 2014; UNODC 2015d). Given the broad definition that other studies give to high-level traffickers, the literature occasionally includes similar actors among high-level traffickers labelling them as wholesalers or distributors (Desroches 2007).

Dealers that purchase drugs from intermediate distributors and sell it to final consumers operate at the retail level (Executive Office of the President Office of National Drug Control Policy 2004; FATF/OECD 2014). In addition to "dealers", the literature also refers to people acting in the retail level of drug supply chains as pushers, lower-level dealers, street level dealers (Desroches 2007, 828). This is the category of actors whose definition is the least controversial, and upon which the vast majority of the literature is concentrated (Mieczkowski 1994; Natarajan 2000). Retail level dealers constitute the majority of people taking part in drug trafficking, and they often take part in drug dealing to finance their own consumption (Tunnell 1993).

II.3.4.2 Prices

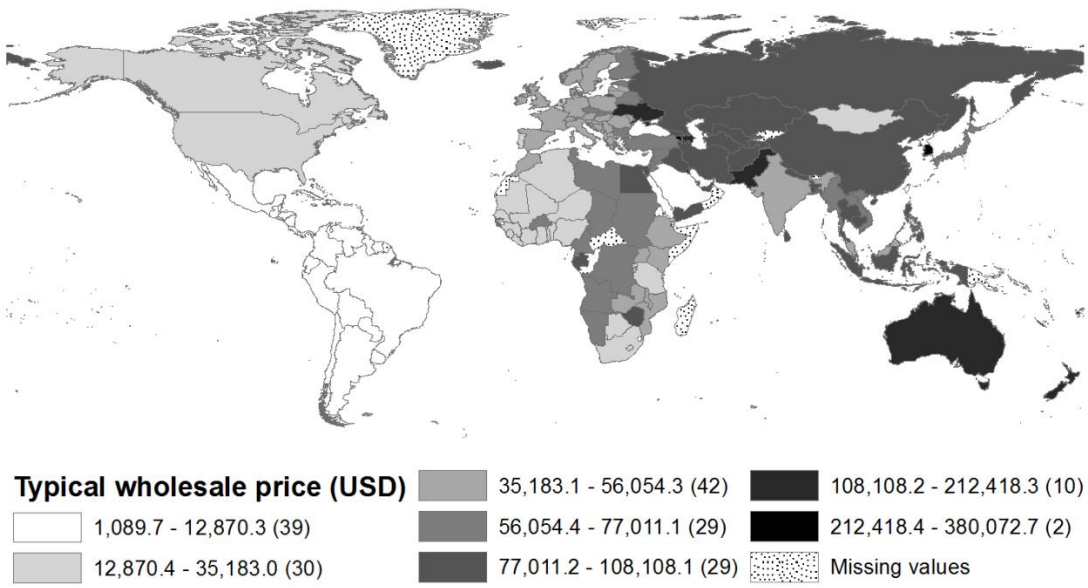
Illicit prices at each stage of the supply chain are extremely precious data for scholars attempting to analyse drug markets (Costa Storti and De Grauwe 2009). However, the correct use of data on drug prices requires a comprehension of the contextual issues in which the same data has been originated, whether that be the gathering method or the problematic behind it (Caulkins 1995; 2007). Drug markets, indeed, have peculiarities that make it different from any other market, such as the high variability of the product quality, or the spatial variations of drug prices (Kleiman 1992).

With respect to prices in final markets, the principal difficulty is that it is not possible to rely on information collected from buyers. Consumers cannot report a reliable price on a standardised unit; rather, they only know how much they spend on some quantity of drug, the actual potency of which is ordinarily unknown (Reuter and Greenfield 2001). This fact introduces a relevant obstacle because the range of pure gram prices at a retail level is huge. Prices vary enormously both between and within nations, as well as across time (Caulkins and Reuter 1998; Reuter and Greenfield 2001; Reuter 2009). With these obstacles in mind, it is worth mentioning the three data sources of price data, as indicated by Caulkins (2005). The first one is synthesis reports by government agencies; the second is self-report by users; the third, and most widely used by scholars, is transaction-level data. Law enforcement agencies carefully record data on transactions whilst conducting their operations within illicit drug markets. These records often contain purity levels, prices, and quantity, which can be used for research purposes.

UNODC's online databases (2014a) provide six levels of prices per country (i.e., minimum, typical, and maximum price at both street and wholesale levels) for most of the country in the world

(UNODC 2009). In addition, farm-gate prices are available for main producing countries (UNODC 2016b). UNODC collects its price data from the ARQ, and supplements this data with other sources such as DAINAP, EMCDDA and Government reports. Hence, by checking all of the publications of the World Drug Report, it is possible to increase the availability of data for some countries, and, in turn, have a more complete time series.

Figure 9. Typical "wholesale price" as reported by the UNODC, average 1997-2014



Note: author's elaboration on UNODC data.

Data reported by the UNODC, much like data on drug prices in general, have neither the accuracy nor the depth of data on legal commodities, whose collection is much less challenging. The same UNODC is also not capable of fully assessing how data were collected and how reliable it is. Although improvements have been made over the years, a number of law enforcement bodies have not yet established a regular system for collecting price data (UNODC 2016b). Despite these problems, authors have observed UNODC's data on prices display broad phenomena and trends that match up well with what one would expect both over time and across countries (Chandra and Joba 2015).

Chandra and his colleagues used data on wholesale cocaine and heroin prices reported in the World Drug Reports to reconstruct their drug trafficking networks (Chandra, Barkell, and Steffen 2011; Chandra and Barkell 2013; Chandra and Joba 2015). Other authors have made use of data on prices by the UNODC in their estimates of the value of drug markets (Kilmer and Pacula 2009; Paoli, Greenfield, and Zoutendijk 2013), to understand its dynamics (Costa Storti and De Grauwe 2009), and to conduct policy analysis (Mejía and Posada 2008; Caulkins and Reuter 2010; Piazza 2011).

The current study checks the meaningfulness of available prices by confronting street level and wholesale prices, and estimates missing data on prices by applying basic interpolation techniques as was done for missing data on purities. In order to make the quantities comparable, all the prices are purity-adjusted. By combining the estimates of the prices of cocaine with the corresponding estimates of purity, the study produces six estimates of purity-adjusted prices per country per year, one for each estimate of prices provided by the UNODC (2014a).

Finally, the study produces six original estimates of prices for each country, one for every transaction included in the schematization of the cocaine supply chain by combining the different purity-adjusted prices. These prices are named "international price", "average importing price", "average exporting price", "wholesale price", "distribution price", and "retail price".

"Average importing price" refers to the average price per kilogram of cocaine loads entering into a country. Conversely, "Average exporting price" indicates the average price that international traffickers operating in a given country are able to collect when they ship cocaine to the next country of the trafficking network. "International price" is the price at which an international transaction takes place between two specific countries. Therefore, the estimate of both "Average importing price" and the "Average exporting price" depends on "International price".

Wholesale price" is the typical price at the point of transaction between high-level international traffickers and intermediate distributors, who operate at the national level. "Distribution price" indicates the purity-adjusted price at which national distributors sell a kilogram of cocaine to local retailers. "Retail price" is simply the typical price at which final consumers purchase cocaine from their dealers.

The first three prices (e.g., "International price", "Average importing price", and "Average exporting price") are relational, that is, their value depends on the combination of estimates of prices in more than one country, and on the specific connections of the trafficking network. The other three prices instead concern relationships between actors active within the same country. Annex I presents the calculi behind the estimates of these values. The main idea behind the estimate of these prices is to put in a relationship all available price estimates, both in the international trafficking network and along the national supply chains. Regardless of the actual volumes at which these transactions typically occur, the estimate of profit relies on purity-adjusted prices for a kilogram of cocaine.

In the three main producing countries, project specialists of the *Sistema Nacional de Monitoreo*, supported by UNODC, collect monthly data on prices of sun-dried coca leaf, coca base, and cocaine. The data comes from semi-structured interviews with key informants. These people have been selected amongst farmers, storekeepers and other participants in the production and distribution of coca and the production of coca base (UNODC 2003b; Mejía and Posada 2008). The UNODC publishes these

prices together with other data obtained from the field in the volumes of the *Crop Monitoring Reports*.[8] This list of publications supplements data in the *Delta ARQ* database with additional information on prices. In particular, farm-gate prices of cocaine and, alternatively, minimum registered prices of cocaine are used as costs to calculate profits of international traffickers of cocaine in Bolivia, Colombia, and Peru.

Data available in the UNODC's databases may present some differences with respect to the data originally reported by national law enforcement officers; these discrepancies are mainly due to currency conversions made by UNODC. Indeed, UNODC directly presents the data in USD equivalents, in order to facilitate their use and comparability. At the same time, comparisons of prices from different years need to be made with caution, as part of the variations may be due to changes in the exchange rates as opposed to prices actually observed in the market (UNODC 2009). The final estimate of the gross value added and its main component are adjusted by the *Price level ratio of PPP conversion factor (GDP) to market exchange rate* developed by the World Bank, which increases the comparability of data across countries and longitudinally.

"Purchasing power parity conversion factor represents the number of units of a country's currency required to buy the same amount of goods and services in the domestic market as a USD would buy in the United States. The ratio of PPP conversion factor to market exchange rate is obtained by dividing the PPP conversion factor by the market exchange rate. The ratio, also referred to as the national price level, makes it possible to compare the cost of the bundle of goods that make up gross domestic product (GDP) across countries. It suggests how many dollars are needed to buy a dollar's worth of goods in the country in comparison to the United States. PPP conversion factors are based on the 2011 ICP round" (World Bank 2015). The use of this specific adjustment factor allows for simultaneously taking into account the differences in the evolutions of the currency exchange rate across countries, and the actual value of money in the particular country. This second aspect, in turn, allows both for time series estimates to be adjusted for inflation, and to understand how much the money is worth in each country.

The combination of the original estimates of prices and volumes obtained by the estimate of the size of national markets, as well as information emerging from the flow/network model, makes it possible to calculate the gross value added generated by cocaine trafficking for each country. Cocaine

[8] Crop monitoring reports published between 2002 and 2015 are available at: https://www.unodc.org/unodc/en/crop-monitoring/index.html

trafficking total gross value added is the sum of the profit emerging from high international trafficking, from drug distribution at the national level, and from cocaine retailing. The next three subsections present the methodology behind the estimates of these three components of the total gross value added.

II.3.4.3 Calculating the gross value added at high-international level

High-level international trafficking refers to the traffic of large loads of cocaine across international boundaries, and their distribution to intermediate distributors in destination markets, according to the conceptualization provided by FATF/OECD (2014) and UNODC (2015d).

Revenues for high-level traffickers emerge from both the trade of cocaine with other countries connected in the trafficking network, and from the sale of cocaine to national distributors. For any given country, revenues from international trafficking make up two thirds of the value of exports of cocaine and one third of the value of imports. Value of imports is obtained by multiplying imported volumes with the average of the "importing price"; in the same way, the value of the exports is a product of exported volumes and the average "exporting price". The study estimates both imported and exported volumes in relation to the model of flows presented in Section II.3.3. The necessity of subdividing revenues related to international trafficking among importers and exporters is a consequence of the substantial lack of information on the nationality of actors taking part in cocaine trafficking in each country. Indeed, scholars have closely documented the prominent role of some groups, such as Colombians, Italians, Mexicans, Cubans, Nigerian, Turkish, etc., in specific countries (Paoli and Reuter 2008; Paoli, Greenfield, and Reuter 2009; Alkholt 2010; Astorga and Shirk 2010; Calderoni 2012; Siegel and van de Bunt 2012; Reuter 2014; Natarajan, Zanella, and Yu 2015; Calderoni et al. 2015). However, it is not possible to develop meaningful estimates for all the countries of the network due to the available empirical data. Revenues from drug sales to intermediate distributors are gained by multiplying "wholesale price" and sale volume, which, in turn, is equal to the sum of national consumption, seizures at retail level, and half of the seizures at an intermediate level. Both high-level traffickers and national distributors manage volumes of drugs compatible with intermediate level of trafficking, because they trade in cocaine in these volumes among each other. Since available information does not allow for a more comprehensive understanding of which of the two categories suffers the costs of the seizures, the methodology splits the burden equally between both groups.

With respect to the cost of purchasing of cocaine on the international market, in producing countries, the costs are the farm-gate prices of cocaine. The estimate of the gross value added does not assess the costs as transportations, guard services, and bribes. The study assumes that the margins of

traffickers include the monetary value of these ancillary services. In any case, the literature indicates that these costs are relatively low in comparison to other dimensions of the business. Small groups can easily move large quantities of drugs and earn millions of dollars in rewards (Reuter and Haaga 1989; Dorn, Levi, and King 2005; Desroches 2005). Revenues within high-level trafficking are the difference between the two forms of revenues and these aforesaid costs.

II.3.4.4 Calculating the gross value added at distribution level

At an intermediate-distribution level, drug traffickers manage large quantities of drugs domestically, connecting international traffickers to local retailers (Pearsons and Hobbs 2001; UNODC 2015d). The difference between the value of the sale to retailers active in the country and the cost of purchasing products from high-level international traffickers, ultimately determines the gross value added at the intermediate-distribution level.

The volume of cocaine that intermediate actors sell to local retailers is equivalent to volume consumed, plus seizures taking place at a retail level. Revenues at this level are equal to the sum of these volumes times the "distribution price" that retailers pay to procure the cocaine from distributors. The costs for distributors are equal to the volumes of cocaine they purchase from high-level traffickers multiplied by the "wholesale price". In turn, the volume purchased by distributors is assumed to be equal to the sum of internal consumption, seizures at the retail level, and half of seizures at distribution level. The study includes only half of the costs of the volumes intercepted at the intermediate level in its estimate of the costs for distributors, in order to account for the fact that the highest risks for traffickers come from transactions. If seizures are more likely to occur during transactions in the absence of further information, then it is prudent to attribute half of the burden of the lost goods to sellers and the other half to buyers. The differences between revenues and costs determine the gross value added at the intermediate level. Much like international traffickers, national distributors also incur other financial costs alongside the mere purchase of cocaine, such as transportation and protection (Paoli, Greenfield, and Reuter 2009). The study does not assume that these costs are included in the margins of traffickers, but does consider them to be a feature of the illicit economy of cocaine trafficking. Since the estimate of profits adopts a national perspective, it is not relevant which specific criminals earn this money as long as they are part of the cocaine trafficking business.

The inclusion in the model of an intermediate level between large-scale cocaine trafficking and retail level is of greater relevance, both for the conceptualization of the cocaine supply chain, and in terms of the analysis of the economic value and dynamics of single markets as opposed to cross-country analyses. Indeed, while the presence of actors occupying intermediate positions in the supply chain is evident within even relatively small countries (Caulkins et al. 2016), it would technically be

possible to redistribute to the higher and lower levels of the supply chain costs and revenues referring to the intermediate level of distribution. Despite this, the choice has been made to introduce a more sophisticated approach that increases the coherence of the model with available literature, and provides more elements for further analysis of the economic dimension of cocaine trafficking.

II.3.4.5 Calculating the gross value added at retail level

Profit at retail level refers to the profits made by selling cocaine to consumers, which is estimated by calculating the difference between revenues at retail and costs incurred by dealers purchasing cocaine from national distributors. The calculation of revenues at retail level is the most classical one: cocaine consumption is multiplied by purity-adjusted prices at retail level (Rhodes and McDonald 1991). The model assumes law enforcement actions to be able to intercept part of the cocaine circulating at retail level, as discussed in a variety of literature (Reuter and Kleiman 1986; Everingham 1994). Therefore, retail dealers have to buy a larger amount than the one they sell to consumers; hence, they purchase from intermediate distributors a volume equal to consumption plus seizures at retail. The amount of seizures occurring at retail level is calculated by combining information on the size of seizures and the total level of seizures registered in the country (see subsection II.3.2.3). Consumers pay the dealer the cocaine "retail price," while dealers purchase cocaine from intermediate distributors at the "distribution price".

It is common practice among cocaine retailers to offer quantity discounts for habitual clients (Caulkins and Padman 1993; Kilmer et al. 2014). Therefore, the relevant price for the calculation of revenues at retail should not simply be the most widespread price of the typical unit of purchase, but, rather, should account for quantity discounts (Caulkins 1994, 815). Available data does not permit us to understand to what extent published retail prices reflect these dynamics. At the same time, they also do not allow for introducing these refinements into the estimates.

Especially in consumer countries, price is not strongly related with purity when controlling for transaction size (Caulkins and Reuter 1998; Reuter and Greenfield 2001). Authors explain it by stressing that illicit drugs are experience goods (Caulkins 2007, 8). That is to say, buyers paid a price according to their expectation of the quality of the substance they are buying, which is based upon observable information like the size of the purchase, location, and other factors. However, especially during the first transaction, sellers can deceive consumers about the purity of the product (Caulkins and Reuter 1998; Mejía and Posada 2008). Often, wholesale transaction also takes place without any assessment of the purity being performed (Reuter and Caulkins 2004). A weak correlation between prices and purity levels might suggest a low level of standardization in transaction at retail level, and a resultant inability of typical/average data to accurately reflect the phenomenon. Moreover, it is not

possible to state the direction of the eventual bias due to the quality of this data. Despite these limitations, authors adopting a global perspective for the study of drug trafficking related violence have little choice but to work with the data available to them at that particular time.

A third potential issue concerns people who are primarily involved in drug dealing in order to finance their own habit. These people may provide their labour in exchange for the drugs they consume, or they may consume a portion of the drug they purchase from intermediate distributors (Johnson 2003). In both these cases, the final price they pay for cocaine is below the typical purchase price paid by other consumers.

The final issue concerns cocaine received by consumers, either as a gift from friends or in exchange for services (Hamid 1992; Taylor and Potter 2013). However, the practice is more common for less expensive drugs, such as methamphetamines (Kilmer et al. 2014) and marijuana (Taylor and Brownstein 2003; Caulkins and Pacula 2006; Belackova and Vaccaro 2013) than it is for cocaine. Moreover, people sharing cocaine doses are more likely to have purchased them. Because of this, the inclusion of these revenues in the final estimate is coherent with the assumptions of the model. All together, these considerations suggest that the overall estimate of profit at retail level may underestimate the actual values.

Today, the traditional categorization of nations as producer, consumer, and transit countries is no longer in vogue (Gratius and Palacios 2012; UNODC 2015d). Latin America, the Caribbean, Europe, not to mention Western Africa, and Central Asia are all regions where it is known that illicit drugs are consumed, produced, and transited (Beyrer et al. 2000; Akyeampong 2005; Destrebecq and Leggett 2007; Ellis 2009; Gratius and Palacios 2012; UNODC 2013c; 2015h; 2015d; 2016c). Yet, as expected, the estimate indicates that gross value added at retail level is higher in countries with both a large installed base of consumers and relatively high retail prices, such as the United States or the United Kingdom. By comparison, in countries at the beginning of the trafficking routes, such as Colombia or Venezuela, the gross value added at the trafficking level accounts for the largest share of the total gross value added, especially if they have numerous naval connections with lucrative final markets.

II.4 Construction and selection of measures concerning drug markets and structural theories of violence

The following subsection provides a brief discussion of data on homicide rates, the selected dependent variable. The subsection immediately following this introduces all the explanatory variables used in the econometric models.

II.4.1 Dependent variable

The overwhelming consensus within extant available literature is that homicide data is most adapt source of information for cross-national analyses on violence (e.g., Braithwaite and Braithwaite 1980; Krahn, Hartnagel, and Gartrell 1986; Shichor 1990; Neapolitan 1994; Messner and Rosenfeld 1997; Fajnzylber, Lederman, and Loayza 2000; 2002a; 2002b; Karstedt 2003; Neumayer 2003; Lin 2007; McCall and Nieuwbeerta 2007; Pridemore 2008; 2011; Cole and Gramajo 2009; 2011; Favarin 2014). The current study adopts homicide rates as a proxy for the level of violence in each country.

The use of data on homicides mitigates two important issues with cross-national studies on violence. The first issue concerns underreporting, whilst the second derives from the heterogeneity of available definitions of crimes within different national legal systems (Neapolitan 1994; LaFree 1999; Heinemann and Verner 2006; McCall and Nieuwbeerta 2007; Aebi 2010; Aebi and Linde 2012). The former problem introduces a potentially strong source of bias within cross-country studies, because the level of underreporting is not homogeneous across countries. Different levels of omertà, fear of retaliation, trust in law enforcement, social stigma, national institutions ability to record crimes, and other reasons underpin these differences (Finkelhor and Ormrod 1999; Gaviria 2000; Levitt and Rubio 2005; Heinemann and Verner 2006). The latter problem, ultimately, presents challenges when using any official source of data due to differences in definitions and in the conceptualization of crime, which makes it difficult to accurately compare crimes across countries (LaFree and Drass 2002; Levitt 2004; Aebi 2008; Aebi et al. 2010).

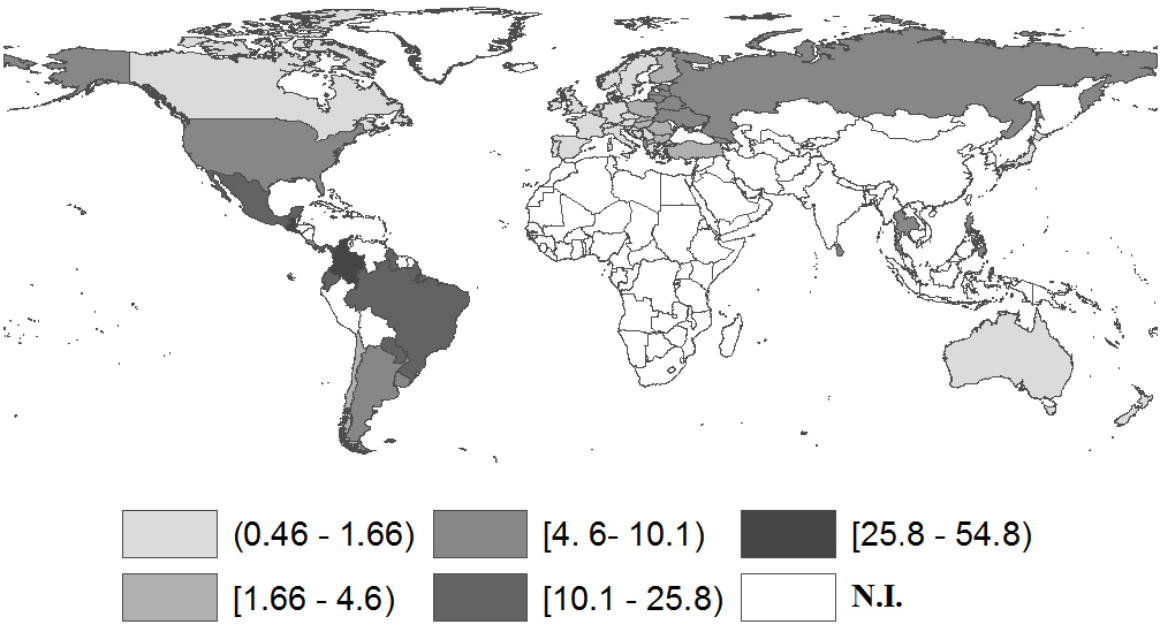
Homicide data presents important comparative advantages with respect to any other data on violent crimes. Firstly, homicides are less underreported and less likely to be under recorded than any other crime (Fajnzylber et al. 2000; Fajnzylber, Lederman, and Loayza 2002a). The gravity of this crime makes it relatively uncommon that a homicide is not reported or discovered by law enforcement agencies, which makes it an extremely reliable proxy for violence (Fox and Zawitz 2000; LaFree and Tseloni 2006; Lin 2007; Favarin 2014; UNODC 2014b). Secondly, homicide data is extremely valuable from the perspective of cross-national studies, because of the high level of homogeneity in

definitions within different legal systems (Archer and Gartner 1984; Lynch 1995; Fajnzylber et al. 2000; LaFree and Drass 2002).

The major sources of longitudinal, cross-national homicide data are the World Health Organization, and the UNODC (Neapolitan 1997; LaFree 1999). The use of data provided by international sources partially mitigates the bias emerging from the comparison of crimes whose definitions are not identical across countries (Favarin 2014). WHO's homicide data are based on cause-of-death reports submitted by participating nations (WHO 2015). Since 1946, the United Nations has collected homicide data from both the criminal justice system and health institutions at national and international levels. Whenever neither of these two sources is available for a given country, UNODC derives its homicide data from estimates produced by the WHO (UNODC 2014b). Today, the *Global Study on Homicide* edited by the UNODC (2011b; 2014b) provides the most complete series of data on homicides (Fajnzylber, Lederman, and Loayza 1998; 2002b; Hart 2015). Following Fajnzylber, Lederman and Loayza (1998; 2002a), and Fajnzylber et al. (2000) this study utilises homicide rate data from the database of the *Global Study on Homicide* (2011b; 2014b).

Homicide rates are measured per 100,000 inhabitants, where homicide refers to "unlawful death purposefully inflicted on a person by another person" (UNODC 2014b, 102). To reduce skewedness, while inducing homogeneity in the error variance, homicide rates are expressed in natural logs.

Figure 10. Homicide rate, average 1999-2013



Note: author's elaboration on UN data.

II.4.2 Explanatory variables

The key independent variables are fluctuations in the gross value added by cocaine trafficking, and indicators of contraction in gross value added. Other variables concerning cocaine markets are seizure rates, cocaine consumption, the share of gross value added generated at transnational trafficking level, and the estimate of the gross value added. A set of controls for both socio-economic characteristics of single countries and for the presence of homicide enablers integrates the models. Their selection and operationalization derive from extant cross-national studies on the determinants of violence. Table 3 provides a summary of descriptive statistics for each variable included in the analysis.

Table 3. Descriptive statistics of used variables for the 63 countries included in the econometric analysis, years 1999-2013

Variable	N. Obs	Mean	Std. Dev.	Min	Max	Source
Dependent variable						
ln Homicide rate	889.00	1.13	1.26	- 1.61	4.55	UNODC
Cocaine Market						
Fluctuation of GAV, best est.	931	0.21	0.23	0.00	1.50	Author's est.
Fluctuation of GAV, mid. est.	923	0.22	0.22	0.00	1.35	Author's est.
Decreasing GAV indicator best est.	931	0.11	0.31	-	1.00	Author's est.
Decreasing GAV indicator mid est.	923	0.11	0.31	-	1.00	Author's est.
Cocaine consumption (kg) best est.	1,008	8,435.38	52,709.32	0.05	478,505.50	Author's est.
Cocaine consumption (kg) mid. est.	1,008	12,228.09	72,091.79	0.09	657,638.30	Author's est.
GAV, PPP best est.	1,008	4,097.53	31,713.46	0.01	530,305.00	Author's est.
GAV, PPP mid. est.	1,008	5,914.21	43,570.42	0.03	733,700.80	Author's est.
GAV produced at high-tr. Level (%), mid. est.	1,008	0.46	0.27	0.03	1.00	Author's est.
GAV produced at high-tr. Level (%), best est.	1,008	0.45	0.27	0.03	1.00	Author's est.
Cocaine consumption (kg) best est.	1,008	8,435.38	52,709.32	0.05	478,505.50	Author's est.
Cocaine consumption (kg) mid. est.	1,008	12,228.09	72,091.79	0.09	657,638.30	Author's est.
Seizure rate, best est.	1,008	0.19	0.24	0.00	0.97	Author's est.
Seizure rate, mid. est.	1,008	0.13	0.20	0.00	0.95	Author's est.
Structural determinants of violence						
Infant Mortality rate	1,008	10.78	8.40	2.10	43.00	UN
GDP per capita, PPP	992	23,877.25	15,146.42	3,072.16	77,720.89	WB
Urban population (%)	1,008	67.77	17.96	8.67	100.00	WB
Probity & rule of law	950	19.51	12.98	2.29	46.08	WB & TI
Police rate	842	- 16.71	136.89	- 296.86	1,432.06	UNODC
15-34 male (5)	922	0.30	0.04	0.20	0.42	UN & WHO
Alcohol Consumption	900	7.93	3.50	-	17.87	WHO
Political Violence Indicator	945	0.35	1.07	-	7.00	Marshall

II.4.2.1 Measurements of cocaine market

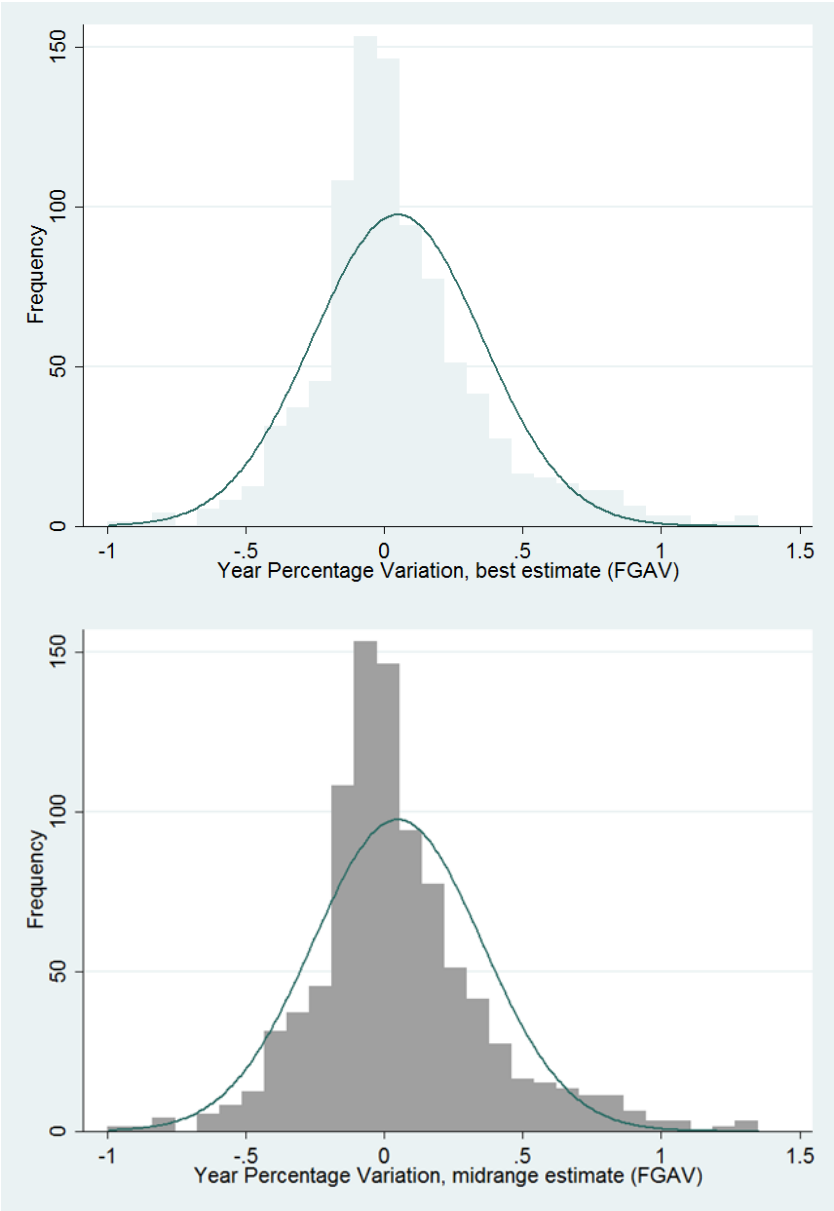
All of the variables used to investigate the relationship between the functioning of cocaine markets and violence are produced with the flow/network approach described in the previous subsections.

Fluctuation of gross value added – FGVD |%|

The absolute value of the year percentage variation of the gross value added in a country is adopted as a proxy for fluctuations. The use of the absolute value allows for the isolation of the intensity of the change from its direction. The percentage is considered to better depict the actual change which occurred in the market, rather than the simple difference between two yearly estimates. Moreover, it permits us to isolate the effect of the change in the value of the market from its size, thus allowing for identification of the influence on violence of the two factors separately. The proposed econometric models make use of two versions of this estimate. The first is based on the best estimate of the gross value added. The second is a midrange estimate obtained by averaging the high and the low estimates of the gross value added. A strategy based on interquartile ranges is adopted for identifying eventual outliers. As result, 22 cases are deleted from the best estimate and 30 from the midrange estimate.

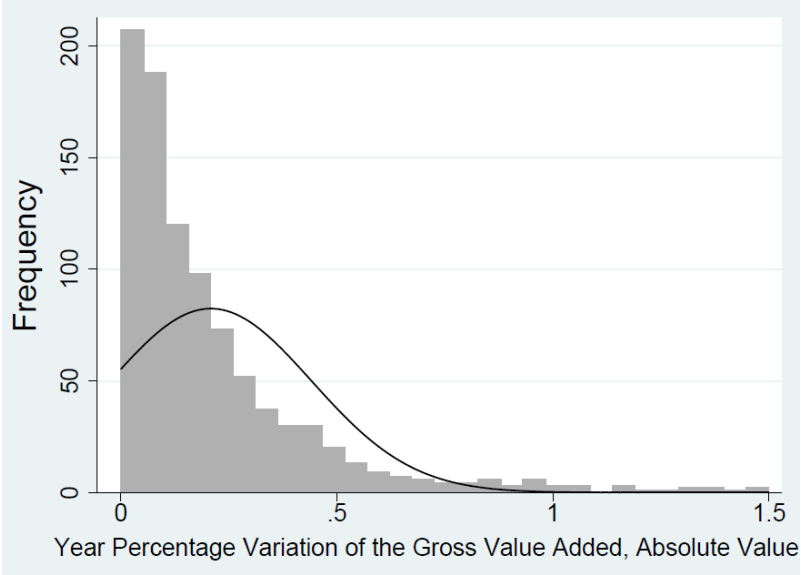
The best estimate of the year percentage variation of the gross value added in the 63 countries included in the analysis is +4.6% over the evaluated period, with a standard deviation of 30.9 percentage points (see Figure 11). In 46.8% of cases the variation is negative, while in 53.2% it is positive; values are similar for the distribution of the midrange estimate (see Figure 11).

Figure 11. Distribution of frequency of the year percentage variation of the gross value added, best and midrange estimate



Note: author's elaboration.

Figure 12. Distribution of frequency of the absolute value of the year percentage variation of the gross value added

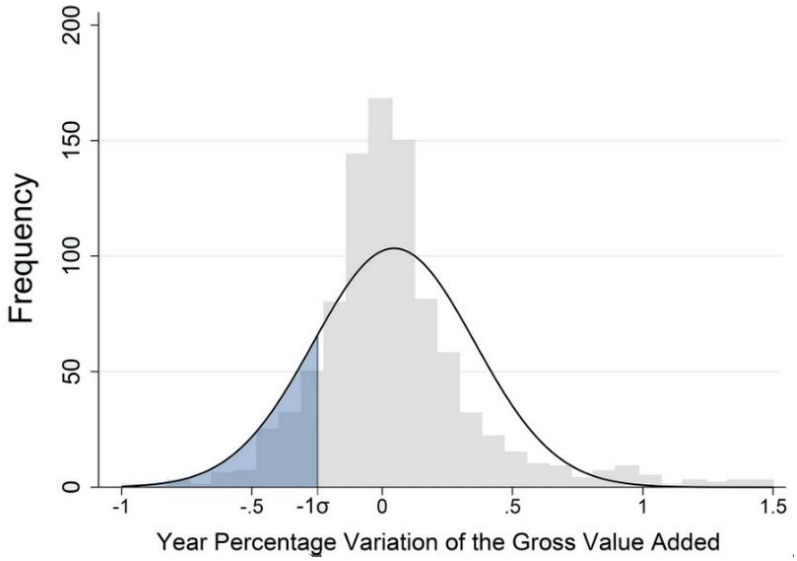


Note: author's elaboration.

Reduction indicator - Decreasing GAV

In order to investigate the specific role of decreases in the gross value added generated by cocaine trafficking upon violence, the study includes the models a variable that identifies the contraction of the gross value added. A dummy variable is created that assumes the value of 1 when the year percentage variation of the gross value added is smaller than the mean of the distribution by more than a standard deviation and 0 in all other cases.

Figure 13. Graphic representation of the production of the dummy variable

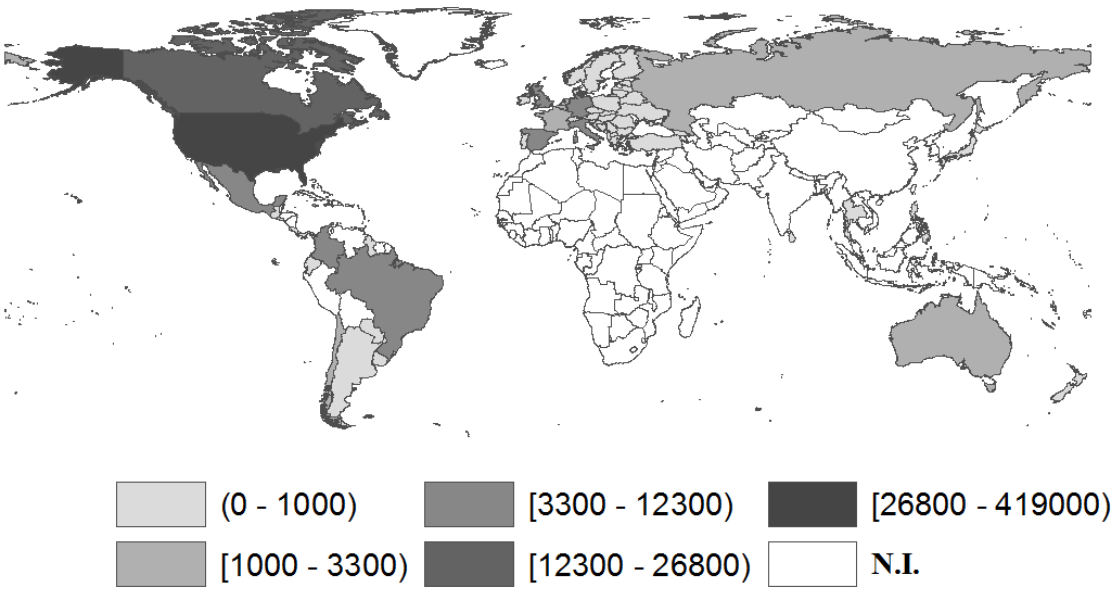


Note: author's elaboration.

Cocaine consumption

Research has observed that the abuse of stimulants like cocaine, for a variety of reasons, can increase violent attitudes and the risk of victimization (Ellinwood 1971; Asnis, Smith, and Crim 1978; Fink and Hyatt 1978; Goldstein 1985; Fagan 1993; Boles and Miotto 2003; McKetin et al. 2014). Moreover, according to systemic violence theory a large consumer market may determine a higher amount of violence because of a greater number of illicit transactions (Miron 2001). In order to take into consideration these two potential links between cocaine consumption and homicide rates, the study, in line with Fajnzylber, Lederman, and Loayza (2002a), includes an indicator of cocaine consumption among the regressors. A best estimate and a midrange estimate of cocaine consumption are taken from those produced to calculate the gross value added. Both the values refer to pure consumption.

Figure 14. Cocaine consumption, best est., pure kilograms 1999-2013 average



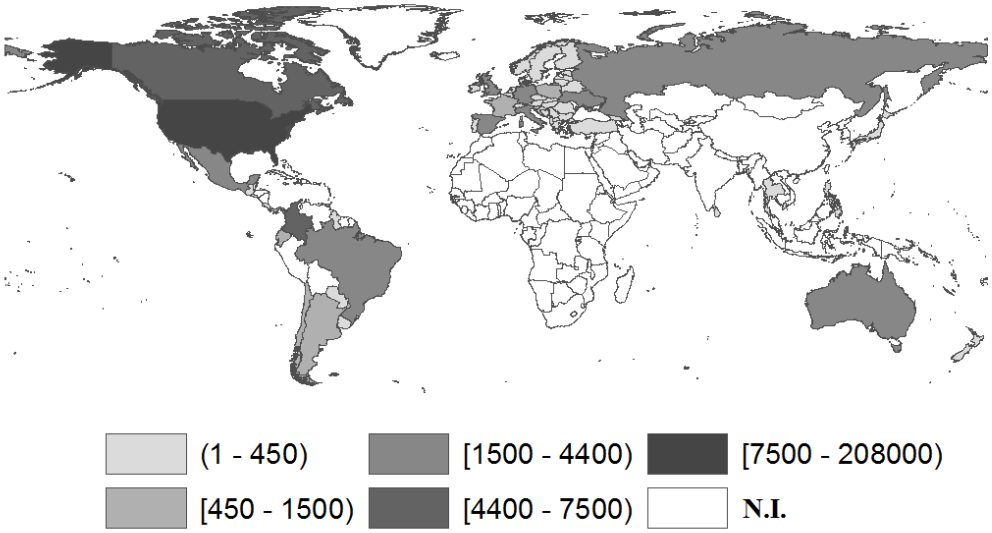
Note: author's elaboration.

Value of cocaine market – Gross value added

In the absence of opportune controls, the impact of variation in the gross value added on violence might be biased due to the overall value of the cocaine market in a country. Large fluctuations in the gross value added in countries where the cocaine market is not a major issue, might have no impact on the overall level of violence. Vice versa, small changes in a vast market might cause important increases in homicide rates. To better address the specific impact of fluctuations, the study proposes the introduction of the estimate of the gross value added in the regression. The final estimate of the

gross value added is adjusted by the *Price level ratio of PPP conversion factor (GDP) to market exchange rate* developed by the World Bank. Since, the gross value added produced in a country depends, in part, on cocaine consumption, the two estimates do not enter as regressors in the same econometric models. As for other variables, both the best and the midrange estimates are exploited in the econometric analysis.

Figure 15. Gross Value Added, best est., PPP adjusted million USD, 1999-2013 average



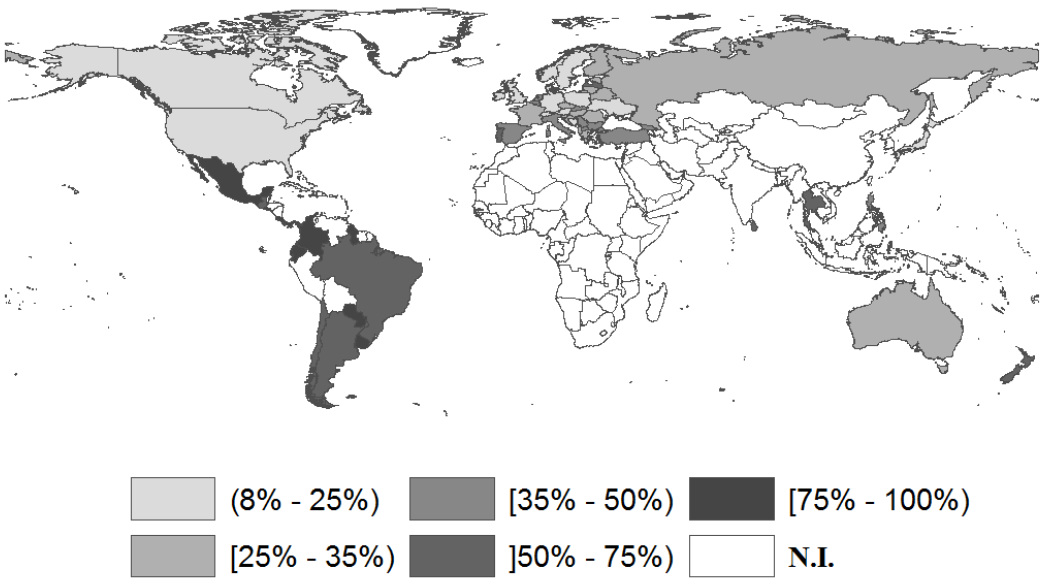
Note: author's elaboration.

Share of the gross value added generated at the high-international level

International shipments and sales of large loads have peculiar characteristics that make them different from street dealing or small-scale smuggling (Reuter and Haaga 1989). Transactions are more complex and the relationships between participants are often not clearly defined (Reuter 2016). Shipments may have to enter and exit several borders, and criminals may speak different languages and have different cultural backgrounds (UNODC 2015d; Reuter 2014; Paoli and Reuter 2008). At the same time, large shipments come with bigger margins and, therefore, larger profits to fight over. All these factors may facilitate a n increase disputes, which causes high-level drug trafficking to be relatively more violent than national distribution or even street dealing (Reuter 2016).

Taking these plausible patterns into consideration, the study includes in the regression an indicator of the share (%) of the gross value added generated at the international-trafficking level, according to the proposed supply-chain modelling. Data for the construction of this indicator are generated through the flow/network approach described above.

Figure 16. Share of the Gross Value Added generated at the transnational/high level of the market, best est., average 1999-2013



Note: author's elaboration.

Law enforcement actions against drug trafficking - Seizure rate

Many studies have shown that law enforcement action aiming at disrupting drug markets may lead to an increase in violence (Riley 1998; Miron 1999; Eck and Maguire 2000; MacCoun and Reuter 2001a; Freeman 2006; Kleiman 2011; Kleiman et al. 2012; Rios 2013; Calderón et al. 2015; Osorio 2015). The proposed flow/network provides estimates of the size of cocaine flows entering into each country of the network. This data provides the possibility of going beyond the traditional limitations of using seizures as measures of law enforcement. The seizure rate indicator used in the econometric analyses is simply the ratio between seizures occurring in a country and total inflows of cocaine.

II.4.2.2 Structural and cultural determinants of violence

This subsection presents the selected tangible factors used in the econometric analysis to examine the role of structural and cultural determinants of violence.

Economic deprivation – Infant mortality rate

Although a single direct measure of poverty is unavailable for all nations, infant mortality is commonly employed as a proxy for poverty in non-criminological cross-national analyses, because of its expedience as an indicator of deprivation (Pridemore 2008). Although infant mortality rate shares

with other measures of absolute and relative deprivation the problem of a high risk of collinearity with any measure of poverty, the data on this issue is especially abundant. This study adopts the data on infant mortality provided by the UN, which, in turn, collected data from other international institutions.

Level of economic wealth – per capita GDP

The vast majority of cross-national studies of violence include some measure of the productive capacity of countries, such as GDP per capita, as a control or principal variable (e.g. Braithwaite and Braithwaite 1980; Messner 1982a; 1989; Witte 1980; Krahn, Hartnagel, and Gartrell 1986; Shichor 1990; Neapolitan 1994; Lee 2001; Fajnzylber, Lederman, and Loayza 2002a; 2002b; Messner, Raffalovich, and Shrock 2002; Neumayer, 2003; Altindag 2012). To put it simply, GDP measures final purchases by households, businesses, and governments by adding up consumption, investment, government spending, and net exports (Landefeld 2000). GDP and GDP per capita are good proxies for the average wealth of citizens in any given nation. Alternatively, authors like Krohn (1976) use unemployment rates as a measure of GDP, while Jacobs and Richardson (2008) use both unemployment rate and GDP.

In accordance with previous literature on homicides and violence, this study assesses the criminogenic consequences of different levels of economic development as well as changes in development through using GDP per capita. Data on GDP are gathered from the *World Development Indicators* database by the World Bank (2016b). The World Bank (2015a) defines the selected variable as: "GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2005 U.S. dollars." Utilising data on gross domestic products transformed into constant USD form, increases the reliability of cross-country analyses, whilst introducing a possible source of bias in terms of longitudinal analysis. Indeed, part of the fluctuation in the GDP estimate is due to changes in the exchange rate between the local currency and the USD, as opposed to structural variation in the country's own economy. With regards to the more serious problem of the different value of currencies between countries, the study accepts a bias in the estimate of within countries variations in the level of GDP per capita.

Urbanization

Wirth (1938) asserts that greater urbanization increases the anonymity of people within their social context. This process breaks down shared cultural understandings, favouring the spread of crime and,

more seriously, violence (Wirth 1938). Criminologists have used extensive indicators of urbanization in macro studies investigating the determinants of violence (e.g., McDonald 1976; Parker and Smith 1979; Messner 1982a; Krahn, Hartnagel, and Gartrell 1986; Bennett 1991a; 1991b; Ortega et al. 1992; Fajnzylber, Lederman, and Loayza 2002b; Cole and Gramajo 2009). In addition to direct measures of urbanization, other authors have exploited similar indicators, such as Braithwaite and Braithwaite (1980) who use data on population concentration, or Hansmann and Quigley (1982) and Messner (1982a) who use population density.

In accordance with previous literature on the topic, this study introduces the proportion of people living in an urban area as a variable to take into account urbanization as a potential determinant of violence. Ortega et al. (1992), Cole and Gramajo (2009), Fajnzylber, Lederman, and Loayza (2002a) among others, operationalize urbanization in precisely the same manner. National estimates of urban population as a percentage of total population are gathered from the *World Bank Indicator* database (2015a). In these databases, urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects (World Bank 2015a).

Control of corruption and rule of law

The capacity of a country to impose its own laws as well as the health of its criminal justice system are important elements in understanding the determinants of homicide levels and trends (Mendez, O'Donnell, and Pinheiro 1999; Briceño-León, Villaveces, and Concha-Eastman 2008; UNODC 2014b; Adelman 2015). An uncertain rule of law provides criminals with a sense of impunity, and thus may contribute to the perpetration of violence and exacerbate vicious cycles of violence (Briceño-León, Villaveces, and Concha-Eastman 2008; UNODC 2014b).

To operationalize the concept of the rule of law, of course, is not a straightforward task, because the concept includes two main aspects: the first is the existence of certain rules and the way in which they are enforced; the second concerns the actual justice of the content of the laws (Kaufmann, Kraay, and Mastruzzi 2011, 222). Focusing on a single dimension of the rule of law, such as the functioning of the judicial system, several single indicators can serve the scope of measuring its efficiency. The list of indicators may include the number or the rate of homicide cases solved by the police, persons arrested for and persons convicted of homicide (UNODC 2014b). However, these indicators are based on data that are unable to provide information about fundamental qualitative aspects of criminal justice administration. For example, they ignore the length of trials, the quality of investigations, the fairness of procedures, among many other aspects (UNODC 2014b). Moreover, the rule of law does not concern only the criminal system; it is a much more complex concept that embraces a multitude of aspects of the functioning of a society (Hutchinson and Monahan 1987; Fallon 1997).

The relevance of the rule of law to control violence calls for the inclusion in the econometric analysis of a variable able to proxy it. At the same time, the complexity and the multidimensionality of the phenomenon make it difficult to model, thus necessitating the selection of a synthetic index to account for the different dimensions of the concept.

Within the framework of the *Worldwide Governance Indicators (WGI) project*, the World Bank (2015b) provides an indicator of the rule of law for 215 countries during the period 1996-2014. The original data consists of perceptions of governance collected from 31 different data sources and provided by 25 different organizations. (Kaufmann, Kraay, and Mastruzzi 2007) The synthetic indicator is constructed on the basis of the methodology developed by Kaufmann, Kraay, and Mastruzzi (2010). The rule of law indicator "[…] captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence" (Kaufmann, Kraay, and Mastruzzi 2011, 223).

Control of corruption - CPI

Authors such as Neapolitan (1999) assert that it is critical to analyse the level of corruption so as to understand differences in the level of violence among countries. Taking into account the phenomena of corruption is especially pertinent when analysing drug trafficking determined violence (Reuter 2009). It is important for two reasons: firstly, in several countries involved in drug trafficking, corruption has reached judges, governors and politicians, but, above all, enforcement agencies (Thoumi 2002; Latin American Commission on Drugs and Democracy 2009; INCB 2013; INCB 2014); secondly, because corruption and the concomitant distrust in government makes it difficult to develop any effective policies to reduce violence (Chi et al. 2013).

Among the possible indicators of corruption, this study utilises the *Corruption Perceptions Index (CPI)* produced by Transparency International (2016). Fredriksson, Vollebergh, and Dijkgraaf (2004), Goel and Nelson (2005) and Méndez and Sepúlveda (2006) used this indicator to conduct cross-sectional studies of corruption. *CPI* is a measure of corruption in the public sector based on national surveys provided by a multitude of institutions. As reported by Transparency International (2016), "[t]he CPI […] is a composite index, a combination of polls, drawing on corruption-related data collected by a variety of reputable institutions. The CPI reflects the views of observers from around the world, including experts living and working in the countries/territories evaluated". An alternative estimate of the level of corruption in any given country is the *Control of Corruption* indicator by the World Bank (2014). Several studies have indicated that there is a correlation between the two indicators at levels above 0.97, with respect to the timeframe and the countries available in both

databases (Butler, Gluch, and Mitchell 2007; Antonaccio and Tittle 2007). Consequently, the use of one or the other should not affect the final estimates.

Integrity and rule of law – Synthetic indicator based on CPI and Kaufmann, Kraay, and Mastruzzi's (2010) index

Given the importance of measuring both the rule of law and control of corruption, not to mention the simultaneous high correlation between the two indicators, the study makes use of a synthetic index that combines the previous two. To create this index, the indicators integrity and rule of law proposed by Kaufmann, Kraay, and Mastruzzi (2010) are translated in order to have only positive values, while leaving unchanged the differences among countries which are then multiplied by the Corruption Perception Index developed by Transparency International (2016). By multiplying the two values, the synthetic index implicitly assumes a positive and exponential effect of the two measures combined.

Police – Police rate

Numerous studies control for the size of police forces in absolute and relative terms (McDonald 1976; Levitt 1997; Fajnzylber, Lederman, and Loayza 2002a). Available studies make use of the number of police personnel per 100,000 inhabitants or other indicators of the presence of police, because these are simple direct measures of the efforts of the state to control criminal behaviour.

The study makes use of the most classic indicator of the presence of police: the size of the police personnel per 100,000 inhabitants. Data is collected from the *Crime and criminal justice statistics* database of the UNODC (2015c). UNODC defines Police Personnel as "means personnel in public agencies as at 31 December whose principal functions are the prevention, detection and investigation of crime and the apprehension of alleged offenders. Data concerning support staff (secretaries, clerks, etc.) should be excluded."

Lagged levels of violence

The culture of honour often goes hand-in-hand with a strong inclination toward retaliation, which is another important catalyst for the spread of violence (Loftin 1986; Topalli, Wright, and Fornango 2002; Kubrin and Weitzer 2003b). Violent retaliation restores damaged reputations and gives offenders some sense of symbolic control over their identity and their environment (Topalli, Wright, and Fornango 2002; Jacobs and Wright 2006). This mechanism is particularly relevant for those criminals active in the drug industry (Bourgois 1995; Blumstein and Rosenfeld 1998; Castillo, Mejía, and Restrepo 2014). By interviewing drug dealers, Topalli, Wright, and Fornango (2002) observed that direct retaliation represents for these criminals the best response to victimization, because it allows them to re-establish their diminished self-esteem.

More generally, the use of lagged levels of violence permits the detection of the inertia of violence. Fajnzylber, Lederman, and Loayza (2002a), for example, identify a positive correlation between past levels of homicide and current levels of homicide. Both Osorio (2015), who studied violent dynamics in Mexico, and Sanchez and Díaz (2006), who studied violence in Colombia, also found a significant intertemporal dependency with respect to violence rates.

Age structure – 15-34 males as share of the total population

There is no single fact about crime more widely accepted by criminologists than that which states that there is a positive association between a young population and criminal propensity. Therefore, it is unsurprising that most studies on the determinants of violence propose some form of control for the age structure of their unit of analysis. This is true for research conducted when developmental life-course theories were in their infancy and for more recentcross-sectional and longitudinal studies (Hansmann and Quigley 1982; Krahn, Hartnagel, and Gartrell 1986; Land, McCall, and Cohen 1990; Ortega et al. 1992; Fajnzylber, Lederman, and Loayza 1998; 2002a; Neumayer 2003; McCall and Nieuwbeerta 2007; McCall, Parker, and MacDonald 2008; Moeller and Hesse 2013). That said, the model includes a specific variable to control for the age structure of the countries included in the analysis.

Variables representing the age structure of the population simultaneously control for differences in the prevalence of youths with respect to potential offenders and victims. While comparable data on offenders are scarcer, data on victims is readily available. Therefore, the specific control is constructed with respect to information on victims. The UNODC (2011b; 2014b) publishes the *Global Study on Homicide*, the most comprehensive report describing the underlying patterns and trends related to different forms, settings and risk factors of homicide at global, regional, and national levels. This document aids understanding about which age groups are more likely to be victimized in different part of the world, and thus should be considered to construct the most effective control.

UNODC statistics confirm one of the central tenets of developmental life-course theorists: all over the world, victims of homicide are generally relatively young. People between 15-29 and 30-44 years of age account for almost half and slightly less than a third of all homicides respectively (UNODC 2014b). The previous edition of the report indicates similar findings (UNODC 2011b). Briceño-León, Villaveces, and Concha-Eastman (2008) analysed the occurrence of homicides in Latin America, and provided similar statistics, even for previous years, which confirmed that not only are most victims around 30 years of age, but also that most homicides are, in fact, committed by young men (Briceño-León, Villaveces, and Concha-Eastman 2008). However, the incidence of homicides between the 30-44 age group is higher in some Central American and Caribbean countries, as well as throughout Europe (UNODC 2014b). Hence, it is relevant to consider how these UNODC's descriptive analyses

of homicide patterns are characterised by all of the limitations previously mentioned with respect to homicide statistics.

Taking into consideration both the statistics presented by the UNODC regarding the distribution of age ranges of victims of homicides and the available literature on the topic, this study decides to use the share of the total population of males aged between 15 and 34 years of age. This selected age range is considered the most adequate control for age structure considering the variety of countries included in the final analysis. Estimates of the population per sex and age group, as well as data on total population come from the *Health statistics and information systems* of the WHO (2015). Data from the *World Population Prospects* database of the United Nation (2015) confirm WHO's figures.

Alcohol abuse – Size of national alcohol consumption

Criminologists have established that the acute consumption of psychoactive substances is an important precipitator of interpersonal violence (Boles and Miotto 2003). Even from the perspective of cross-national studies, available data confirms the relevance of alcohol, and the existence of social norms which favour its consumption, as key facilitators of interpersonal violence (Briceño-León, Villaveces, and Concha-Eastman 2008; Rossow 2001; Graham et al. 2010; UNODC 2014b).

This study introduces a control variable for the abuse of alcohol, given the plethora of research that has identified the excessive use of alcohol as a factor which exacerbates interpersonal violence. In particular, the study uses available estimates of the per capita consumption of all alcoholic beverages in litres since 1990 provided by the World Health Organization (UNODC 2016a), which defines the variable as "[…] the per capita (15 years and older) amount of alcohol consumed in litres of pure alcohol in a country in a calendar year." Although this data does not represent alcohol abuse, but, rather, average alcohol consumption, it can nevertheless be considered as a good proxy for abuse in the absence of better international estimates.

Political violence – Marshall's (2016) index

Archer and Gartner (1976), in their comparison between 50 nations in which a war had taken place and 30 control countries, observed that nations all over the world tend to register higher homicide rates in the period immediately following a war. The increases in homicides identified by the authors were substantial in both defeated and victorious nations. The *Global Study on Homicide* confirms these findings, thus emphasising that nations which experienced wars and conflicts have to carry the burden of high levels of violence long after the formal termination of hostilities (UNODC 2014b). In light of this evidence, a control for forms of political violence is also added to the model.

Etiological studies on violence rarely include controls for present and past episodes of international and national violence (Hsieh and Pugh 1993; Pridemore 2011). However, there are exceptions: Gartner (1991) for example, included in her model an estimate of the loss of life as a result of the wars of the 20th century, based on data by Small and Singer (Small and Singer 1981).

In order to take into account the possible inflationary effect of forms of political violence on other forms of interpersonal violence, this study includes as a control variable a synthetic indicator of political violence. The Centre for Systemic Peace (2014), in its *Major Episodes of Political Violence, 1946-2015 (War List)*, provides annual, cross-national, time-series magnitude scores on interstate, societal, and communal warfare violence for a fair number of countries. The estimate (i.e., Magnitude score of episode(s) of any form of political violence involving a state in that year) scales form 1 (lowest) to 10 (highest). The estimate used in the study synthesises the magnitude scores in relation to international warfare, civil violence, civil warfare, ethnic violence, and ethnic warfare (Marshall 2016). The *Uppsala Conflict Data Program* by the Uppsala University (2016) is an alternative source of data on past and ongoing conflicts. The synthetic index proposed by Marshall (2016) and the Centre for Systemic Peace (2014) appears to be more appropriate than the data on fatalities provided by the *Uppsala Conflict Data Program.*

II.5 Econometric methodology

II.5.1 The system GMM estimators

The econometric study of the relationship between fluctuations in the value of cocaine markets and violence poses several challenges. First, reverse causality often characterises the relationship between lethal violence and its likely determinants. Although this dynamic might characterise the relationship between certain structural variables, such as the effectiveness of the rule of law or income inequality, it might also affect the evolution of drug markets also. Failure to correct for the two-way causality of the relationship between the explanatory variables and lethal violence would lead to inconsistent coefficients, which would cause an up-downwards estimate of their correlation.

Second, as observed by a range of scholars (Jacobs, Topalli, and Wright 2000; Fajnzylber, Lederman, and Loayza 2002a; Jacobs and Wright 2006), in different contexts violence embodies inertial dynamics. To account for these temporal dependencies, it is thus necessary to develop a dynamic, lagged dependent econometric model capable of effectively managing the error component of the model.

The third estimation problem is that, despite the focus of this study on lethal violence, measurement errors are known to afflict data on intentional homicides. As discussed, crime

underreporting is not homogeneous across countries; on the contrary, it various across countries and often correlates with other factors affecting crime rates, such as the rate of urbanization, inequality, or the level of income (Fajnzylber, Lederman, and Loayza 2002a). Ignoring this problem might lead to biased estimates, especially in light of the dynamic nature of our model. To deal with this issue, the control for measurement errors requires either random noise, or a combination of an unobserved country-specific effect and random noise (Fajnzylber, Lederman, and Loayza 2002a).

Fourth, the cross-national study of the determinants of lethal violence suffers inevitably from the lack of variables fully capable of operationalising potential determinants of the level of violence. The spread of firearms in the population, the type and number of organised criminal groups active in the country would certainly constitute the most relevant of these factors. Indeed, when considering the fact that these features of a country tend not to change too abruptly over a 15 year period, the model necessitates the use of country fixed effects to mitigate the potential biases stemming from the omission of these factors from the analysis.

The system generalized method of moments (system GMM) applied to dynamic models of panel data is the approach put forward to test in the soundest possible manner the two hypotheses of this study. Blundell and Bond (1998) developed the system GMM on the back of previous studies by Hansen and Singleton (1982), Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), and Arellano and Bover (1995). In recent years, the GMM estimators for dynamic panels have grown in popularity, and, hence, it is now possible to find studies making use of them across the most disparate of disciplines, including criminology (e.g., Fajnzylber, Lederman, and Loayza 2002b; Lederman, Loayza, and Menéndez 2002; Kleck, Kovandzic, and Schaffer 2011; Kovandzic et al. 2016). The use of this class of estimators is presented and discussed in econometric handbooks (e.g., Hall 2005; Greene 2011; Wooldridge 2012) and apposite packages have been released so one can use these estimators in most common statistical software (e.g., Roodman 2009a; 2009b).

GMM provides a framework for estimation and testing that is designed for empirical problems where endogeneity is a relevant issue (Kleck, Kovandzic, and Schaffer 2005; Roodman 2009a; Han and Phillips 2010). Moreover, system GMM is particularly suited to perform econometric analyses with panel data: that has a large number of units in comparison to the number of periods of observation; that hypothesizes a linear functional relationship between independent and dependent variable; that has a dynamic and autoregressive dependent variable; that might require the use of unit-specific fixed effects; that is afflicted by heteroskedasticity and autocorrelation within units, but not across them (Roodman 2009a; Han and Phillips 2010).

The first crucial advantage of using system GMM is that reliance upon both a time-series and cross-country dimension allows for richer econometric model specifications and more accurate

conclusions. GMM is also well suited to appreciating the influence on violence of regressors that both vary across countries and change on a year by year basis. The set of variables used in this study includes both these categories. Infant mortality, the share of youth males, urban population, to cite some examples, all tend to vary across countries, whilst GDP growth and the gross value added register important variations across time. Panel data also permits consideration of variables that strongly vary across units and time (e.g., seizure rates, GDP per capita).

The second strength of the use of system GMM is that this technique is suited for dealing with dynamic and autoregressive phenomena, with past realizations of the dependent variable influencing current ones (Fajnzylber, Lederman, and Loayza 2002a). Indeed, system GMM affords the inclusion of regressors that are predetermined but not strictly exogenous; as in the case in which a lag of the dependent variable is included among the factors on the right side of the equation (Roodman 2009a). On the contrary, erroneously ignoring possible correlations of regression disturbances over time can lead to severely biased statistical inference (Nickell 1981; Kezdi 2003; Hoechle 2007). The development of a dynamic system also allows for the modelling of specific features of lethal violence, such as inertia, retaliation, and the proliferation of a violence culture.

The third advantage of using panel data is that it allows for controlling for the effect of unobserved variables that vary only marginally over time, and therefore can be considered as country-specific effects. As noted by Fajnzylber, Lederman, and Loayza (2002a), it is quite often the case in criminological studies that the most relevant country-specific effect is the systemic error involved in data collection and data reporting. Willingness of people to report crimes, capacity of law enforcement agencies to collect information, and diligence of governmental agencies in transmitting reliable data vary tremendously across countries (Aebi 2008; Anna Alvazzi del Frate 2008; Aebi et al. 2010). Evidently, the more countries are included in the analysis, the higher the potential bias. The presence of organized crime and the spread of firearms are other important variables often omitted from cross-country studies on lethal violence, as previously discussed. By controlling for these country-specific effects, the system GMM limits the estimation bias from the underreporting of crimes and, more generally, mitigates against any unobserved unit-specific and time-invariant heterogeneity.

The main advantage of using GMM over other econometric methods increases when it is desirable to take into consideration unobserved unit-specific effects and the time dimension of the panel is relatively short (Kripfganz and Schwarz 2015). Indeed, in this situation, standard fixed and random effects estimators cannot be used because of both multicollinearity problems and biases in dynamic panel data models (Nickell 1981; Kripfganz and Schwarz 2015).

Finally, and most importantly, panel data models with system GMM regressors are particularly effective in controlling for the potential joint endogeneity of certain explanatory variables (Fajnzylber,

Lederman, and Loayza 2002a; Kleck, Kovandzic, and Schaffer 2011; Roodman 2009a; Han and Phillips 2010). System GMM permits the specification of exogenous and endogenous regressors, and uses lagged values of explanatory variables as instruments to deal with joint endogeneity issues. This feature is fundamental for producing consistent coefficients of the correlation between the explanatory variable and homicide rates, when the two might present some forms of reverse causality - as is the case for several of the explanatory variables included within this analysis. In particular, the causality of the trafficking value added-homicides relationship is likely to carry over from homicides to trafficking profits.

The standard solution to the problem of endogeneity, when it is not possible to conduct any experiment and there is no regression discontinuity, is to construct an equation which exploits the instrumental variables (IV) estimator. IV estimation requires an additional variable to be used as an instrument for each endogenous regressor. In IV, each instrument has to meet two fundamental criteria. First, the instrument has to be relevant, which is to say that the instrument has to be correlated with its corresponding endogenous variable. Second, the instrument has to be exogenous; excluded instruments cannot be correlated with the disturbance term in the equation (Roodman 2009; Kovandzic et al. 2016). If both these requirements hold, then the instrument affects the dependent variable exclusively through the endogenous regressor. With respect to the trafficking profits-lethal violence relationship, an instrument would be relevant if it was correlated with profits, and would be exogenous if it affected homicide rates only via its association with trafficking profits. The same would have to hold for any other instrument included in the model.

System GMM allows for the inclusion of external instruments, but does not assume their existence outside the available dataset. Given that finding variables that can serve as valid instruments can be challenging in the field of criminology (Bushway and Apel 2010), this is another key advantage of system GMM. This econometric approach uses the dynamic properties of the data to generate proper instrumental variables; in particular, this system exploits lags of the instrumented variables as instruments (Roodman 2009a). System GMM models use lagged values of regressors, both in levels and in differenced form, as instruments for independent variables, while also allowing lagged dependent variables as regressors in panels with a limited time span (Arellano and Bond 1991, Blundell and Bond 1998). The validity of these additional instruments in system GMM depends upon the assumption that changes in the instrumental variables are uncorrelated with fixed effects, in the sense that deviations from long-run means are not systematically related to fixed effects throughout the study period (Roodman 2009a).

II.5.2 Testing for overidentification and for autocorrelation

A crucial assumption for the validity of GMM is that the instruments are exogenous. To verify whether the instruments are exogenous, Sargan's (1958) or Hansen's (1982) J-test is performed for each model. The J-test is a statistical test of overidentifying restrictions that allows for verifying whether the instruments are exogenous (Roodman 2009b). This test checks if there are more orthogonality conditions than parameters to be estimated, and, consequently, if the equation of the model is overidentified. Under the null hypothesis that all the variables that are assumed to be exogenous are indeed exogenous (i.e., the orthogonality conditions are valid), the minimized value of J is distributed as chi-squared with degrees of freedom equal to the degree of overidentification (see Sargan 1958; 1988; Hansen 1982). It should be noted that Hansen's J-test requires that we assume that at least one instrument is exogenous. This means that if none of the instruments are exogenous, the J statistic itself will be biased and inconsistent and, consequently, could erroneously fail to reject the null hypothesis (Murray 2006). All the models included in this study include year indicators among the instruments, so as to be certain to generate consistent and unbiased J statistics.

A second test has to be performed in order to assess the validity of the estimates performed with the system GMM; this consists of the Arellano and Bond (1991) test, which permits us to reveal if serial correlation in the disturbance is present. The fact that autocorrelation in the idiosyncratic disturbance term would render some specific lags invalid as instruments, requires us to first test it before accepting them (Roodman 2009). The Arellano and Bond test for autocorrelation has a null hypothesis of no autocorrelation. The test for AR(1) process in first differences usually rejects the null hypothesis. The test for no second-order serial correlation in the first differenced residuals AR(2) is more important, because it detects autocorrelation in levels (Arellano and Bond 1991; Bond 2002).

II.5.3 The specific estimation strategy

All the estimates of the effects are obtained using the system GMM developed by Blundell and Bond (1998), and refer to the period 1999-2013. These analyses concern the 63 countries for which a richer set of comparable data is available with respect to the years 1999-2013.[9] 17 of the included

[9] Albania; Argentina; Australia; Austria; Belgium; Bulgaria; Bahrain; Bosnia; Belarus; Brazil; Canada; Switzerland; Chile; Colombia; Costa Rica; Cyprus; Czech Republic; Germany; Denmark; Ecuador; Spain; Estonia; Finland; France; United Kingdom; Georgia; Greece; Guatemala; Guyana; Croatia; Hungary; Ireland; Israel; Italy; Jamaica; Japan; Sri Lanka; Lithuania; Latvia; Mexico; Former Yugoslav Republic of Macedonia,

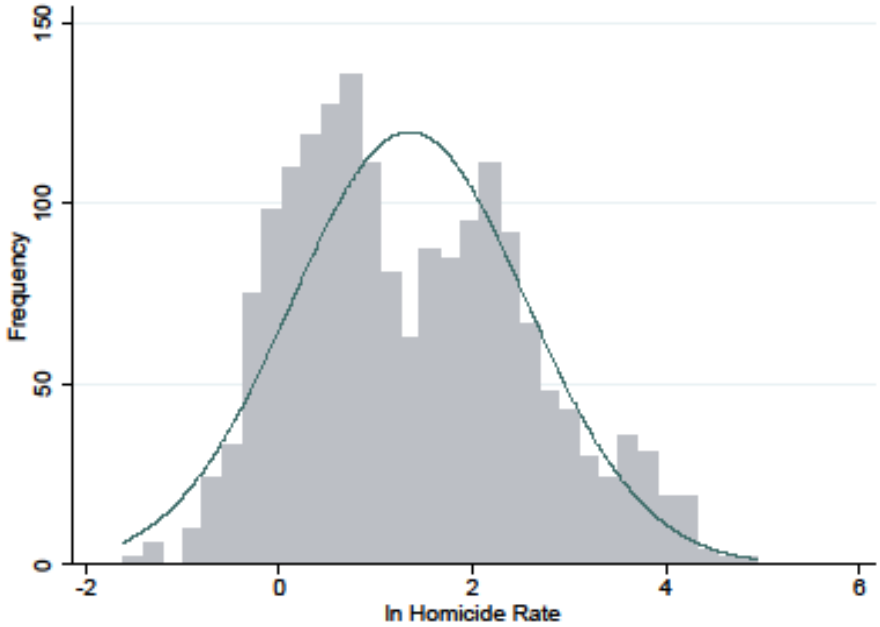
countries are located in the Americas, 10 in Asia, 34 in Europe, and 2 in Oceania; no African country is included in the panel. While countries are selected according to the availability of data on structural determinants of violence, these countries also tend to be the countries which provide better data on drug trafficking and drug markets. Therefore, focusing on them contributes towards not projecting onto the econometric analysis the most severe limitations of certain estimates of cocaine markets.

To estimate the impact of variations in trafficking profits and of structural and cultural determinants characteristics on the recourse to lethal violence, in all of the proposed models the dependent variable is the homicide rate, which, as discussed in the previous chapter, presents several advantages over other measurements of lethal violence. To reduce skewedness, while inducing homogeneity in the error variance, homicide rates are expressed in natural logs. No country in the sample has zero homicides; therefore, this transformation does not cause any loss of information, and, indeed, a simple visual inspection suggests no extreme skewedness or outlier problems after log transformation. Other authors treat homicide data in the same manner (e.g., Messner and Rosenfeld 1997; Fajnzylber, Lederman, and Loayza 2002b; Kleck, Kovandzic, and Schaffer 2011). Since the dependent variable is measured in logs, each estimated coefficient should be interpreted as the relative change in the homicide rate caused by a unit change in the specific explanatory variable (Nannicini 2010; Benoit 2011).

---

the; Netherlands; Norway; New Zealand; Panama; Philippines; Poland; Portugal; Paraguay; Romania; Russia; Singapore; El Salvador; Serbia; Slovak Republic; Slovenia; Sweden; Thailand; Trinidad; Turkey; Ukraine; Uruguay; United States.

Figure 17. Histogram of frequency density of natural logarithm of homicide rates, 1999-2013



Note: author's elaboration on UN data.

Models are organized into two main sets. The first presents the main results concerning the relationship between fluctuations in the gross value added in cocaine markets and the recourse to lethal violence (set I). The second replicates the regressions relying on different estimates of the cocaine market to check the robustness of the main results (set II). Ancillary analyses ran to either investigate the role of a specific variable, or to better test the role of structural determinants of violence are presented in Annex II.

The first set of models focuses on testing the capacity of the economic evolution of the cocaine market. The role of fluctuations in the gross value added and its contractions to the increase of lethal violence represent the cores of these models. All variables concerning the cocaine market and its value (i.e., gross value added, fluctuation of the gross value added, seizure rate, cocaine consumption, share of the gross value added generated at the trafficking level) presented in the first set of models are based on the best estimates obtained with the flow/network approach. In contrast, all those variables referring to the cocaine market presented in the second set are based on the midrange estimate.

Variables referring to social and structural determinants of violence (i.e., infant mortality rate, urban population, GDP per capita, probity and rule of law, police rate, share of young males, alcohol consumption, level of political violence) enter into the different specifications of the models. The

inclusion of these variables is effective for controlling confounding factors that might mediate the interaction between cocaine trafficking and the increase of violence. At the same time, the study of the correlation between these variables and homicide rates permits us understand far more, which structural factors have a stronger role in determining the level of violence within a particular country.

In addition, system GMM produces standard errors of the coefficient estimates that are adjusted to be heteroskedasticity and autocorrelation consistent. This feature permits us to propose dynamic models that include the lagged homicide rate, among the independent variables. Lagged homicide rates provide a control for the temporal inertia of violence, as proposed by by Sah (1991), Fajnzylber, Lederman, and Loayza (1998), and Osorio (2015). At the same time, the inclusion of lagged value of homicide rates permits us to also take into account the exacerbation of vicious cycles of retaliation (Bourgois 1995; Topalli, Wright, and Fornango 2002). Because of the inclusion in the regressions of the lagged value of homicide rates, each estimated coefficient expresses the short-run effect of the respective variable. To obtain long-run effects, coefficients have to be divided by 1 minus the coefficient on the lagged dependent variable (Greene 2011).

Several of the data exploited in the production of the estimates are the best that are currently available; nonetheless, as discussed extensively, the level of uncertainty is high with respect to certain information. As a measure of the robustness of the findings, the second set of models replicates the analyses presented in the first set, by substituting best estimates of the variables with which to operationalise the cocaine market and its dynamics with mid-range estimates. The mid-range estimates are constructed by taking the mean of the lower and upper estimates presented in chapter two. These different specifications have the purpose of checking the robustness of the findings, regardless of the specific estimate of gross value added. Given the numerous assumptions made in the design of the procedure to estimate cocaine trafficking profits, this exercise is of particular relevance.

Each regression includes yearly dummies to remove universal time-related shocks from the errors. This procedure allows us to be more confident in holding the assumption that there are no correlations across individuals in the idiosyncratic disturbances, upon which the autocorrelation test and the estimates of the coefficient standard errors in system GMM rely (Roodman 2009a; Hernandez and Rudolph 2015). The inclusion of time dummies is common practice in the literature (Acemoglu et al. 2005; Roodman 2009a; Wooldridge 2012); however, for each regression one must perform a joint Wald test in order to see if the dummies for all years are equal to 0 (see an example in relation to model (1) in Annex II). Since the null hypothesis of the Wald test that all the coefficients, except the constant, are zero is always rejected, the time dummies are thus included in all regressions.

III Chapter: The fluctuation-homicide relationship

This chapter presents the estimates of the correlation between different variables concerning cocaine markets, classical structural determinants of violence and homicide rates; specific attention is dedicated to the relationship between fluctuations of the gross value added and violence. The estimates are obtained using the system GMM by Blundell and Bond (1998) and refer to the period 1999-2013. All models include year dummies while corrections for individual effects are implicit in the use of the system GMM. The dependent variable is the natural logarithm of the homicide rates in a given year in each model.

The results of model (1) indicate a statistically significant correlation between fluctuation in the gross value added generated in cocaine markets (*FGAV* |%|) and homicide rates in the 63 countries included in the study. The coefficient of the correlation is 0.327 with a standard error of 0.099, which is significant at 0.1% level. The adopted econometric strategy allows for controlling the endogeneity of gross value added through the use of its lagged values as instruments. The effectiveness of this device is not absolute, but it is likely to be high with respect to this specific variable.

Some of the factors that can influence the yearly fluctuation in the gross value added tend to have short-run dynamics that the system GMM is capable of managing; this is the case, for example, with successful large law enforcement operations. Moreover, while cocaine trafficking might more readily emerge in disorganized and violent milieus, the selected variable also considers reductions in the value of the business, which are less likely to be driven by long-run increases in the level of violence. In addition, the two classical specification tests proposed by Arellano and Bond (1991) indicate that the system GMM estimator is consistent. The failure in rejecting the null hypothesis of the AR(2) test indicates that the error term is not serially correlated and the moment conditions are well specified. The failure in rejecting the null hypothesis of the Hansen J test suggests the overall validity of the lags of the explanatory variables as instruments in the homicide rate regression.

Table 4. Set I. Effect of cocaine trafficking and structural characteristics of a country on homicide rates, years 1999-2013 unbalanced panel of 62-63 countries

	(1) Fluctuation	(2) Contraction	(3) Fluctuation & Contraction	(4) Value of the GVA	(5) GDP per Capita
			ln Homicide Rate		
FGAV |%|	0.3266**		0.3093***	0.2390***	0.1362**
	(0.0979)		(0.0676)	(0.0555)	(0.0421)
Decreasing GAV		0.1786*	0.1483*	0.1506+	0.1084+
		(0.0730)	(0.0573)	(0.0797)	(0.0582)
Cocaine consumption	0.0000	-0.0000	0.0000***		
	(0.0000)	(0.0000)	(0.0000)		
GAV, PPP				0.0000***	0.0000**
				(0.0000)	(0.0000)
Infant mortality rate	0.0910***	0.0909***	0.0481***	0.0512***	
	(0.0150)	(0.0200)	(0.0075)	(0.0080)	
GDP per capita					-0.0000**
					(0.0000)
Probity & Rule of Law	0.0115	0.0171	0.0015	0.0067	
	(0.0118)	(0.0137)	(0.0074)	(0.0082)	
Urban population (%)	0.0030	0.0022	0.0030	0.0013	0.0034
	(0.0053)	(0.0049)	(0.0023)	(0.0024)	(0.0030)
Police rate	-0.0002	-0.0017	-0.0003	-0.0006	-0.0005*
	(0.0007)	(0.0011)	(0.0004)	(0.0004)	(0.0003)
ln hom. rate t-1	0.1574*	0.1517+	0.5283***	0.5438***	0.6691***
	(0.0769)	(0.0813)	(0.0492)	(0.0501)	(0.0645)
15-34 male (%)	14.5871***	16.9202***	5.7634**	5.9043**	4.7034**
	(2.9159)	(3.2411)	(1.7888)	(1.8604)	(1.7684)
Seizure rate	0.5242**	0.4677*	0.2431*	0.2032+	0.1319
	(0.1715)	(0.1914)	(0.0915)	(0.1019)	(0.1026)
Traff. share of GAV	0.5590	0.3936	0.7639***	0.9225***	-0.0373
	(0.3458)	(0.3098)	(0.1972)	(0.2129)	(0.1262)
Alcohol consumption	0.0618**	0.0628*	0.0385**	0.0456**	-0.0075
	(0.0218)	(0.0302)	(0.0130)	(0.0140)	(0.0088)
Political violence	0.3982***	0.3596**	0.1115**	0.0998***	0.1044***
	(0.1085)	(0.1329)	(0.0372)	(0.0224)	(0.0262)
Year controls	Yes	Yes	Yes	Yes	Yes
N	608	616	607	607	610
N. of countries	63	63	63	63	62
N. of instruments	57	55	61	61	55
F	39.85	154.19	1449.73	2371.63	3472.85
F test	0.0000	0.0000	0.0000	0.0000	0.0000
AR(2) test	0.6121	0.1198	0.1717	0.1425	0.0515
Hansen J test	0.5259	0.2729	0.6256	0.3710	0.2839

Note: the table reports the results of system GMM by Blundell and Bond (1991; 1998) regressions of economic indicators of cocaine market and structural variables on homicide rates in 63 (62 in model 5) countries between the period 1999-2013. The dependent variable is the log of the homicide rate in each year; the main explanatory variable is the fluctuation of the gross value added with respect to cocaine trafficking in each country (i.e., FGAV). FGAV corresponds to the absolute value of the per cent year variation in the gross value added, as estimated in chapter 2. Yearly dummies are included in all regressions. The results of the F test, AR(2) test, and the Hansen J test are presented in the bottom part of the table, after the number of observations, countries, and instruments. The F test gives the p value for the joint significance of the included variables. The null hypothesis of the AR(2) test is that there is no autocorrelation of second order (Arellano and Bond 1991). The null hypothesis of the Hansen J test is that the instruments are uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation (Hansen 1982). Standard errors are in parentheses; +, **, **, and *** indicate coefficients significantly different from zero at the 90.0%, 95.0%, 99.0%, and 99.9% confidence level, respectively.

If one accepts the proposed methodology, then this estimate suggests that a further variation in profits of 1 percentage point would lead to an increase in the homicide rate of 32.6% in the short-run. Equivalently, an increase of 2.1% in the variation of the year gross value added is likely to cause an increase of 32.6% in the homicide rate in relation to an average variation country/year. Assuming a long-run perspective, the increase would be about 38.8% (i.e., ≈0.327/[1-0. 0.157]).

Table 5. Significance and expected signs of correlations investigated in models (1) to (5)

	(1)	(2)	(3)	(4)	(5)
	Fluctuation	**Contraction**	**Fluctuation & Contraction**	**Value of the GVA**	**GDP per Capita**
FGAV |%|	+	..	+ ***	+ ***	+ **
Decreasing GAV	..	+ *	+ *	+ +	+ +
Cocaine consumption (kg)	n.s.	n.s.	+ ***	..	..
GAV, PPP	..	..	..	+ ***	+ **
Infant mortality rate	+ ***	+ ***	+ ***	+ ***	..
GDP per capita	..	..	..	..	- **
Probity & Rule of Law	n.s.	n.s.	n.s.	n.s.	..
Urban population (%)	n.s.	n.s.	n.s.	n.s.	n.s.
Police rate	n.s.	n.s.	n.s.	n.s.	- *
ln hom. rate t-1	+ *	+ +	+ ***	+ ***	+ *
15-34 male (%)	+ ***	+ ***	+ **	+ **	+ **
Seizure rate	+**	+ *	+ *	+ +	n.s.
Traff. share of GAV (%)	n.s.	n.s.	+ ***	+ **	n.s.
Alcohol consumption	+**	+*	+ **	+ **	n.s.
Political violence	+***	+**	+ **	+ ***	+ ***
Year controls	Yes	Yes	Yes	Yes	Yes

Not included
significant, expected sign
non-significant
significant, unexpected sign

Note: the table reports the results of system GMM by Blundell and Bond (1991; 1998) regressions of economic indicators of cocaine market and structural variables on homicide rates presented also in Table 4. The dependent variable is the log of the homicide rate in each year. The main explanatory variables are the absolute value of the percentage variation of the gross value added related to cocaine trafficking in each country in each year (i.e., FGAV |%|), and the dummy identifying contraction of the gross value added (Decreasing GAV). The table reports whether or not an included variable is significantly correlated with the homicide rate, and if the sign of the correlation is the expected one. **, **, and *** indicate coefficients significantly different from zero at the 90.0%, 95.0%, 99.0%, and 99.9% confidence level, respectively.

The analysis of the other variables concerning cocaine markets indicates that seizure rates are significantly correlated with homicide rates. As in the case of homicides, in the case of seizures the causality might also run in both directions. A substantial line of research views law enforcement

operations targeting illicit markets as a driver of systemic violence (e.g., Riley 1998; Miron 1999; Eck and Maguire 2000; MacCoun and Reuter 2001a; Freeman 2006; Kleiman 2011; Kleiman et al. 2012; Rios 2013; Calderón et al. 2015; Osorio 2015). At the same time, however, it could be that countries afflicted by higher levels of violence have more incentives to participate in illicit activities, such as cocaine trafficking. Accepting a causal relationship between the two dimensions running from seizure rates to violence, as posited by most of the literature and supported by the proposed statistical tests, the results of the model suggest that homicides rates are likely to augmented by 52.4% in the case of an increase in the cocaine interception rate of 1 percentage point. The last two variables concerning cocaine markets (i.e., the volume of consumption and the share of gross value added generated at the international trafficking level) are not significantly correlated with the level of homicides.

Interpersonal lethal violence is not merely a matter of drug trafficking. The social and cultural characteristics of countries influence the level of violence within the country itself. In addition, drug systemic violence, equally, does not concern only monetary values and economic dynamics, but, rather, is shaped by the political, cultural, and social context of the environment where it emerges (Collins 1990; Dickinson 2014). Therefore, the inclusion in the econometric model of variables representing socio-cultural factors is critical both for understanding the determinants of lethal violence and for reducing the omitted variable bias in the estimate of the relationships between the dimension of drug markets and violence.

Model (1) considers the infant mortality rate, the share of urban population, a synthetic indicator of rule of law and corruption control, the number of police officers per 100,000 inhabitants, the share of the male population between the age-bracket of 15-34, the lagged value of homicide rate, the size of alcohol consumption, and an index of political violence. Through the use of an *uncentered variance inflation factor* (VIF), the collinearity between these variables is checked (Wooldridge 2012). Variables with a value of VIF above 7.90 (i.e., urban population, indicator of rule of law and corruption control, infant mortality, alcohol consumption, and police rate) are expressed as variations from their means, and enter in the model in this form so as to reduce their collinearity, as suggested by Mitra (2006). In the case of severe multicollinearity, the estimate of the coefficients would become wholly unstable and the coefficients' standard errors excessively inflated (Allen 1997).

The demographic structure of the countries under analysis is the most influential variable on homicide rates; the correlation between the two dimensions is significant at the 99.9% confidence level. As purported by developmental life-course theories, the correlation is positive and strong (i.e., β=14.587); a higher share of young males are more likely to increase the level of lethal violence within a country.

The coefficient of the lagged value of homicide rates is also significant (at 95.0% confidence level) and has the positive expected sign; current violence is positively correlated with its level in the past. The relation, in this case, is of the form log-log; consequently, the coefficient represents the percentage change of the dependent variable associated with a change of 1% in the independent one (Greene 2011). Therefore, an increase in the homicide rate of 1.00% per 100,000 is expected to cause an increase of 0.16% in the homicide rate in the following year. As expected, the indicator of political violence also correlates with homicide rates; the level of significance is 99.9%. The indicator of political violence also has a correlation (significance at 99.9% level) with past level of homicides of 0.2736; however, the performed VIF analysis does not provide evidence that the joint use of these two variables is anyhow problematic.

Different hypotheses on the relationship between the rule of law, control of corruption and violence have been proposed in the literature. The findings of previous studies highlight the crucial role of the rule of law and reduction in corruption in the development of more effective criminal justice systems (Karstedt and LaFree 2006). In turn, a better criminal justice system discourages the recourse to lethal violence (Gaviria 2000). On the contrary, Snyder and Durán Martínez (2009) hypothesize that a higher level of corruption might actually reduce violence, due to the accommodating behaviour of law enforcement officers to criminals. The results of this study do not provide support to any of these alternative theories; the integrity and rule of law index does not significantly correlate with lethal violence in model 1, or in almost any of the performed models. The lack of correlation might be due, in part, to the presence of corrupted officials who change the target of their operations, but do not necessarily reduce the overall intensity of their interventions (Freeman 2006). Alternatively, it may be the case that corruption practices actually offer criminals a more peaceful instrument through which to conduct their business, with the increase in homicides stemming from a need to overcompensate for this greater sense of impunity.

Table A. 2 in the Annex presents model (1) together with three other specifications of it. These ancillary models show the variations in the results when using different variables to express the quality of public institutions. Model (1) combines CPI and rule of law in a synthetic indicator. Model (1.i) relies exclusively on the indicator of rule of law developed by Kaufmann, Kraay, and Mastruzzi (2010), model (1.ii) on the CPI, model (1.iii) uses both CPI and the indicator of rule of law.

Results indicate that CPI, the indicator of rule of law, and the indicator representing the interaction of the phenomena are not significant explanatory variables for homicide rates when considered in isolation. The rule of law indicator gains explanatory power when used together with the control of corruption indicator. The effects on violence of the two indicators when used separately (i.e., control of corruption and rule of law) is also not significant. The expected impact of fluctuations in the level

of gross added value in the cocaine market reduces with respect to model (1), both when only one of control of corruption or rule of law is included in the regression, and when they are included together as separate regressors. The interaction of most other variables with the level of homicides changes slightly. In any case, fluctuation in the level of gross value added remains positive and significant. The importance of including both the dimensions of social institutions in the analysis, together with their high correlation (0.9336, significant at 99.9% confidence level), led to the decision to use their interaction as unique indicators in the econometric analysis. A heterogeneous distribution of countries with respect to corruption and rule of law (e.g., countries with high levels of corruption and low levels of rule of law and vice versa) may blur the analysis when one of the factors is not taken into account.

The relationship between the adopted measure of economic deprivation (i.e., infant mortality) and violence is strongly significant. Further, in accordance with previous studies, the size of alcohol consumption also positively correlates with the overall level of lethal violence registered in a country. The statistical analysis indicates that the share of urban population and the police rate are not statistically correlated with the level of lethal violence.

While social disorganization theories consider the migration of people from rural contexts to urban settlements to be an explanation for growing levels of crime and violence, not all empirical studies confirm the validity of this explanation. The results of the studies by McDonald (1976) and Krahn, Hartnagel, and Gartrell (1986) confirm the validity of urbanization theory, whereas other authors did not find any correlation between the two phenomena (Messner 1982a; Cole and Gramajo 2009; Fajnzylber, Lederman, and Loayza 2002a). Finally, Ortega and his colleagues (1992) posited that an increase in the urban population has a negative effect on homicide rates. These contrasting results have led to authors classifying the relationship between urban population, poverty, and the incidence of homicide, as relatively unclear (Briceño-León, Villaveces, and Concha-Eastman 2008).

Models collected in set II replicate regressions (1) to (5) substituting the best estimate of all variables on the cocaine market with a midrange of low and high estimates emerging out of the flow/network calculi. Using the average low and high estimates serves to test the general validity of the findings of model (1) to (5) by partially addressing potential shortcomings in the estimatation of profits (see Table 6). Model (6), in particular, replicates the first regression. The use of the midrange estimates confirms the sign, the significance, and the order of magnitude of all coefficients. The levels of significance of single independent variables are also similar or identical in the two models. Nonetheless, the results of the F tests suggest that the model considering midrange estimates provides a better fit than model (1) which is based on best estimates. Moreover, the impact of the fluctuations in the value of the gross value added related to cocaine trafficking is higher when considering the average of low and high estimates as opposed to the best estimate. Model (6), indeed, suggests a

coefficient correlation of 0.5408 between fluctuations in the gross value added and homicide rates, which is higher than 0.3266 obtained from using the best estimate, even when taking into consideration the differences in the average size of the two fluctuations.

Table 6. Set II. Effect of cocaine trafficking and structural characteristics of a country, including GDP growth, infant mortality, and region on homicide rates, years 1999-2013 unbalanced panel of 63 countries (models 5 to 7) and 65 countries (model 8).

	(6) Fluctuation	(7) Contraction	(8) Fluctuation & Contraction	(8) Value of the GVA	(10) GDP per Capita
			ln Homicide Rate		
FGAV |%|	0.5408**		0.2721+	0.1439+	0.1637*
	(0.1647)		(0.1427)	(0.0851)	(0.0623)
Decreasing GAV		0.1952**	0.0863+	0.2180	0.1609+
		(0.0664)	(0.0438)	(0.1354)	(0.0833)
Cocaine consumption	0.0000	0.0000	0.0000		
	(0.0000)	(0.0000)	(0.0000)		
GAV, PPP				0.0000*	0.0000***
				(0.0000)	(0.0000)
Infant mortality rate	0.0712***	0.0694***	0.0806***	0.0609**	
	(0.0192)	(0.0192)	(0.0130)	(0.0207)	
GDP per capita		0.0041		0.0044	-0.0000*
		(0.0040)		(0.0050)	(0.0000)
Probity & Rule of Law	0.0014		0.0176		
	(0.0160)		(0.0109)		
Urban population (%)	0.0025	0.0072	0.0049	0.0063	0.0009
	(0.0054)	(0.0131)	(0.0043)	(0.0118)	(0.0053)
Police rate	0.0006	-0.0007	-0.0002	-0.0004	-0.0006
	(0.0007)	(0.0006)	(0.0008)	(0.0008)	(0.0010)
ln hom. rate t-1	0.1713+	0.1687**	0.1742*	0.1914*	0.4058***
	(0.0898)	(0.0619)	(0.0867)	(0.0932)	(0.0759)
15-34 male (%)	11.9144**	16.6185***	16.8569***	15.9882***	14.5334***
	(4.0847)	(3.2763)	(3.4342)	(3.6987)	(2.4739)
Seizure rate	0.4263**	0.7640*	0.3138*	0.5891	0.6386**
	(0.1453)	(0.3268)	(0.1521)	(0.3852)	(0.1922)
Traff. share of GAV	0.9659**	0.5443*	0.4493		1.0013***
	(0.3381)	(0.2174)	(0.3117)		(0.2378)
Alcohol consumption	0.0695*	0.0579*	0.0515*	0.0772*	0.0516***
	(0.0296)	(0.0269)	(0.0233)	(0.0315)	(0.0148)
Political violence	0.5259***	0.2424+	0.3297***	0.4372***	0.1870***
	(0.1299)	(0.1350)	(0.0822)	(0.0512)	(0.0523)
Year controls	Yes	Yes	Yes	Yes	Yes
N	601	616	601	601	603
N. of countries	63	63	63	63	62
N. of instruments	57	56	61	60	57
F	163.25	269.65	188.69	195.25	440.75
F test	0.0000	0.0000	0.0000	0.0000	0.0000
AR(2) test	0.6638	0.2155	0.0915	0.2969	0.1946
Hansen J test	0.8354	0.3081	0.4429	0.6276	0.2909

Note: the table reports the results of system GMM by Blundell and Bond (1998) regressions of economic indicators of the cocaine market and structural variables on homicides in a series of countries during the period 1999-2013. The dependent variable is the log of the homicide rate in each year; the main explanatory variable is the midrange estimate of the fluctuation of the gross value added related to cocaine trafficking in each country (FGAV |%|). Models (6) to (10) replicates models (1) to (5) substituting best estimates with midrange ones, so as to partially take into account uncertainties in the underlying estimates. Year dummies are included in all regressions. The results of the F test, AR(2) test, and the Hansen J test are presented in the bottom part of the table, after the number of observations, countries, and instruments. The F test gives the p value for the joint significance of the included variables. The null hypothesis of the AR(2) test is that there is no autocorrelation of

second order (Arellano and Bond 1991). The null hypothesis of the Hansen J test is that the instruments are uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation (Hansen 1982). Standard errors are in parentheses; +, **, **, and *** indicate coefficients significantly different from zero at the 90.0%, 95.0%, 99.0%, and 99.9% confidence level, respectively.

Model (2) and model (7) focus on the contraction of illicit gross value added. The models present the same set of variables of the models previously illustrated, but the fluctuation of gross value added is substituted with the dummy indicating a decrease in the gross value added. The econometric results indicate a positive and significant correlation between the variables of interest and homicide rates, both when using the best estimates and midrange values. A generalised increase in the level of violence might induce cocaine users to diminish their consumption so as to not get involved in transactions they perceive to be dangerous. Alternatively, an increase in the level of violence might induce people involved in cocaine trafficking and dealing to diminish their involvement in the market, or to sell their cocaine more rapidly and, in turn, collect lower revenues. The underlying rationale of this study, by comparison, is that a reduction in the gross value added might lead to a change in the level of competition within cocaine markets, whereby actors involved in the illicit markets may react to the contraction of the value of the market by using violence to increase their market share.

In model (2) and model (7) all the correlations that were significant in model (1) and (6) remain significant (see Table 5). In the same way, predictors that were not significantly correlated with homicide rates in the first version of the models do not subsequently emerge as relevant determinants of homicide rates. In both these specifications, the size of the correlation between seizure rates and homicide rates diminishes when focusing on the contraction of the gross value added, rather than on its fluctuations. This result suggests that part of the correlation between contractions of the gross value added and homicide rates reverberates on seizure rates, when the dummy variable is not included in the model. An increase in the interception rate, indeed, might translate into a drop in the value added for traffickers. Nonetheless, the statistical correlation between seizure rates and the contraction indicator is particularly low both for best estimates (0.0679, p-value 0.0015) and midrange estimates (0.0675, p-value 0.0016). The VIF analysis also does not identify problematic issues in their joint use.

The other coefficients that change the most from the previous specification of the model are the ones on the demographic structure of the population that becomes larger and the one measuring the influence of political violence that diminish, especially in model (7). Literature and data are concordant in indicating that drug seizures occurring at the high trafficking levels account for the bulk of the total (Rossi and Ricci 2009; Castillo, Mejía, and Restrepo 2014; UNODC 2015d). This fact may explain why, considering specifically the variation in the profits of high-level markets, the incidence of seizures on the level of violence reduces: a greater part of the explanatory power of seizures translates to the fluctuation in profits.

Model (3) and (8) simultaneously consider estimates of the fluctuation of the gross value added and the dummy, which paint a picture of a market in which the gross value added is strongly decreasing. In the model based on best estimates, the inclusion of both the measure of fluctuation and the indicator of contraction of the value added appeared to release the other measures of the cocaine market from relevant confounding factors. Indeed, the correlation between the shares of gross value added at trafficking level and homicide rates shifted from being not statistically significant to being statistically significant. In the same way, the size of cocaine consumption begins to be significantly correlated with homicide rates, even if the magnitude of the relationship is close to zero. In parallel with this increase in the level of significance of these variables concerning the cocaine market, the magnitude of most of the coefficients of structural determinants of violence decreases. This is precisely the case with infant mortality, youth male population, alcohol consumption, and political violence.

In model (8), on the contrary, the inclusion of both FGAV|%| and Decreasing GAV induces a loss of significance in the relationship between the relevance of the international trafficking level in the production of the overall gross value added and homicide rates. In this model, the levels of significance of FGAV|%| and Decreasing GAV are lower than in the previous models where the variables were considered separately. Moreover, the size of the coefficients is notably lower than in the previous two models. Only minimal changes from previous versions of the model characterise the other correlations.

The fluctuation of the gross value added is constructed in terms of absolute values; the correlation between gross value added and violence relies on both expansions and contractions in the gross value added of cocaine markets. However, in the case of expansion it should be considered as a joint effect of the fluctuation of the gross value added and the estimate of the gross value added of the cocaine market itself (GAV, PPP). Indeed, the estimate of the gross value added might also correlate significantly with the homicide rate in a given country, thus inflating the actual relevance of the fluctuations.

Several possible explanations can be put forward to explain this positively significant correlation between the value of cocaine markets and homicide rates. A larger market that operates outside the law is defined by a higher number of illicit transactions, and, consequently, a higher level of violence. Moreover, according to economic theories of crime, the increase in the value of drug markets might cause a shift in the cost-opportunity ratio of delinquency discussed previously, thus serving as a catalyst for the increased use of violence. A further channel yet still through which an increase in the value of the drug industry might affect crime, refers to the manifold cultural transformations that this illicit business may engender within a particular society. To control for this potential confounding

factor, in model (4) the size of cocaine consumption is replaced by the best estimate of the gross value added; the same in model (9).

The effect on violence of fluctuations in gross value added diminishes when not controlling for the size of gross value added instead of the size of cocaine consumption. However, despite the expected relevance of the magnitude of the gross value added for shaping the level of violence in a country, all significant correlations in previous models remain significant in model (4) and all variables not correlated with homicide rates in previous models remain not statistically correlated. The fact that the best estimate of the gross value added is strongly correlated with the volume of cocaine consumption (0.757 at 99.9% of significance) might go some way to providing an explanation for the stability of the model, when the size of the gross value added is introduced in the model.

The use of the gross value added instead of the size of the markets has a stronger effect in the model with respect to midranges. While the size of consumption is not significant in the previous models of the II set, the estimate of the gross value added is significantly correlated with homicide rates. As for the models of the I set, however, the coefficient is almost zero. Using the gross value added has a minimum impact on the correlations between the structural determinants of violence and homicide rates. The indicator of the contraction of the value of the gross value added is not significantly correlated with violence, after the size of the gross value added is taken into consideration. The two variables are not statistically correlated; therefore, the results indicate that once one controls for the actual size of the gross value added, strong decreases in its value, in actual fact, have no influence on the level of violence.

Economic development or other indicators of productive capacity are considered relevant determinants of violence, and most cross-national studies of violence include some measure of the productive capacity of countries. In the last two models of the I set and in all of the II sets, the measure of economic deprivation (infant mortality rate) is substituted with the per capita GDP at purchasing power parity, in order to control for a broader indicator of wealth. To reduce the potential biases due to excessive collinearity between different predictors, the probity and rule of law indicators are also removed from this specific formulation of the regression.

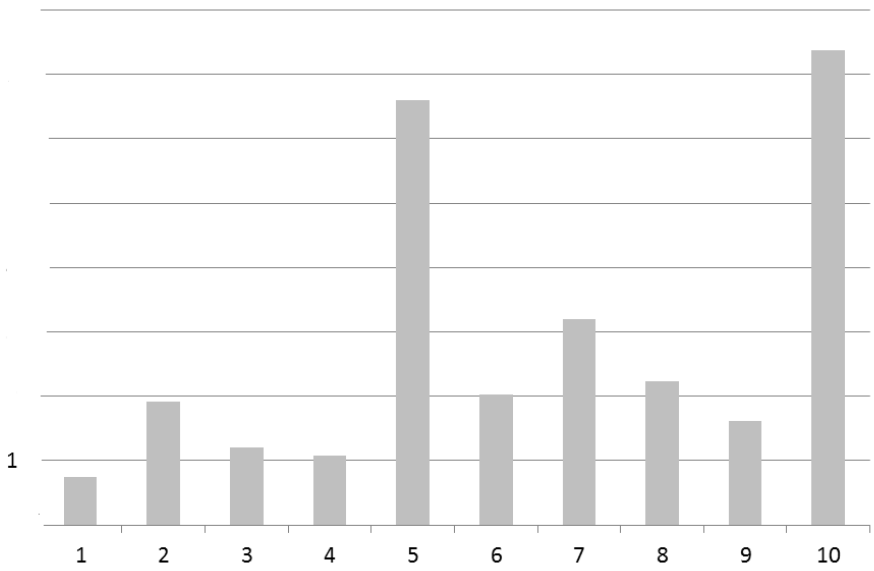
The introduced variables and homicide rates are significantly correlated. Whilst higher GDP should imply a more stable political, economic, and social structure, a stronger rule of law, and a concomitant decrease in violence rates as a result, the magnitude of the coefficient representing the potential effect of an increase in the GDP per capita on homicide rates is particularly low (i.e., β=0.000) in both models, in which (5) is based on the best estimate and 10 is based on the midrange estimate. Countries with high GDP per capita tend to enjoy the presence of other factors that decrease homicides, such as a low level of political violence or lower levels of past homicides. These concurrent determinants of

violence might reduce the explanatory power of GDP, thus making it difficult to ascertain whether GDP per capita alone is a strong predictor of homicide rates. Another possible explanation for the small size of the identified coefficients is that GDP does not specifically depict the wealth or the income of the less affluent part of the population. Therefore, it is not fully adequate for measuring the burden of poverty in a country, which is, in actual fact, the main determinant of violence.

The inclusion of the GDP per capita in the regression based on the best estimates has no effect on the level of significance of certain structural regressors, such as the share of youth males in the population, the lagged values of homicides, and the political violence indicator. The size of alcohol consumption, the seizure rate, and the share of the gross value added at the trafficking level, in fact, cease to be significantly correlated with the level of violence. This result is particularly surprising, because countries with a prominent role in cocaine trafficking tend to occupy a peripheral role within licit trade. Therefore, when GDP is not included in the model, it might upwardly bias the estimate of the relationship between the trafficking role of a country and the level of violence.

Returning back to the focus of this study, fluctuations in the gross value added and the indicator of decreasing gross value added remain significantly and positively correlated with the level of violence, both in model (5) and in model (10). The coefficients for the model relying on the best estimate are lower than in any previous model specification. In model (10), their size is more in line with the other four estimates.

Figure 18. The relevance of the fluctuations in the gross value added as determinants of violence



Note: the graph reports the ratio between the F statistic of models (1) to (10) and the corresponding models, without the fluctuation of the gross value added and/or the indicator of significant contraction in the size of gross value added. F test of the overall significance is a specific form of F test that compares the specified models

against a model with no predictors. F test follows an F-distribution, and can be used to compare statistical models. In this specific case, models (2) to (10) perform better than the corresponding models without *GAV|%|* and/or *Decreasing GAV*.

Overall, the first two set of models suggest the existence of a statistically significant correlation between economic dynamics in the cocaine markets and the level of lethal violence at country level. The main explanatory variables are significantly correlated with homicide rates across all the proposed model specifications. Moreover, the size of the correlations are relevant for both the fluctuation of the gross value added and for the indicator of decreasing gross value added. The size of the gross value added is also correlated with the level of violence in a country. However, the coefficients expressing the magnitude of its relationship with homicide rates are close to zero in all of the model specifications including this variable. This finding further reinforces the idea that variations in the monetary value of cocaine markets are a powerful predictor of violence.

The AR(2) test and the Hansen J test, reported at the bottom of each column, indicate that the overidentifying restrictions implied by this GMM procedure are not rejected when adopting the most common thresholds, with the exception of model (5) and model (8) for which only the 90.0% level works. Figure A.2 in Annex II presents the distribution of the residuals of models (1) to (5) against a normal distribution.

IV Chapter: Discussion

The principal aim of this study is to assess whether economic instability within cocaine markets, measured in terms of gross value added, is a catalyst for violence. The hypothesis proposed is that both increases and contractions in the profits generated by drug trafficking are likely to cause an increase in the use of violence among criminals involved in drug trafficking. Variations in the economic opportunities provided by drug trafficking modify the competitive environment of illicit drug markets. Since criminals active in the drug industry cannot access the institutions of the legal system and lack the means available to legal enterprises to cope with these changes, the modification of the competitive environment exacerbates their recourse to violence. Both expansions and contractions of cocaine trafficking profits determine increases in the recourse to interpersonal violence: the trigger element is the variation with respect to a previous equilibrium.

In an attempt to verify this hypothesis, the study firstly provides an estimate of gross value added related to cocaine in 151 countries worldwide. Then, it uses a panel-data based system GMM methodology to estimate a dynamic model of national homicide rates among a sample of 63 countries, for which it is possible to operationalize socio-structural determinants of violence. The system GMM estimator controls for unobserved country-specific effects potentially correlated with the explanatory variables, the joint endogeneity of some of the explanatory variables, and the existence of some of the measurement errors which undermine data on homicides. Ancillary regressions are designed to test both the robustness of the core results and to investigate in greater depth specific issues concerning the structural determinants of violence.

The proposed econometric analyses indicate the existence of a relationship between variations in the gross value added generated by cocaine trafficking and homicide rates in the 63 countries under analysis. The finding presents a certain stability against variation in the specifications of the model; even when taking different estimates of the variation in the level of profits and changing the set of the other explanatory variables, fluctuations in profit remain significant determinants of homicide rates. In the same way, the correlation between the control that identifies contractions in the gross value added and homicide rates remains both statistically significant at commonly accepted levels, and positive in most econometric models.

The stability of the significance of the correlation between the main explanatory variables and the level of homicides suggests a certain robustness in the results, at least among the countries being analysed. Relying on the statistical theories which underpin the panel-data based GMM methodology, the results of the AR(2) and the Hansen J tests performed for the proposed models suggests that the direction of the causality goes from the variation in gross value added to the level of violence.

Moreover, even if it were possible to argue that long-lasting phenomena ultimately determine the series of continuous increases or contractions in the gross value added, these dynamics are quite specific. Consequently, they are relatively unlikely to determine the results of the econometric exercise. That being said, the results of the econometric analyses prudently support the first hypothesis of the study. Variations, both increases and contractions, in the gross value added generated by cocaine trafficking potentially cause an increase in the use of violence. Further analysis based on longer time-series of gross value added, and other indicators of the economic value of cocaine markets, or even natural experiments, should be conducted when new data is available that allows for a more rigorous investigation into the direction of the causality between the two phenomena.

The magnitude of the estimated correlations between the two main variables of interest (the gross value added and the indicator of large contractions in the gross value added) and homicide rates are not negligible. The result of the econometric models indicates a correlation coefficient between the variation of the gross value added and the natural logarithm of homicide rates, ranging between about 0.136 and 0.209 in the short-run. According to the econometric analyses, in the long-run the correlation is about 0.500, whilst, in the short-run, the estimate of the magnitude of the correlation between the two phenomena tends to be equally significant, but larger when considering the midrange estimate of the gross value added as opposed to the best one. In this second case, it varies between 0.164 and 0.272 according to the specificities of the model, while the long-run correlation is estimated to be approximately between 0.105 and 0.403.

The correlation between the variable indicating strong reductions in the gross value added and homicide rates is also of significant importance. It ranges from between 0.108 and 0.151 in the short-run to 0.314 and 0.330 from a long-run perspective. The coefficients of correlation are equally significant, but larger, when the average between the low and the high estimates of the gross value added is used as the independent variable as a substitute for the best estimate. In those models including estimates about the cocaine market based on midrange estimates, the short-run impact correlation between significant contractions of the gross value added and the natural logarithm of the homicide rates ranges approximately between 0.086 and 0.288. The models estimate a long-run correlation of about 0.25 in the 63 countries. The two main variables of interest are significantly correlated, but the magnitude of their correlation is not particularly high (β_{best}= 0.2970; β_{mid}= 0.2610), the performed VIF analyses do not discourage their joint use.

The proposed interpretation of the results relies on several theories that scholars have developed to explain the spread of drug systemic violence. Reasoning in terms of monetary values permits us to merge them into an integrated perspective from which to examine the nexus between drug markets and violence. The first step for the interpretation of the results involves a consideration of the motivations

behind participation in drug trafficking. It has been observed that people get involved in drug trafficking to experience a sense of excitement, to procure or maintain a dominant position in existing political structures, and, more generally, to achieve social power (Violante 1987; Arlacchi 1988; Adler 1993; Marks 1997; Dorn, Oette, and White 1998; Dorn, Levi, and King 2005). However, the literature is concordant in considering economic profits to be the most relevant driving force behind drug trafficking (Arlacchi and Lewis 1990; Desroches 2007; Kenney 2007; Chi et al. 2013). Traffickers' yearning for social recognition and political power does not invalidate the reasoning, rather it corroborates it. Indeed, economic success also acts a tremendous source of power and social recognition, or at the very least we could say the two go hand-in-hand, both within high-level drug trafficking and at a local retail level (Levitt and Venkatesh 2000; Anderson 2015).

A corollary to this fact about participation in drug trafficking being economically motivated is that people active in drug markets aim to maximize their profits and minimize their risks; to do this they must modify their behaviour accordingly in relation to external stimuli (Reuter and Kleiman 1986; Benson and Decker 2010; Che and Benson 2014). More generally, as posited by economic theories of crime (Becker 1968; Nettler 1978), drug traffickers rely on bounded rationality when making their choices in the management of their businesses.

Even in most structured drug markets, a multitude of factors may determine important variations in the value of the market, as well as the respective margins for traffickers and drug dealers. Arrests, drug seizures, increases in demand, modification of trafficking routes, spikes in the production of drugs, and shifts in consumption towards other substances are only a few of the numerous factors that may cause variations in drug traffickers profits (Kleiman 1992; Caulkins 1993; Hough and Natarajan 2000; Kerr, Small, and Wood 2005; Kleiman, Caulkins, and Hawken 2011; Castillo, Mejía, and Restrepo 2014). There are manifold potential simultaneous combinations of several of these different factors, and their overall effect is usually complex to evaluate (Kilmer and Hoorens 2010; Kilmer, Reuter, and Giommoni 2015; UNODC 2015k). These variations in the value of drug markets are likely to modify the competitive environment in which traffickers operate, regardless of the specific drivers causing the change (Miron 2001; Kleiman 2004; Robles, Calderón, and Magaloni 2013; Castillo, Mejía, and Restrepo 2014). A reduction in the overall supply of drug reaching a country for example, may cause some operators to seek for new contacts in source countries; alternatively, an increase in the demand for a drug in a new area or in different social environments may provide an opportunity to expand the business. In these new scenarios, depending on the specific evolution of the market, drug traffickers have the chance to either increase their gains or risk losing part of their income. A change in the balance between anticipated rewards and costs performed by criminals makes the recourse to violence more appealing than it was previously.

Moreover, the illegality of the business itself poses two constraints upon peacefully adapting to the new realities of the market. Firstly, due to their criminal status, drug traffickers cannot rely upon the institutions of the legal system to settle their disputes and enforce their contracts (Goldstein 1985; Caulkins and Reuter 1998; Jacques and Wright 2011; Chimeli and Soares 2011; Mejía and Restrepo 2013; Robles, Calderón, and Magaloni 2013; Castillo, Mejía, and Restrepo 2014). Secondly, businesspeople who operate in illicit markets cannot utilise important levers available to legal entrepreneurs; for example, they are unlikely to develop advertising and branding to gain increased market share and profits (Gambetta 2009; Che and Benson 2014).

Finally, during hard times for the cocaine industry, it is difficult for traffickers to liquidate their business and find alternative employment which would offer a similar income, hence making them more likely to persist in cocaine trafficking (Collins 1990; Reuter et al. 1990; Count the Costs 2013). The fact that gains are invariably not colossal for most of those who participate in the trafficking industry (Levitt and Venkatesh 2000; Decker and Chapman 2008), allied with the fact that that economic profit is the primary driving force behind drug trafficking (Arlacchi and Lewis 1990; Desroches 2007; Kenney 2007; Chi et al. 2013), provides further incentive yet still to take recourse to violence.

As a consequence of these dynamics, violence becomes a potential substitute for legal practices in response to changes in the value of drug markets (Kleiman 1989; Rasmussen, Benson, and Sollars 1993; Rasmussen and Benson 1994; Desroches 2007; Costa Storti and De Grauwe 2008; Moeller and Hesse 2013; Rios 2013). Since changes in market opportunities influence the use of violence, both expansions and contractions in drug trafficking profits are likely to exacerbate the turn to interpersonal violence (Kleiman 2004).

This interpretation is in line with a series of observations proposed by scholars with respect to market equilibria, both before and after law enforcement interventions (Rasmussen, Benson, and Sollars 1993; Rasmussen and Benson 1994; Benson, Rasmussen, and Kim 1998; Benson, Leburn, and Rasmussen 2001). These authors posit that increases in the intensity of drug law enforcement tend to modify the established hierarchies among criminals active within the same market. The disruption of these equilibria generates an increase in the use of violence and in homicides. Other scholars, whose attention was focused on the evolution of the crack-cocaine and amphetamine markets in America, also identified in the stability of the market an important factor for the reduction of systemic violence (Lattimore 1997; Brownstein, Crimmins, and Spunt 2000; Brownstein and Taylor 2007). The rationale of these authors is not centred on the value of the markets, but, rather, on its size and on the entrance and exit of new actors.

At the same time, the proposed rationale does not ignore recent findings on the relationship between the size and value of drug trafficking and violence by Angrist and Kugler (2008), Rios (2012), Mejía and Restrepo (2013), Castillo, Mejía, and Restrepo (2014). Rather, the proposed approach questions the possibility of providing interpretations about the effects of market values on violence by considering single indicators and trying to make previous results more general. In particular, the findings of Angrist and Kugler (2008), who posited that the expansion of the coca and cocaine industries led to an expansion in conflicts in Colombia, is coherent with the rationale proposed here. The same applies to the results of the study by Mejía and Restrepo (2013), who also showed that increases in coca cultivation generate increases in the level of violence. The results by Rios (2012), concerning the fact that drug dealing and violence emerge together as a consequence of a fragmented political milieu, can also be integrated within the approach adopted here. Castillo, Mejía, and Restrepo (2014) purported that shortages in cocaine supply cause an increase of violence in illicit drug markets, by increasing the value of the market. Despite some doubts regarding the possibility of assuming an increase in the value of a drug market due to a reduction in the availability of the substance, these results are not necessarily in contradiction with the notion that both reductions and contractions in the value of the market are likely to cause an increase in the level of violence. The results of this study, indeed, do partially contradict the findings of Osorio (2015), who found that the price of a gram of pure cocaine reports a significant and positive effect on violence in models, yet its effect is almost indistinguishable from zero, while the models in this study indicate a modest but relevant relationship with respect to expansions of drug markets and violence.

The estimate of the gross value added emerging from the cocaine market permits us to introduce into the regression a control for the relative size of the cocaine economy with respect to the licit economy in each country for each year. The inclusion of this variable not only isolates the effects of variations from the size of the market, but it also enables us to garner further information about the drug/violence nexus. The value of cocaine-trafficking profit as share of GDP is significantly related to homicide rates in all the specifications of the model, and, further, the relationship between these variables and violence is positive. The magnitude of its coefficient is high in the models in relation to the 63 countries and a larger set of explanatory variables, while it is lower for the panels including more countries. In the regressions including more countries, not only is the size of the correlation smaller, but the confidence in the significance of the estimate is also reduced.

The sign of this correlation is absolutely in line with what most theories examining the relationship between drug markets and violence hypothesize. A larger market that operates outside of the law comes with a higher number of illicit transactions, and, in turn, a higher level of violence. Moreover, according to economic theories of crime, the increase of the value of drug markets with respect to the

legal economy causes a shift in the cost-opportunity ratio of delinquency, thus contributing to an increase in the use of violence. A further channel through which an increase in the value of the drug industry might affect crime derives from the cultural shifts that illicit business can engender within any given society. The expansion of the drug industry is associated with specific changes in social norms and attitudes that may, in turn, reinforce violent dynamics. In particular, drug trafficking cultures develop in outlawed contexts, in which the ability to defend oneself is often seen to be crucial. Consequently, these subcultures tend to hold in high-esteem violent attitudes, honour, and retribution over perceived or actual slights. Further, an increase in the economic relevance of the drug industry can also promote drug traffickers as archetypal examples of self-made men. The same drug traffickers reproduce such beliefs by espousing how immense their gains are, even when they are not (S. Decker and Chapman 2008). This phenomenon may serve to proliferate this subculture of violence beyond the bounds of the drug industry (Dorn, Murji, and South 1992; Blumstein 1995; Cohen et al. 1998; Blumstein, Rivara, and Rosenfeld 2000; Moeller and Hesse 2013).

The flow/network model adopted to estimate profits generated in the illicit market for cocaine, also permits the production of original estimates on seizure rates. These estimates on the interception rates of cocaine are significantly correlated with homicide rates in all, except two, of the proposed regressions. The level of statistical significance of the relationship is higher in those models that consider the midrange estimates. The coefficient of the correlation ranges between 0.203, obtained in the model including the best estimate of the gross value added, to more than 0.524 in the model without the control for rapidly decreasing gross value added. One potential explanation for this dynamic is the presence in the panel of countries characterised by high-value added profits and high seizure rates, or low gross value added and low-value added in the same year. Consequently, the omission of the size of the gross value added from the analysis upwardly biases the correlation coefficient of the seizures. These possible dynamics, however, are contradicted by the results of the models based on midrange estimates, which indicate an increase in the magnitude of the correlation between seizure rates and violence, when the dimension of the gross value added is included among the regressor. Assuming a causal effect in the relationship between cocaine interceptions and homicide rates, these results indicate that homicide rates may increase between a range of 20.3% and 52.4% as a consequence of a 1 percentage point increase in seizure rates. The magnitude of the correlation is higher when using midrange estimates.

This result is in line with a growing number of studies that frame law enforcement counter-operations as a potential cause of increased violence in drug markets (Riley 1998; Miron 1999; Eck and Maguire 2000; Maher and Dixon 1999; MacCoun and Reuter 2001a; Astorga 2005; Freeman 2006; Donnelly and Shirk 2010; Shirk 2010; Guerrero 2011; Kleiman 2011; Calderón et al. 2012;

Kleiman et al. 2012; Rios 2013; Calderón et al. 2015; Osorio 2013; 2015; Dell 2015; Shirk and Wallman 2015). In particular, it provides support to previous findings that suggest that non-violent law enforcement tactics also exacerbate conflict among criminals, as well as potentially among traffickers and law enforcement agents (Miron 2001; Osorio 2015).

The adopted econometric strategy does not guarantee in isolation that the estimated correlation expresses a causal relationship between drug seizures and violence. However, it does constitute an important step forward in the analysis of this aspect of drug control policies. Indeed, as asserted by Werb and his colleagues (2011), the vast majority of studies that test empirically the effects of law enforcement on violence are strictly longitudinal, and thus fail to address the direction of the causality for such a complex phenomenon as drug market violence. The issue of reverse causality is instead relevant when it comes to analysing law enforcement actions, including drug seizures, and violence (Werb et al. 2011; Dell 2015).

A second element of key interest in this analysis regards the generalizability of the findings from the sample of countries previously considered in the analysis. Indeed, while in this study the correlation between law enforcement action and violence emerges from data concerning a vast number of countries, previously available research did not. Quantitative research had mainly focused on consumer countries, in particular the U.S. (Goldstein et al. 1989; Rasmussen, Benson, and Sollars 1993; Benson, Rasmussen, and Kim 1998; Riley 1998; Miron 1999; Levitt and Venkatesh 2000; Resignato 2000; Benson, Leburn, and Rasmussen 2001; Miron 2001; Shepard and Blackley 2005) and Australia (Maher and Dixon 1999; 2001). More recently, a new branch of research has extended the analysis to trafficking countries, especially Mexico (Calderón et al. 2012; Osorio 2013; Rios 2013; Calderón et al. 2015; Dell 2015; 2015). Law enforcement actions ordinarily do not target random targets; thus, areas or routes with higher violence attributed to drug trafficking may be perceived as more problematic, and receive more attention by law enforcement. Consequently, a positive and significant cross-sectional correlation between law enforcement actions and violence could be determined by focused interventions by law enforcement agencies to dismantle the most violent traffickers, rather than by a general increase in violence generated by law enforcement interventions.

The use of seizure rates instead of a more common estimate of seizure rates is another highlight of this analysis of law enforcement actions as a determinant of violence. On the contrary, most studies usually rely on indicators which are not able to express the effectiveness of law enforcement interventions, and therefore do not provide valid information about their impact on criminals (Miron 2001; Kleiman 2009; Willis et al. 2010; Kilmer et al. 2014). Seizures, in particular, are considered good indicators of the overall level of law enforcement because they usually correlate positively with other elements of prohibition enforcement policies, such as drug arrests and, more generally, reflect a

stricter attitude toward enforcement (Miron 2001; UNODC 2015k). However, the main negative aspect stemming from the use of seizure data is that differences between countries and across time might be due to differences in the use of drugs and, in turn, of drug flows. If the use of drug changes, then the amount of seizures can differ, even if law enforcement actions do not get any more stricter or more effective (Willis et al. 2010). Since a large level of consumption may also inflate seizure rates, the use of rates does not completely solve the issue, but certainly reduces this potential source of bias (Miron 2001).

The results of the econometric analysis indicate that countries in which gross value added is mostly generated at the high-level of trafficking show a higher level of homicide rates in some of the models, but not in all of them. Considering best estimates, trafficking countries seem to be more violent than other countries only when the actual fluctuation of the gross value added and the contraction indicator are included in the analysis.

The last regressors concerning drug markets are the consumption and the size of the gross value added. These two variables provide different indications as to the size of the market under analysis; consequently, they are fundamental controls for the assessment of the actual relationship between the variables measuring the fluctuations in the gross value added and violence. The correlation between cocaine consumption and violence is statistically significant in only one of the four models, based on the best estimates in which it is included among the regressors. In the third model, which considers, simultaneously, the absolute value of the percentage of change in the gross value added and the indicator of contraction of the gross value added, the correlation turns significant and positive; however, the coefficient of the correlation is close to zero. In none of the control models based on midrange estimates is the size of cocaine consumption correlated with homicide rates.

Therefore, the results suggest that the notion of “psychopharamcological violence” proposed by Goldstein (1985) contributes little to the understanding of homicides at country-level. Similarly, the results contradict the notion that a larger consumer market is likely to determine a higher amount of violence, because of a greater number of illicit transactions (Miron 2001). Even though use and abuse tend to be strongly correlated with homicides and other less serious forms of violence, it must be stressed that in several studies identifying a connection between cocaine consumption and psychopharmacological violence (Ellinwood 1971; Asnis, Smith, and Crim 1978; Fink and Hyatt 1978; Goldstein 1985; Fagan 1993; Boles and Miotto 2003; McKetin et al. 2014), the focus is more on the abuse of cocaine than on its use per se, and homicide is the most serious form of violence, but it is not the only one.

The value of cocaine-trafficking gross value added adjusted for the cost purchasing power parity is significantly related to homicide rates in all of the specifications of the model, and, moreover, the

relationship between this variable and violence is positive. The magnitude of the coefficient of the correlation, however, is close to zero, regardless of the specificities of the models.

Moving onto to the proxies of socio-cultural factors, it is possible to note that in all proposed models, the lagged level of homicides has a significant and positive effect on homicide rates in the following year. The magnitude of the impact is relatively substantial; the coefficient of the correlation between the logarithm of lagged homicide rates and the logarithm of homicide rates ranges from about 0.157 in the simplest models to a maximum of 0.669 in others.

This finding provides support to previous research investigating cross-national differences in violence levels, which used longitudinal data to detect the inertia of violence. Fajnzylber, Lederman, and Loayza (2002a), for example, identified a positive correlation between previous levels of homicides and current levels of homicides. Osorio (2015), who studied the dynamics of violence in Mexico, and Sanchez and Díaz (2006), who studied violence in Colombia, also found a significant intertemporal dependency of violence rates. More generally, evidence for a correlation between past incidents of violence within society and future levels of homicide rates lends empirical support to theories underpinned by the concept of violence inertia (Sah 1991; Glaeser, Sacerdote, and Scheinkman 1996), retaliation (Bourgois 1995; Topalli, Wright, and Fornango 2002; Jacques and Wright 2011), and spread of violent culture (Sellin 1938; Cohen 1955; Miller 1958). A more mechanical dynamic through which to explain the strong path dependency of violence, concerns the failure of the law enforcement and judicial systems to adapt to strong increases in the incidence of violence (Fajnzylber, Lederman, and Loayza 2002a). The erosion of judicial institutions' efficiency can lead to a reduction in the deterrence effect of sanctions, and, in turn, to an increase in violence and delinquency (Beccaria 1766; Becker 1968).

Not surprisingly, the results of the study also indicate that a high proportion of young males in a population may lead to the increased incidence of violent acts. Youth males, as a portion of the total population, are always significantly correlated to the rate of homicides in those models that consider this regressor. Demographic structure is the single most relevant explanatory variable in many formulations of the model. The results are thus in contradistinction to some of the findings of specific cross-national studies on the determinants of violence, such as that of Savolainen or Fajnzylber, Lederman, and Loayza (2002a). Some authors, such as Gartner and Parker (1990) and Pampel and Gartner (1995), assert that the effect of age structure seems to be valid in some countries, such as the US, but that it does not always hold across other countries. Certainly, the presence or absence of specific institutional arrangements and cultural factors (e.g., alcohol-consumption and firearms possession) do impact upon the relevance of the age-effect in explaining homicides across the respective countries. Indeed, from the perspective of a cross-national etiological study on homicide,

one of the most relevant conclusions reached by developmental life-course theories is that nations with a larger share of youths are more likely to have a greater number of both potential offenders and potential victims of homicide (Land, McCall, and Cohen 1990; McCall, Parker, and MacDonald 2008).

The econometric models also point towards a significant relationship between alcohol consumption and homicide rates. This finding corroborates those of previous cross-national studies (e.g. Rossow 2001; Graham et al. 2010) that considered alcohol abuse capable of increasing the level of lethal violence. Criminologists have established that acute consumption of psychoactive substances is an important precipitator of interpersonal violence (Boles and Miotto 2003). Goldstein (1985), who provided a framework for the interpretation and comprehension of drug related violence, refers to this specific dynamic as psychopharmacological violence. Forms of psychopharmacological violence designate violent crimes committed under the acute influence of a psychoactive substance, and the violent victimization of individuals whose consumption of psychoactive substances has reduced their ability to protect themselves (Goldstein 1985). Even from the perspective of cross-national studies, available data confirms the relevance of alcohol, as well as social norms that contribute to an alcohol culture, as facilitators of interpersonal violence (Briceño-León, Villaveces, and Concha-Eastman 2008; UNODC 2014b).

Conversely, the proposed regressions do not identify any significant relationship between police rate and homicide rates. In general, the presence of police is an important crime deterrent. An effective police structure increases the probability of apprehension, and, consequently, of punishment for violent actions. Therefore, according to both rational choice theory (Cornish and Clarke 1986; 1987) and the economic approach to crime (Becker 1968), an increase in the expected amount of punishment is likely to operate as a disincentive for individual's to take part in a crime. However, debates pertaining to the effectiveness of police enforcement in preventing crime and violence are longstanding, whilst research has produced discordant results depending on the specific programs considered in the analysis and the confounding factors interacting with the presence of police (Sherman et al. 1998).

As previously discussed, several limitations affect the analysis carried out in this study. First, even if one accepts the assumptions required to reconstruct the cocaine trafficking network and the size of national cocaine markets, the mobilised data, as discussed previously, presents important limitations with respect to both their numerosity and their quality. By limiting the dimension of the panel database to 63 countries, it was possible to partially mitigate these issues, but not to solve them completely.

A second strand of limitations concerns the (im)possibility of accurately comparing criminal data across countries. As discussed in a wide array of literature, homicide data enjoys a higher level of

homogeneity across countries, and, by making use of country specific fixed effects, it is possible to take into account differences in reporting systems. In spite of this, there may remain some underlying differences which means that the final correlation estimates may be partially biased. Moreover, despite the development of a strategy to reduce the problem stemming from the omission of significant variables, with country specific fixed effects, the numerosity of the potential determinants of violence suggests that they might be omitted variables that are not stable in the period under analysis.

For example, this study does not include in the econometric analyses measures representing the presence of organized crime in a country. The exclusion of the presence of organized crime groups from the list of regressors stems from the extreme difficulty in developing a unanimous definition of the phenomenon, and finding a way to measure it (Paoli 2001; Finckenauer 2005; Symeonidou-Kastanidou 2007). In conjunction with this, the omission of an indicator of organised crime allows for a longer time-series and affords the consideration of a higher number of countries. In fact, most available studies in the cross-national literature on homicides do not include any control for this aspect of the criminal environment in a country either (e.g., Krohn 1976; 1978; McDonald 1976; Krahn, Hartnagel, and Gartrell 1986; Ortega et al. 1992; Neapolitan 1994; 1998; Huang 2001; Fajnzylber, Lederman, and Loayza 2002a; Pridemore 2011). However, this choice is likely to induce some bias due to the relevance of the omitted variable. Several studies have stressed the connection between the presence of organized crime groups and the level of violence in a country (Van Dijk 2007; Calderoni 2011; Pinotti 2011; Hopkins, Tilley, and Gibson 2013; UNODC 2014b). In particular, the neglected effect of organised criminality is likely to distort the magnitude and the significance of the correlation between homicide rates and the other variables correlated with the presence of criminal groups. For example, Sung (2004) identified a relationship between the levels of organized crime and the level of development of the democratic systems within countries.

The same holds for the synthetic index measuring corruption controls and rule of law that the models identify as significantly and negatively correlated with levels of homicides. Even with respect to this variable, several scholars have stressed that corruption is a fundamental modus operandi of a large variety of criminal organizations (Fiorentini and Peltzman 1997; Buscaglia 2003; Sung 2004; Freeman 2006; Gounev and Ruggiero 2012; Ernesto U. Savona 2013). Therefore, the effect of rule of law in decreasing the level of violence may be deflated in the proposed regressions, thus explaining the lack of significance of the indicator.

Another potential explanation for the lack of significance in the correlation between the synthetic indicator representing rule of law and control of corruption, is that these variables have different effects in different countries. In one respect, a higher level of corruption may mitigate the reactivity of law enforcement agencies against drug traffickers and other criminals in general. Since many scholars

(e.g., Riley 1998; Miron 1999; Eck and Maguire 2000; MacCoun and Reuter 2001a; Freeman 2006; Kleiman 2011; Kleiman et al. 2012; Rios 2013; Calderón et al. 2015; Osorio 2015) consider law interventions to increase the level of violence in drug markets, and similar dynamics may similarly characterize other illicit markets (Groenhuijsen, Roos, and Kooijmans 2010; Kulick, Prieger, and Kleiman 2015), then, in another respect, a higher level of corruption may actually reduce the overall level of violence. Despite the plausibility of this indirect effect of corruption on the use of violence, by assuming corruption as an indicator of social disorganization the study hypothesizes that widespread corruption is likely to increase the level of both perceived and effective impunity, thus generating an increase in the level of violence. Therefore, the Corruption Perception Index is expected to have a positive and significant correlation with homicide rates.

Finally, criminals managing large drug loads are more often part of criminal enterprises as opposed to autonomous actors. Consequently, the positive correlation between the presence of organised crime groups and the level of violence is likely to reverberate on the estimates of the coefficients of the overall value of gross value added, as well as the role of the variable representing trafficking countries (Paoli 1994; Paoli and Reuter 2008; Kleiman 2011; Calderoni 2012; Beittel 2015). By contrast, no major issue appears to undermine the analysis of fluctuations in the gross value added in relation to cocaine trafficking. Indeed, this variable is constructed as annual percentage variation.

None of the econometric models presented in this study includes a measure pertaining to either the availability of firearms or of their use. The substantial lack of data, especially concerning illicit firearms, impedes estimates about the impact of the diffusion of firearms in cross-national studies on homicides. This is also the case with the vast array of cross-national studies of determinants of homicides, which do not directly address the issue of gun availability (Bennett and Lynch 1990; Shichor 1990; Bennett 1991a; 1991b; Neapolitan 1994; 1996; 1998; Savolainen 2000; Fajnzylber, Lederman, and Loayza 2002a; Pratt and Godsey 2003; Pridemore 2008; 2011).

Within the literature, there is no consensus regarding the relevance of fire arms as a determinant of homicide rates (Kleck 1997). For example, Miron (2001), who does not consider gun availability to be a relevant determinant of the differences in violence levels among countries, proposes the following simple observation. In countries such as Israel, Switzerland, and New Zealand, laws regulating the use of guns are relatively tolerant in comparison to other countries. Nonetheless, these countries register homicide rates that are comparable to other countries like England or Japan, with which they share many structural characteristics. He later confirms his intuition through an ad hoc econometric model. Yet, other sources of evidence indicate that higher rates of gun ownership are responsible for disproportional homicide rates across countries (Killias 1993), especially in high-income countries (Hemenway and Miller 2000; Hepburn and Hemenway 2004).

Other authors assert that the availability of guns, at the very least, is correlated with the number of deaths from firearm-related homicides (Siegel, Ross, and King 2013), which are certainly not an insignificant proportion of the total number of homicides (UNODC 2011b). Considering those studies which argue for a connection between firearm proliferation and violence, the absence of a proxy for the use of firearms may generate biases in the estimate of the correlation between included variables and lethal violence. The identification of those variables whose coefficients are more likely biased is not straightforward since none of them is immediately connected to the diffusion of firearms. However, the linkage between drug trafficking and gun possession is already well established (Sheley 1994; Decker, Pennell, and Caldwell 1997; Dube, Dube, and García-Ponce 2013). Therefore, not including an indicator of the availability and diffusion of firearms might cause an upwards bias of the coefficient correlation between the overall value of the cocaine market and homicide rates.

Finally, most of the relationships investigated in this study are exposed to a serious endogeneity issue that undermines the capability of the model to identify the direction of the causality in each of the analysed relationships. By constructing instrumental variables based on previous values of the variable under analysis, system GMM is expedient for solving this issue for the two variables representing the fluctuation in the value of cocaine markets. As explained in Chapter II, the adopted econometric technique mitigates the effects of these biases by controlling for unobserved country specific effects that are potentially correlated with the explanatory variables. This manoeuvre is not a panacea against all biases that arise in regressions, but it is particularly effective in removing the potential long-run determinants of both homicide rates and the main explanatory variables. This is because these variables tend not to have long stable trends, whose origin might be partially explained by past levels of violence. The issue, instead, might be more relevant for certain structural determinants of violence, such as the effectiveness of the rule of law or the GDP per capita. Nonetheless, the performed statistical test tends not to refute the validity of the assumptions underlying the proposed models.

With these limitations in the estimates of the regressors in mind, the results of the econometric analysis suggest that the economic dynamics of drug markets are correlated with the level of violence in a country, and, as such, are potentially relevant determinants of violence. The inclusion of a control for a market whose value is decreasing allows for the consideration of these findings for both expansions and contractions in the gross value added. In conjunction with this, the study confirms the existence of a significant association between levels of drug law enforcement and levels of drug market violence. Despite not being definitive, the empirical analysis nonetheless indicates a causal relationship moving from enforcement to violence.

More generally, the results confirmed the second hypothesis of the study. Socio-cultural theories of violence are fundamental to our understanding of violence after controlling for drug market dynamics. The cross-country analysis provides evidence in favour of a model of violence that emphasizes the importance of socio-cultural variables, such as the demographic structures of countries, and accounts for inertial effects.

This study never set out to discover an empirical regression model that explains global homicide rates. Instead, this study combines the study of violent dynamics in drug markets with academic theories of violence, in order to understand the determinants of drug systemic violence and critically evaluate the expedience of criminological theories of violence for examining at a global level, once drug related violence is taken into account. With respect to socio-cultural determinants of violence, while this study provides empirical evidence to support the argument that some variables are an inadequate explanation for determining the sources of variance between homicide rates globally, it does not test a wide enough set of independent variables to identify a complete regression model of homicide determinants.

In this respect, it is important to stress that all of the results should be considered as tentative rather than conclusive. Further research needs to be conducted which investigates the relationship between economic dynamics in drug markets and violence at a more micro level, so as to be able to identify different dynamics that are too often obfuscated when adopting a macro approach to the phenomenon. Moreover, the proposed estimation technique of illicit profit has to be considered as tentative. Stronger data on seizures, per user consumption, stockpiles, etc., would allow for a more rigorous refinement of the figures proposed in this study. At the same time, there is sufficient room to improve the management of missing data, and tighten the underlying rationale behind certain steps of the network/flow model, such as the lack of relationship between seizures and consumption, or the distribution of profit among traffickers from different countries. With regards to the broader issue of the determinant of lethal violence, the study proposed an ambitious approach with an extremely broad geographical extension. Further studies investigating drug markets and violence at a macro level could embolden their results by expanding the number of control variables, especially with respect to criminal environment, and the availability of firearms. Finally, improved strategies through which to better disentangle the specific roles of absolute and relative deprivation should also be developed.

Conclusions

The severity of violence varies tremendously across countries and, whilst serious forms of violence are relatively rare in most nations, violence continues to place a tremendous burden upon society in others (Falk and Falk 1990; Land, McCall, and Cohen 1990; Gartner 1993; Miron 2001; Dills, Miron, and Summers 2010). The global distribution of homicide rates shows that few countries have very high homicide rates, while most countries have relatively low homicide levels (Cole and Gramajo 2009). Even within Latin America, where violence levels are pronounced, there are nevertheless marked differences in terms of violence rates between countries (Briceño-León, Villaveces, and Concha-Eastman 2008). Indeed, important cross-national differences among neighbouring countries can be observed in every area of the world over long time spans (Gartner 1990). Research has shown that violence rates also vary across time (Falk and Falk 1990; Land, McCall, and Cohen 1990; Liska and Bellair 1995; Eisner 2001; Eisner 2003).

Classic, structural criminological theories, originally developed in the 1920s, continue to provide the theoretical frameworks for the majority of aggregate-level cross-sectional and cross-national studies of violence rates (Parker, McCall, and Land 1999; Ousey 2000; McCall and Nieuwbeerta 2007). Along with classical socio-cultural explanations, new determinants have also emerged and have been integrated within these models (Andreas and Wallman 2009). For instance, criminologists have begun to broaden their understanding of macro-level processes associated with violence by taking into consideration psychoactive substance use and trafficking (Johnson, Hamid, and Sanabria 1992; Parker and Auerhahn 1998; McCall, Parker, and MacDonald 2008).

A major contribution to the study of the relationship between drugs and violence is that of Goldstein (1985), a sociologist at the University of Illinois, who theorized a conceptual framework to explain the complex relationship between violence and drugs. In his seminal paper, Goldstein (1985) identifies three possible mechanisms in which drug and violence are related: *psychopharmacological*, *economic compulsion*, and *systemic.*

Systemic violence is the third component of Goldstein's framework; it refers to violence which emerges from interactions between people involved in the system of drug distribution and use (Goldstein 1985). The systemic violence framework represents a key innovation in the study of the drugs-violence nexus, inasmuch as it does not attribute drug related violence to the individual drug user or addiction. Rather, it investigates the role of the structure of the market for illicit goods as a catalyst for violence (Ousey and Lee 2002). Today, the systemic component is considered the most relevant of the three mechanisms through which drugs relates to violence (Harwood et al. 1984; Goldstein et al. 1989; Collins 1990; Miron 2001; Ousey and Lee 2002; Owens 2011).

Illegal drug markets are often peaceable (Reuter 2009; Snyder and Durán Martínez 2009; Calderoni 2012; Bacon 2016). Many scholars agree upon the fact that violence is a distinctive feature of illicit drug markets, but its outbursts tend to be linked to degenerate dynamics rather than being ordinary and ubiquitous (Dorn, Levi, and King 2005). Having said this, certain drug markets do exhibit extremely high levels of violence which can serve to transform them into the most violent sector of the illicit economy (Andreas and Wallman 2009; Reuter 2009; Moeller and Hesse 2013). Drug trafficking at all levels is now considered a key driver of violence, both in trafficking countries and final markets (UNODC 2011b; 2015k).

Given the applicability of the relationship between drug trafficking and violence, scholars have conducted extensive research in an attempt to identify the principal causes of violence in drug markets. The principal studies in extant literature support one or more of the following explanations for the drug/violence nexus: the lack of legal instruments with which to resolve disputes (Caulkins and Reuter 1998; Chimeli and Soares 2011; Mejía and Restrepo 2013; Robles, Calderón, and Magaloni 2013); the spread of retaliation (Bourgois 1995; Topalli, Wright, and Fornango 2002); the interaction with law enforcement (Benson, Leburn, and Rasmussen 2001; Guerrero 2011; Werb et al. 2011; Rios 2013; Prieger and Kulick 2014); and the strong competition and the unique nature of the organizational structure (Reuter 1983; Kleiman 1989; Decker, Katz, and Webb 2007; Costa Storti and De Grauwe 2008).

Despite the robustness of these theories, authors have argued that the understanding of drug systemic violence necessitates a deeper comprehension of the economic dynamics underlying drug' markets (Collins 1990; Taylor and Brownstein 2003; Kleiman 2004; Ousey and Lee 2007). From this consideration emerged a further strand of research that sought to explain the link between drug markets and violence in strictly economic terms, using indicators such as drug prices, revenues, shortage of the supply, profits, among others (e.g., Wright and Decker 1997; Miron 1999; MacCoun, Kilmer, and Reuter 2003; Reuter 2009).

Unfortunately, the illegality of the drug industry makes it incredibly difficult to estimate its overall size and value (Reuter and Greenfield 2001; Thoumi 2002; 2005; Mejía and Posada 2008; Pedroni and Verudgo Yepes 2011). Scholars have utilised data deriving from a multitude of sources, such as interviews with dealers and traffickers, journalistic reports, overdose data, satellite photos of coca fields, police statistics, declared prices, and many others to assess the economic dimension of specific parts of the illicit drug industry (Reuter and Greenfield 2001; Thoumi 2005; UNODC 2015f). Nonetheless, estimates of the profits deriving from international cocaine trafficking are rare, and, in fact, most of the commonly cited figures refer purely to total revenues at a retail level (Reuter and Greenfield 2001). Resultantly, they include neither earnings from international cocaine trade, nor any

form of cost. The lack of economic estimates of drug trafficking reverberates within the empirical analysis of the drug/violence nexus.

In accordance with the fact that the literature is concordant in considering economic incentives as the most relevant catalytic force behind drug trafficking (Arlacchi and Lewis 1990; Desroches 2007; Kenney 2007; Chi et al. 2013), this study set out to examine the relationship between drug markets and violence from an economic perspective. More specifically, the study fixes its analytical gaze on the role that fluctuations in the level of gross value added generated by cocaine markets, as it considers them to be an expedient instrument for measuring the most important patterns and shifts occurring in drug markets, which act as a determinant for the violence reeked by the drug industry.

To generate the necessary data for conducting this analysis, the study proposes a unique approach capable of generating both longitudinal and cross-sectional estimates of the gross value added related to cocaine trafficking and dealing in roughly GDP-comparable terms, as proposed by Paoli, Greenfield, and Reuter (2009). The approach which undergirds this estimate relies on both the ideas of scholars who conceptualise drug trafficking as a series of physical and monetary flows (Farrell, Mansur, and Tullis 1996; Anthony and Fries 2004; Gootenberg 2006; Paoli, Greenfield, and Reuter 2009; Walker and Unger 2009; UNODC 2011a) and on previous network models of drug trafficking (Boivin 2011; 2013; 2014a; 2014c; Chandra, Barkell, and Steffen 2011; Chandra and Barkell 2013; 2013; Chandra and Joba 2015; Chandra, Yu, and Bihani 2016).

This study conceives of international drug trafficking as a network of trading relationships between countries, and national drug distribution as a series of transactions that allow drugs to pass from international drug traffickers to final consumers. By doing so, it estimates the gross value added related to national and international cocaine trafficking for each country. In this study, gross value added denotes the revenues emerging from the international trade, national distribution, and retail sales of cocaine, minus costs incurred through either purchasing the cocaine that traffickers resell within the supply chain, or losses due to interceptions by law enforcement agencies. Of course, the resulting estimate is not without its limitations, which concern primarily the scarcity and low reliability of original data, but it is nevertheless a unique instrument through which to comprehend the relationship between the profitability of drug trafficking and the recourse to lethal violence.

The conceptualisation of international drug markets as a chain of economic exchange among countries may sound overly simplistic at first glance, but, in actual fact, drug trafficking's peculiar characteristics actually confirm precisely that. All of the major illicit drugs including cocaine, illicit opiates, amphetamine-type drugs, are commodities whose commerce is necessarily international (Caulkins 2015). Indeed, whilst the production of these illicit substances is concentrated within a few specific areas, their consumption is global (Caulkins 2015; UNODC 2016c). This is especially the case

with cocaine (Caulkins 2015). The other dimension that makes drug markets global is the ease of transportation. Cocaine is a compact good and to ship it around the world is relatively straightforward from a logistical perspective (Caulkins 2015). Therefore, if cocaine is available in one country, it is likely to soon be available in other countries (Caulkins 2015). These precise elements provide the rationale to conceptualise cocaine trafficking as a chain of transactions connecting drugs from producing countries to final consumers.

Then, homicide rates are regressed on the fluctuations in the gross value added generated by cocaine trafficking, as well as a series of other measures of drug markets and structural characteristics of countries, in order to explain the recourse to lethal violence. Results of the econometric analysis indicate that the economic dynamics of cocaine markets are statistically correlated with violence, and, as such, may provide one possible explanation for the large differences in homicide rates across countries. In particular, as hypothesised in this study, fluctuations in the gross value added generated by cocaine trafficking are significantly correlated with variations in levels of violence. Shocks in the rate of profit, both expansions and contractions, appear to increase violence; conversely, more stable markets are correlated with a lower level of violence. Alongside this, the study confirms the existence of a significant association between levels of drug law enforcement and levels of violence in a country. Despite not being definitive, the empirical analysis does point toward a causal relationship between the two, moving in the direction of enforcement to violence. Moreover, the cross-country analysis provides evidence in favour of a model of violence that emphasizes the role of certain socio-cultural variables and accounts for inertial effects. The proportion of youth males and the level of absolute deprivation are also found to be a robust determinant of homicides rates.

More generally, this study underscores the importance of economic dynamics in the interpretation of violent crime. The analyses conducted here extends the relevance of this concept far beyond both the American suburban context and the most problematic drug producing and trafficking countries upon which most previous studies concentrated. Above all, it demonstrates the connection between aspects of the cocaine market and lethal violence at a global level. At the same time, the approach adopted here manages to encapsulate different levels of the drug supply chain as opposed to relying exclusively on street dealing, which allows for more general conclusions to be drawn, even with respect to cocaine markets within just a single country.

The paradigmatic role of economic patterns in determining drug systemic violence, as identified in this study, advocates the development of new and more robust approaches to estimating illicit revenues, which, ultimately, can be utilised within large-scale criminological studies. Given that the major strength of this approach is its capacity to translate complex dynamics like competition, incentives, constraints in quantities and numbers, interpretations of illicit markets driven by economic

and monetary elements can thus extend well beyond the confines of studying the cocaine industry. Theories concerning systemic violence within other illicit markets, such as those for heroin, firearms, tobacco, among many others are capable of being translated into economic/monetary values also.

Notwithstanding the enrichment of theoretical knowledge about the relationship between cocaine markets and violence, and verifying the validity of approaches based upon the economic dimensions of phenomena, the findings of this study also have implications for the recalibration of policies aimed at reducing drug harm. The econometric models confirm that violent drug market disputes engendered by law enforcement form an important aspect of the harms associated with drug prohibition. This findings is in accordance with an ever increasing number of studies that view law enforcement counter action policies as a potential cause of additional violence in drug markets (Riley 1998; Miron 1999; Eck and Maguire 2000; Maher and Dixon 1999; MacCoun and Reuter 2001a; Astorga 2005; Freeman 2006; Donnelly and Shirk 2010; Shirk 2010; Guerrero 2011; Kleiman 2011; Calderón et al. 2012; Kleiman et al. 2012; Rios 2013; Calderón et al. 2015; Osorio 2013; 2015; Dell 2015; Shirk and Wallman 2015). At the same time, the findings of this study also suggests that reductions and expansions in the profits generated by cocaine trafficking, and the concomitant fluctuations in the value of cocaine markets, are also likely to have knock-on effects for societies regardless of any form of law enforcement intervention.

The interaction of this particular relationship between cocaine market, law enforcement actions, and violence appears to leave policy makers in a trap which is difficult to escape from. On the one hand, large and profitable drug markets constitute a grave threat to society for a number of reasons, including the extent of violence they generate. On the other hand, interventions which aim to curtail them have the pernicious effect of causing the illicit markets to become more violent yet still. In addition to the direct impact of disruptions in the drug market on violence, it is necessary to add the additional violence caused by an eventual contraction (or expansion) in illicit profits. As demonstrated by the results of this study, indeed, discontinuity in the level of profits is likely to further exacerbate the recourse to violence.

When considering this complex and problematic situation, policy interventions should thus aim to be as non-disruptive and measured as possible. The curtailment of cocaine consumption and cocaine trafficking has to be viewed as a long-term process, in order to reduce the exogenous shocks to the equilibria of illicit markets. Doing so will help to improve social welfare as a whole, rather than merely reducing drug consumption and the power of criminality at the cost of escalating levels of violence. Further, we should view drug related counter measures as also being part of the current drug market. Therefore, a less disruptive approach does not mean a reduction of interventions within each

country, but, rather, fine-tuning these interventions to think long-term and consider the associated risks of inducing shocks in the market.

A second key finding that emerges from the study is the major influence that factors, such as economic deprivation, proportion of young males within a population, and prior levels of violence have on homicide rates. The contemporaneous containment of drug consumption and a reduction in the use of violence, therefore, might be out with the jurisdiction, so to speak, of policies dealing directly with drug consumption and drug markets. Policies that, simultaneously, seek to address the socio-cultural determinants of both violence and drug markets might be more effective in reducing some of the burden caused by drug markets, while compensating for the temporal and collateral increase in violence.

For example, policies aimed at increasing social inclusion of potentially deviant subjects, such as young males in disadvantaged urban communities, might make significant inroads into undermining illicit markets in several respects. They might be effective at decreasing the attractiveness of cocaine trafficking for these people, or in terms of increasing the opportunity cost, even from a moral point of view, of participating in in illicit activities. When taken together, these initiatives may lead to a contraction in the use of violence, thus compensating for the eventual increase in drug systemic violence due to the destabilization of the drug market. The relationship between drug markets and violence is undoubtedly a complex issue, one whose solution is unlikely to be straightforward or easy to implement necessarily. However, the strong correlation between specific structural characteristics of society with violence may provide useful instruments through which to manage more effectively the problem of illicit drugs.

An approach which focuses on the economic dimension of the phenomenon and on estimates based on flow/network approaches promises to increase our understanding of many aspects of drug markets. More reliable data on drug consumption and drug flows would allow for the refining of the estimates of profits put forward in this study. At the same time, there is sufficient room to improve the management of missing data, as well as the assumptions underpinning certain steps within the network/flow model, such as the lack of relationship between seizures and consumption, or the distribution of profit among traffickers from different countries. Future research should focus on the relationship between economic dynamics in drug markets and violence at a more micro-level of analysis, in order to identify different dynamics that may be blurred by virtue of adopting a macro-approach. Regarding the broader topic of determinants of lethal violence, this study undertook an ambitious approach that encompassed an extremely broad geographical focus. Future studies examining violence at macro-levels in relation to drug markets could strengthen their results by expanding the number of control variables, especially with respect to criminal environment, and

availability of firearms. Subsequent studies, informed by the available data, should also methodically disentangle the specific roles of absolute and relative deprivation, cultural factors, as well as violence inertia.

References

Abt. 2001. “What America’s Users Spend on Illegal Drugs.” Cambridge: Abt Associates Inc.

Acemoglu, Daron, Simon Johnson, James A. Robinson, and Pierre Yared. 2005. “From Education to Democracy?” 95 (2): 44–49.

Acemoglu, Daron, James A. Robinson, and Rafael J. Santos. 2013. “The Monopoly of Violence: Evidence from Colombia.” *Journal of the European Economic Association* 11 (January): 5–44. doi:10.1111/j.1542-4774.2012.01099.x.

Adelman, Sam. 2015. “The Marikana Massacre, the Rule of Law and South Africa’s Violent Democracy.” *Hague Journal on the Rule of Law* 7 (2): 243–62. doi:10.1007/s40803-015-0017-3.

Adler, Freda, William Laufer, and Gerhard O. Mueller. 2001. *Criminology*. 4th edition. New York: McGraw-Hill.

Adler, Patricia A. 1993. *Wheeling and Dealing: An Ethnography of an Upper-Level Drug Dealing and Smuggling Community*. Columbia University Press.

Aebi, Marcelo F. 2008. “Measuring the Influence of Statistical Counting Rules on Cross-National Differences in Recorded Crime.” In *Crime and Criminal Justice Systems in Europe and North America 1995-2004*, edited by Kauko Aromaa and Markku Heiskanen, 196–214. HeuniReports 55. Helsinki: HEUNI European Institute for Crime Prevention and Control, affiliated with the United Nations. http://www.heuni.fi/Etusivu/Publications/HEUNIreports/1215524277763.

———. 2010. “Methodological Issues in the Comparison of Police-Recorded Crime Rates.” In *International Handbook of Criminology*, by S. G. Shoham, P. Knepper, and M. Kett, 211–227. Boca Raton: CRC Press.

Aebi, Marcelo F., Bruno Aubusson de Cavarlay, Gordon Barclay, Beata Gruszczynska, Stefan Harrendorf, Heiskanen Markku, and Hysi Vasilika. 2010. *European Sourcebook of Crime and Criminal Justice Statistics - 2010*. 4th ed. Den Haag: WODC.

Aebi, Marcelo F., and Antonia Linde. 2012. “Conviction Statistics as an Indicator of Crime Trends in Europe from 1990 to 2006.” *European Journal on Criminal Policy and Research* 18 (1): 103–44. doi:10.1007/s10610-011-9166-7.

Agnew, Robert. 1992. “Foundation for a General Strain Theory of Crime and Delinquency*.” *Criminology* 30 (1): 47–88. doi:10.1111/j.1745-9125.1992.tb01093.x.

———. 2001. “Building on the Foundation of General Strain Theory: Specifying the Types of Strain Most Likely to Lead to Crime and Delinquency.” *Journal of Research in Crime and Delinquency* 38 (4): 319–61. doi:10.1177/0022427801038004001.

AIHW. 2005. "2004 National Drug Strategy Household Survey Detailed Findings." 16. Canberra: Australian Institute of Health and Welfare. http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442459722.

———. 2008. "2007 National Drug Strategy Household Survey." 22. Canberra: Australian Institute of Health and Welfare. http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442459906.

———. 2011. "2010 National Drug Strategy Household Survey." Australian Institute of Health and Welfare. http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=10737421139&libID=10737421138.

———. 2014. "National Drug Strategy Household Survey Detailed Report 2013." Canberra: Australian Institute of Health and Welfare. http://www.aihw.gov.au/alcohol-and-other-drugs/ndshs-2013/.

———. 2016. "2016 National Drug Strategy Household Survey." Australian Institute of Health and Welfare. http://aihw.gov.au/2016-national-drug-strategy-household-survey/.

Aitken, Campbell, David Moore, Peter Higgs, Jenny Kelsall, and Michael Kerger. 2002. "The Impact of a Police Crackdown on a Street Drug Scene: Evidence from the Street." *International Journal of Drug Policy* 13 (3): 193–202.

Akyeampong, Emmanuel. 2005. "Diaspora and Drug Trafficking in West Africa: A Case Study of Ghana." *African Affairs* 104 (416): 429–47. doi:10.1093/afraf/adi015.

Alanko, Timo. 1984. "An Overview of Techniques and Problems in the Measurement of Alcohol Consumption." In *Research Advances in Alcohol and Drug Problems*, edited by Reginald G. Smart, Howard D. Cappell, Frederick B. Glaser, Yedy Israel, Harold Kalant, Robert E. Popham, Wolfgang Schmidt, and Edward M. Sellers, 209–26. Research Advances in Alcohol and Drug Problems 8. Springer US. http://link.springer.com/chapter/10.1007/978-1-4613-2719-6_7.

Albuja, Sebastián. 2014. "Criminal Violence and Displacement in Mexico." *Forced Migration Review*, no. 45: 28–31.

Alkholt, Aimar. 2010. "Nigerian Criminal Networks; A Comparative Analysis.," December. https://bora.uib.no/handle/1956/4655.

Allen, Michael Patrick. 1997. "The Problem of Multicollinearity." In *Understanding Regression Analysis*, by Michael Patrick Allen, 176–80. Springer US. http://link.springer.com/chapter/10.1007/978-0-585-25657-3_37.

Allport, Gordon W. 1937. *Personality: A Psychological Interpretation*. Oxford: Holt.

Almeida, Eduardo Simões de, Eduardo Amaral Haddad, and Geoffrey Hewings. 2005. "The Spatial Patterns of Crime in Minas Gerais: An Exploratory Analysis." *Economia Aplicada : EA*, Economia aplicada : EA. - São Paulo, ISSN 1413-8050, ZDB-ID

20134617. - Vol. 9.2005, 1, p. 39-55, 9 (1).

Altindag, Duha T. 2012. "Crime and Unemployment: Evidence from Europe." *International Review of Law and Economics*, The Economics of Efficiency and the Judicial SystemThe Economics of Efficiency and the Judicial System, 32 (1): 145–57. doi:10.1016/j.irle.2011.10.003.

Alvarez, Elena H. 1995. "Economic Development, Restructuring and the Illicit Drug Sector in Bolivia and Peru: Current Policies." *Journal of Interamerican Studies and World Affairs* 37 (3): 125–49. doi:10.2307/166335.

Alvazzi del Frate, Anna. 2008. "Trends and Methodological Aspects in the International Collection of Crime and Criminal Justice Statistics." In *Crime and Criminal Justice Systems in Europe and North America 1995-2004*, edited by Kauko Aromaa and Markku Heiskanen, 215–30. HeuniReports 55. Helsinki: HEUNI European Institute for Crime Prevention and Control, affiliated with the United Nations. http://www.heuni.fi/Etusivu/Publications/HEUNIreports/1215524277763.

———. 2012. "Moving Targets, Chapter 3: A Matter of Survival – Non-Lethal Firearms Violence." In *Small Arms Survey*. Cambridge: Cambridge University Press.

Anderson, Christina. 2015. "The Power of Drug Money in Mali." Christian Aid Occasional Paper. http://www.jolibatrust.org.uk/admin/resources/the-power-of-drug-money-in-mali-a4-1.pdf.

Anderson, Elijah. 1994. "The Code of the Streets." *The Atlantic*.

———. 1999. *Code of the Street: Decency, Violence, and the Moral Life of the Inner City*. W. W. Norton & Company.

Anderson, James F. 2014. *Criminological Theories: Understanding Crime in America*. Second Edition. Jones & Bartlett Publishers.

Andreas, Peter, and Joel Wallman. 2009. "Illicit Markets and Violence: What Is the Relationship?" *Crime, Law and Social Change* 52 (3): 225–29. doi:10.1007/s10611-009-9200-6.

Angrist, Joshua D., and Adriana Kugler. 2008. "Rural Windfall or a New Resource Curse? Coca, Income, and Civil Conflict in Colombia" 90 (2): 191–215.

Anslinger, Harry Jacob. 1937. "Marijuana - Assassin of Youth." *The American Magazine*.

Anthony, R., and A. Fries. 2004. "Empirical Modelling of Narcotics Trafficking from Farm Gate to Street." In *Bulletin on Narcotics*. Vol. LVI. UNODC. https://www.unodc.org/pdf/bulletin/bulletin_2004_01_01_1_Art1.pdf.

Antonaccio, Olena, and Charles R. Tittle. 2007. "A Cross-National Test of Bonger's Theory of Criminality and Economic Conditions." *Criminology* 45 (4): 925–58. doi:10.1111/j.1745-9125.2007.00098.x.

Aquilino, William S. 1994. “Interview Mode Effects in Surveys of Drug and Alcohol Use: A Field Experiment.” *Public Opinion Quarterly* 58 (2): 210–40. doi:10.1086/269419.

Archer, Dane, and Rosemary Gartner. 1976. “Violent Acts and Violent Times: A Comparative Approach to Postwar Homicide Rates.” *American Sociological Review* 41 (6): 937–63. doi:10.2307/2094796.

———. 1984. *Violence and Crime in Cross-National Perspective*. Vol. ix. New Haven, CT, US: Yale University Press.

Arellano, Manuel, and Stephen Bond. 1991. “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.” *The Review of Economic Studies* 58 (2): 277–97. doi:10.2307/2297968.

Arellano, Manuel, and Olympia Bover. 1995. “Another Look at the Instrumental Variable Estimation of Error-Components Models.” *Journal of Econometrics* 68 (1): 29–51. doi:10.1016/0304-4076(94)01642-D.

Arlacchi, Pino. 1983. *La Mafia Imprenditrice: L’etica Mafiosa E Lo Spirito Delcapitalismo*. Contemporanea (Il Mulino) 2. Bologna: Il Mulino.

———. 1988. *Droga e grande criminalità in Italia e nel mondo*. Salvatore Sciascia.

Arlacchi, Pino, and Roger Lewis. 1990. *Imprenditorialità illecita e droga: il mercato dell’eroina a Verona*. Bologna: Il Mulino.

Ashcroft, John, Deborah J. Daniels, and Sarah V. Hart. 2003. “Toward a Drugs and Crime Research Agenda for the 21st Century.” Washington: U.S. Department of Justice Office of Justice Programs. https://www.ncjrs.gov/pdffiles1/nij/194616.pdf.

Asnis, Stephen F., Roger C. Smith, and D. Crim. 1978. “Amphetamine Abuse and Violence.” *Journal of Psychoactive Drugs* 10 (4): 371–77. doi:10.1080/02791072.1978.10471541.

Astorga, Luis. 2005. *El siglo de las drogas: el narcotráfico, del Porfiriato al nuevo milenio*. Mexico City: Plaza y Janés.

Astorga, Luis, and David A. Shirk. 2010. “Drug Trafficking Organizations and Counter-Drug Strategies in the U.S.-Mexican Context.” *Center for U.S.-Mexican Studies*. http://escholarship.org/uc/item/8j647429.

Avison, William R., and Pamela L. Loring. 1986. “Population Diversity and Cross-National Homicide: The Effects of Inequality and Heterogeneity.” *Criminology* 24 (4): 733–49. doi:10.1111/j.1745-9125.1986.tb01509.x.

Bachman, Jerald G., Lloyd D. Johnston, and Patrick M. O’Malley. 1990. “Explaining the Recent Decline in Cocaine Use among Young Adults: Further Evidence That Perceived Risks and Disapproval Lead to Reduced Drug Use.” *Journal of Health and Social Behavior* 31 (2): 173–84. doi:10.2307/2137171.

Bacon, Matthew. 2016. *Taking Care of Business: Police Detectives, Drug Law Enforcement and Proactive Investigation*. Oxford University Press.

Bagley, Bruce M. 1988. "Colombia and the War on Drugs." *Foreign Affairs* 67 (1): 70–92. doi:10.2307/20043675.

Bagley, Bruce M., and Jonathan D. Rosen, eds. 2015. *Drug Trafficking, Organized Crime, and Violence in the Americas Today*. Gainesville: University Press of Florida.

Bailey, William C. 1984. "Poverty, Inequality, and City Homicide Rates." *Criminology* 22 (4): 531–50. doi:10.1111/j.1745-9125.1984.tb00314.x.

Baldassarini, Antonella, and Federico Sallusti. 2014. "Estimating Illegal Drug Flows in Italy: A Statistical Approach." presented at the 8th ISSDP Conference, Rome.

Ball, John C., Lawrence Rosen, John. A. Flueck, and David N. Nurco. 1981. "The Criminality of Heroin Addicts When Addicted and When off Opiates." In *Drugs-Crime Connection*, 39–65. Beverly Bills, CA: SAGE. https://www.researchgate.net/publication/247822446_The_criminality_of_heroin_addicts_when_addicted_and_when_off_opiates.

Banta-Green, Caleb, and Jennifer Field. 2011. "City-Wide Drug Testing Using Municipal Wastewater." *Significance* 8 (2): 70–74. doi:10.1111/j.1740-9713.2011.00489.x.

Barak, Gregg. 2006. "A Critical Perspective on Violence." In *Advancing Critical Criminology: Theory and Application*. Lexington Books.

Barlow, Hugh D., and David Kauzlarich. 2010. *Explaining Crime: A Primer in Criminological Theory*. Rowman & Littlefield.

Barro, Robert J., and Xavier I. Sala-i-Martin. 2004. *Economic Growth*. Cambridge, MA: MIT Press.

Baskin-Sommers, Arielle, and Ira Sommers. 2006. "Methamphetamine Use and Violence among Young Adults." *Journal of Criminal Justice* 34 (6): 661–74. doi:10.1016/j.jcrimjus.2006.09.019.

Baumeister, Roy F., Laura Smart, and Joseph M. Boden. 1996. "Relation of Threatened Egotism to Violence and Aggression: The Dark Side of High Self-Esteem." *Psychological Review* 103 (1): 5–33. doi:10.1037/0033-295X.103.1.5.

Bean, Philip. 2001. "Violence and Substance Abuse." In *Clinical Assessment of Dangerousness: Empirical Contributions*. Cambridge: Cambridge University Press.

———. 2008. *Drugs and Crime*. Third Edition. Portland, OR: Willan Publishing.

Beare, Margaret E., and R. T. Naylor. 1999. "Major Issues Relating to Organized Crime : Within the Context of Economic Relationships." Nathanson Centre for the Study of Organized Crime and Corruption. https://DalSpace.library.dal.ca/handle/10222/10284.

Beccaria, Cesare. 1766. *Dei Delitti E Delle Pene*. Sesta. Harlem.

Becker, Gary S. 1968. "Crime and Punishment: An Economic Approach." *The Journal of Political Economy* 76 (2): 169–217.

Behrens, Doris A., and Gernot Tragler. 2001. "The Dynamic Process of Dynamic Modelling: The Cocaine Epidemic in the United States of America." *Bulletin on Narcotics* LIII (1 and 2): 65.

Behrens, Doris A., Jonathan P. Caulkins, Gernot Tragler, and Gustav Feichtinger. 2000. "Optimal Control of Drug Epidemics: Prevent and Treat—But Not at the Same Time?" *Management Science* 46 (3): 333–47. doi:10.1287/mnsc.46.3.333.12068.

———. 2002. "Why Present-Oriented Societies Undergo Cycles of Drug Epidemics." *Journal of Economic Dynamics and Control* 26 (6): 919–36. doi:10.1016/S0165-1889(01)00003-3.

Behrens, Doris A., Jonathan P. Caulkins, Gernot Tragler, Josef L. Haunschmied, and Gustav Feichtinger. 1999. "A Dynamic Model of Drug Initiation: Implications for Treatment and Drug Control." *Mathematical Biosciences* 159 (1): 1–20. doi:10.1016/S0025-5564(99)00016-4.

Beirne, Piers. 1993. *Inventing Criminology: Essays on the Rise of "Homo Criminalis."* SUNY Press.

Beittel, June S. 2015. "Mexico: Organized Crime and Drug Trafficking Organizations." CRS Report for Congres. Washington D.C.: Congressional Research Service. https://www.fas.org/sgp/crs/row/R41576.pdf.

Bejarano, Jesús Antonio, Camilo Echandía, Rodolfo Escobedo, and Enrique L. Queruz. 1997. "Colombia: Inseguridad, Violencia y Desempeño Económico en Las Áreas Rurales." Bogotá, Colombia: FONADE y Universidad Externado de Colombia. http://aprendeenlinea.udea.edu.co/revistas/index.php/lecturasdeeconomia/article/viewFile/4934/4314.

Bejarano, Jesús Antonio. 2003. "Violence, Security and Economic Growth in Colombia, 1985-1995." *Colombian Economic Journal* 1 (1): 35–57.

Belackova, Vendula, and Christian Alexander Vaccaro. 2013. "'A Friend With Weed Is a Friend Indeed' Understanding the Relationship Between Friendship Identity and Market Relations Among Marijuana Users." *Journal of Drug Issues* 43 (3): 289–313. doi:10.1177/0022042613475589.

Bello Montes, Catalina. 2008. "La Violencia En Colombia: Análisis Histórico Del Homicidio En La Segunda Mitad Del Siglo XX." *Criminalidad* 50 (1): 73–84.

Bennett, Richard R. 1991a. "Development and Crime: A Cross-National, Time-Series Analysis of Competing Models." *Sociological Quarterly* 32 (3): 343–63. doi:10.1111/j.1533-8525.1991.tb00163.x.

———. 1991b. “Routine Activities: A Cross-National Assessment of a Criminological Perspective.” *Social Forces* 70 (1): 147–63. doi:10.1093/sf/70.1.147.

Bennett, Richard R., and James P. Lynch. 1990. “Does a Difference Make a Difference? Comparing Cross-National Crime Indicators.” *Criminology* 28 (1): 153–81. doi:10.1111/j.1745-9125.1990.tb01322.x.

Bennett, Trevor, and Katy Holloway. 2005. “Disaggregating the Relationship Between Drug Misuse and Crime.” *Australian & New Zealand Journal of Criminology* 38 (1): 102–21. doi:10.1375/acri.38.1.102.

———. 2009. “The Causal Connection Between Drug Misuse and Crime.” *British Journal of Criminology* 49 (4): 513–31. doi:10.1093/bjc/azp014.

Benoit, Kenneth. 2011. “Linear Regression Models with Logarithmic Transformations.” London: Methodology Institute, London School of Economics. http://www.kenbenoit.net/courses/ME104/logmodels2.pdf.

Benson, Bruce L., Ian Sebastian Leburn, and David W. Rasmussen. 2001. “The Impact of Drug Enforcement on Crime: An Investigation of the Opportunity Cost of Police Resources.” *Journal of Drug Issues* 31 (4): 989–1006. doi:10.1177/002204260103100410.

Benson, Bruce L., David W. Rasmussen, and Iljoong Kim. 1998. “Deterrence and Public Policy: Trade-Offs in the Allocation of Police Resources.” *International Review of Law and Economics* 18 (1): 77–100.

Benson, Jana S., and Scott H. Decker. 2010. “The Organizational Structure of International Drug Smuggling.” *Journal of Criminal Justice* 38 (2): 130–38. doi:10.1016/j.jcrimjus.2010.01.001.

Berg, Mark T., and Rolf Loeber. 2011. “Examining the Neighborhood Context of Violent Offending-Victimization Relationship: A Prospective Investigation” 27 (4): 427–51.

Berlusconi, Giulia, Alberto Aziani, and Luca Giommoni. 2016. “The Determinants of Heroin Flows in Europe: A Latent Space Approach.” *Working Paper*.

Bernburg, Jón Gunnar. 2002. “Anomie, Social Change and Crime. A Theoretical Examination of Institutional-Anomie Theory.” *British Journal of Criminology* 42 (4): 729–42. doi:10.1093/bjc/42.4.729.

Bernburg, Jón Gunnar, and Thorolfur Thorlindsson. 2005. “Violent Values, Conduct Norms, And Youth Aggression: A Multilevel Study In Iceland.” *Sociological Quarterly* 46 (3): 457–78. doi:10.1111/j.1533-8525.2005.00022.x.

Berton, Margaret Wright, and Sally D. Stabb. 1996. “Exposure to Violence and Post-Traumatic Stress Disorder in Urban Adolescents.” *Adolescence* 31 (122): 489–98.

Beyrer, Chris, Myat H. Razak, Khomdon Lisam, Jie Chen, Wei Lui, and Xiao-Fang Yu. 2000.

"Overland Heroin Trafficking Routes and HIV-1 Spread in South and South-East Asia." *AIDS (London, England)* 14 (1): 75–83.

BJS. 1994. "Fact Sheet: Drug-Related Crime." Rockville, MD: U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics. http://www.bjs.gov/content/pub/pdf/DRRC.PDF.

Blau, Judith R., and Peter M. Blau. 1982. "The Cost of Inequality: Metropolitan Structure and Violent Crime." *American Sociological Review* 47 (1): 114–29. doi:10.2307/2095046.

Block, Michael K., and John M. Heineke. 1975. "A Labor Theoretic Analysis of the Criminal Choice." *The American Economic Review* 65 (3): 314–25.

Blumstein, Alfred. 1995. "Youth Violence, Guns, and the Illicit-Drug Industry." *Journal of Criminal Law and Criminology* 86 (1): 10–36.

Blumstein, Alfred, Jacqueline Cohen, Jeffrey A. Roth, and Christy A. Visher. 1986. *Criminal Careers and "Career Criminals."* Washington, D.C.: National Academies Press.

Blumstein, Alfred, Frederick P. Rivara, and Richard Rosenfeld. 2000. "The Rise and Decline of Homicide—and Why." *Annual Review of Public Health* 21 (1): 505–41. doi:10.1146/annurev.publhealth.21.1.505.

Blumstein, Alfred, and Richard Rosenfeld. 1998. "Explaining Recent Trends in U.S. Homicide Rates." *The Journal of Criminal Law and Criminology (1973-)* 88 (4): 1175–1216.

Blumstein, Alfred, and Joel Wallman. 2000. *The Crime Drop in America*. Cambridge University Press.

Blundell, Richard, and Stephen Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87 (1): 115–43. doi:10.1016/S0304-4076(98)00009-8.

Boivin, Rémi. 2011a. "Le monde à l'envers : analyse de la structure du trafic transnational de drogues illicites." Montréal: Université de Montréal. https://papyrus.bib.umontreal.ca/xmlui/handle/1866/6068.

———. 2011b. "Drug Trafficking Networks in the World Economy." In. Montréal. http://www.erdr.org/textes/boivin.pdf.

———. 2013. "Drug Trafficking Networks in the World-Economy." In *Crime and Networks*. London, New York: Routledge. http://erdr.org/textes/boivin.pdf.

———. 2014a. "Macrosocial Network Analysis: The Case of Transnational Drug Trafficking." In *Networks and Network Analysis for Defence and Security*, edited by Anthony J. Masys, 49–61. Lecture Notes in Social Networks. Springer International Publishing.

———. 2014b. “Risks, Prices, and Positions: A Social Network Analysis of Illegal Drug Trafficking in the World-Economy.” *International Journal of Drug Policy* 25 (2): 235–43.

Boles, Sharon M., and Karen Miotto. 2003. “Substance Abuse and Violence: A Review of the Literature.” *Aggression and Violent Behavior* 8 (2): 155–74. doi:10.1016/S1359-1789(01)00057-X.

Bonanno, George A. 2004. “Loss, Trauma, and Human Resilience: Have We Underestimated the Human Capacity to Thrive after Extremely Aversive Events?” *The American Psychologist* 59 (1): 20–28. doi:10.1037/0003-066X.59.1.20.

Bond, Stephen R. 2002. “Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice.” *Portuguese Economic Journal* 1 (2): 141–62. doi:10.1007/s10258-002-0009-9.

Bonger, Willem Adriaan. 1916. *Criminality and Economic Conditions*. Little, Brown,.

Bouchard, Martin. 2007. “A Capture–Recapture Model to Estimate the Size of Criminal Populations and the Risks of Detection in a Marijuana Cultivation Industry.” *Journal of Quantitative Criminology* 23 (3): 221–41. doi:10.1007/s10940-007-9027-1.

———. 2008. “Towards a Realistic Method to Estimate Cannabis Production in Industrialized Countries.” *Contemporary Drug Problems* 35 (2–3): 291–320. doi:10.1177/009145090803500206.

Bouchard, Martin, and Chris Wilkins. 2010. *Illegal Markets and the Economics of Organized Crime*. New York: Routledge.

Bourgois, Philippe. 1995. *In Search of Respect: Selling Crack in El Barrio*. Cambridge, UK: Cambridge University Press.

Box, George E. P., and David R. Cox. 1964. “An Analysis of Transformations.” *Journal of the Royal Statistical Society. Series B (Methodological)* 26 (2): 211–52.

Braithwaite, John. 1979. *Inequality, Crime, and Public Policy*. Routledge and K. Paul.

Braithwaite, John, and Valerie Braithwaite. 1980. “The Effect of Income Inequality and Social Democracy on Homicide: A Cross-National Comparison.” *The British Journal of Criminology* 20 (1): 45–53.

Bramley-Hanker, Edward. 2001. “Sizing the UK Market for Illicit Drugs.” London: Home Office.

Breault, Kevin D., and Augustine J. Kposowa. 1997. “The Effects of Marital Status on Adult Female Homicides in the United States.” *Journal of Quantitative Criminology* 13 (2): 217–30.

Brewin, Chris R, Bernice Andrews, and John D. Valentine. 2000. “Meta-Analysis of Risk

Factors for Posttraumatic Stress Disorder in Trauma-Exposed Adults." *Journal of Consulting and Clinical Psychology* 68 (5): 748–66.

Brezina, Timothy, Robert Agnew, Francis T. Cullen, and John Paul Wright. 2004. "The Code of the Street A Quantitative Assessment of Elijah Anderson's Subculture of Violence Thesis and Its Contribution to Youth Violence Research." *Youth Violence and Juvenile Justice* 2 (4): 303–28. doi:10.1177/1541204004267780.

Briceño-León, Roberto, Andrés Villaveces, and Alberto Concha-Eastman. 2008. "Understanding the Uneven Distribution of the Incidence of Homicide in Latin America." *International Journal of Epidemiology* 37 (4): 751–57. doi:10.1093/ije/dyn153.

Bright, David A., Caitlin E. Hughes, and Jenny Chalmers. 2011. "Illuminating Dark Networks: A Social Network Analysis of an Australian Drug Trafficking Syndicate." *Crime, Law and Social Change* 57 (2): 151–76. doi:10.1007/s10611-011-9336-z.

Brookman, Fiona. 2005. *Understanding Homicide*. 1 edition. Thousand Oaks, CA: SAGE Publications Ltd.

Brophy, Stephanie. 2008. "Mexico: Cartels, Corruption and Cocaine: A Profile of the Gulf Cartel." *Global Crime* 9 (3): 248–61. doi:10.1080/17440570802254353.

Brown, Ryan P., Lindsey L. Osterman, and Collin D. Barnes. 2009. "School Violence and the Culture of Honor." *Psychological Science* 20 (11): 1400–1405. doi:10.1111/j.1467-9280.2009.02456.x.

Brownstein, Henry H. 1996. *The Rise And Fall of a Violent Crime Wave: Crack Cocaine And the Construction of a Social Crime Problem*. Guilderland, N.Y: Criminal Justice Pr.

Brownstein, Henry H., Hari R. Shiledar Baxi, Paul J. Goldstein, and Patrick J. Ryan. 1992. "The Relationship of Drugs, Drug Trafficking, and Drug Traffickers to Homicide." *Journal of Crime and Justice* 15 (1): 25–44. doi:10.1080/0735648X.1992.9721451.

Brownstein, Henry H., Susan M. Crimmins, and Barry J. Spunt. 2000. "A Conceptual Framework for Operationalizing the Relationship between Violence and Drug Market Stability." *Contemporary Drug Problems* 27 (4): 867–90. doi:10.1177/009145090002700407.

Brownstein, Henry H., and Bruce G. Taylor. 2007. "Measuring the Stability of Illicit Drug Markets: Why Does It Matter?" *Drug and Alcohol Dependence*, Behavioral and Economic Perspectives in Drug Abuse Research, 90, Supplement 1: S52–60. doi:10.1016/j.drugalcdep.2006.11.010.

Bruce, Marino A., Vincent J. Roscigno, and Patricia L. McCall. 1998. "Structure, Context, and Agency in the Reproduction of Black-on-Black Violence." *Theoretical Criminology* 2 (1): 29–55. doi:10.1177/1362480698002001002.

Brunelli, Michele. 2008. "The Italian Connection: Calabrian Mafia's Power Base Has

Expanded," 38–43.

Brunt, Tibor M., Sander Rigter, Jani Hoek, Neeltje Vogels, Peter Van Dijk, and Raymond J. M. Niesink. 2009. "An Analysis of Cocaine Powder in the Netherlands: Content and Health Hazards due to Adulterants." *Addiction* 104 (5): 798–805. doi:10.1111/j.1360-0443.2009.02532.x.

Burke, Roger Hopkins. 2009. *An Introduction to Criminological Theory*. 3 edition. Portland, Or: Willan.

Bursik, Robert J. 1988. "Social Disorganization and Theories of Crime and Delinquency: Problems and Prospects." *Criminology* 26 (4): 519–52. doi:10.1111/j.1745-9125.1988.tb00854.x.

Bursik, Robert J., and Harold Grasmick. 1993. "Economic Deprivation and Neighborhood Crime Rates, 1960-1980." *Law and Society Review* 27: 263–84.

Buscaglia, Edgardo. 2003. "Controlling Organized Crime and Corruption in the Public Sector." *Forum on Crime and Society* 3. https://works.bepress.com/edgardo_buscaglia/8/.

Bushman, Brad J. 1997. "Effects of Alcohol on Human Aggression: Validity of Proposed Explanations." In *Recent Developments in Alcoholism, Vol. 13: Alcohol and Violence: Epidemiology, Neurobiology, Psychology, Family Issues*, 227–43. Recent Developments in Alcoholism, Vol. 13. New York, NY, US: Plenum Press.

Bushway, Shawn D., and Robert J. Apel. 2010. "Instrumental Variables in Criminology and Criminal Justice." In *Handbook of Quantitative Criminology*, edited by Alex R. Piquero and David Weisburd, 595–612. Springer New York. http://link.springer.com/chapter/10.1007/978-0-387-77650-7_29.

Buss, David M., and Todd K. Shackelford. 1997. "Biophysical Conceptualizations of Human aggressionHuman Aggression in Evolutionary Psychological Perspective." *Clinical Psychology Review* 17 (6): 605–19. doi:10.1016/S0272-7358(97)00037-8.

Butler, Christopher K., Tali Gluch, and Neil J. Mitchell. 2007. "Security Forces and Sexual Violence: A Cross-National Analysis of a Principal—Agent Argument." *Journal of Peace Research* 44 (6): 669–87. doi:10.1177/0022343307082058.

Buvinic, Mayra, and Andrew Morrison. 1999. "Violence as an Obstacle to Development." 4. Technical Note. Inter-American Development Bank. http://publications.iadb.org/handle/11319/5273.

Byrd, William, and Christopher Ward. 2004. "Drugs and Development in Afghanistan." 18. Social Development Papers. Washington D.C.: The World Bank. http://siteresources.worldbank.org/INTCPR/214578-1111996036679/20482462/WP18_Web.pdf.

Calderón, Gabriela, Alberto Díaz-Cayeros, Beatriz Magaloni, Gustavo Robles, and Jorge

Olarte. 2012. “The Temporal and Spatial Dynamics of Violence in Mexico.” https://www.dropbox.com/s/ce0lhfs9unsuqa3/paper_policies_violence_Aug30.pdf.

Calderón, Gabriela, Gustavo Robles, Alberto Díaz-Cayeros, and Beatriz Magaloni. 2015. “The Beheading of Criminal Organizations and the Dynamics of Violence in Mexico.” *Journal of Conflict Resolution*, June, 22002715587053. doi:10.1177/0022002715587053.

Calderoni, Francesco. 2011. “The Mafia Index. A Measure of the Presence of the Mafia across Italian Provinces.” In *Research Conferences on Organised Crime at the Bundeskriminalamt in Germany 2008 - 2010*, edited by Ursula Töttel and Heinz Büchler, 141–62. Köln: Luchterhand. http://www.bka.de/nn_227948/SharedDocs/Downloads/EN/Publications/Other/ResearchConferencesOnOrganisedCrime2008-2010,templateId=raw,property=publicationFile.pdf/ResearchConferencesOnOrganisedCrime2008-2010.pdf.

———. 2012. “The Structure of Drug Trafficking Mafias: The ‘Ndrangheta and Cocaine.” *Crime, Law and Social Change* 58 (3): 321–49. doi:10.1007/s10611-012-9387-9.

———. 2014. “Mythical Numbers and the Proceeds of Organised Crime: Estimating Mafia Proceeds in Italy.” *Global Crime* 15 (1–2): 138–63. doi:10.1080/17440572.2014.882778.

Calderoni, Francesco, Giulia Berlusconi, Lorella Garofalo, Luca Giommoni, and Federica Sarno. 2015. “The Italian Mafias in the World: A Systematic Assessment of the Mobility of Criminal Groups.” *European Journal of Criminology*, December, 1477370815623570. doi:10.1177/1477370815623570.

Cao, Liquin, Anthony Adams, and Vickie J. Jensen. 1997. “Test of the Black Subculture of Violence Thesis: A Research Note, A.” *Criminology* 35: 367.

Cárdenas, Mauricio. 2007. “Economic Growth In Colombia: A Reversal Of ‘Fortune’?” *Ensayos Sobre Política Económica* 36. http://www.fedesarrollo.org.co/wp-content/uploads/2011/08/WP-No.-36-Economic-growth-in-Colombia.pdf.

Carpenter, Ami C. 2010. “Beyond Drug Wars: Transforming Factional Conflict in Mexico.” *Conflict Resolution Quarterly* 27 (4): 401–421.

Carrabine, Eamonn, Pamela Cox, Maggy Lee, Nigel South, Ken Plummer, and Jackie Turton. 2009. *Criminology: A Sociological Introduction*. Routledge.

Carrington, Peter J. 2011. “Crime and Social Network Analysis.” In *Sage Handbook of Social Network Analysis*, edited by John Scott and Peter J. Carrington, 236–55. London: SAGE Publications.

Carter, David L. 1990. “Drug-Related Corruption of Police Officers: A Contemporary Typology.” *Journal of Criminal Justice* 18 (2): 85–98. doi:10.1016/0047-2352(90)90028-A.

Cartier, Jerome, David Farabee, and Michael L. Prendergast. 2006. "Methamphetamine Use, Self-Reported Violent Crime, and Recidivism among Offenders in California Who Abuse Substances." *Journal of Interpersonal Violence* 21 (4): 435–45. doi:10.1177/0886260505285724.

Casale, J. F., and R. F. Klein. 1993. "Illicit Production of Cocaine." *Forensic Science Review* 5 (2): 95–107.

Castiglioni, Sara, Andrea Borsotti, Francesco Riva, and Ettore Zuccato. 2014. "Illicit Drug Consumption Estimated by Wastewater Analysis in Different Districts of Milan: A Case Study." *Drug and Alcohol Review*. doi:10.1111/dar.12233.

Castiglioni, Sara, Ettore Zuccato, Elisabetta Crisci, Chiara Chiabrando, Roberto Fanelli, and Renzo Bagnati. 2006. "Identification and Measurement of Illicit Drugs and Their Metabolites in Urban Wastewater by Liquid Chromatography-Tandem Mass Spectrometry." *Analytical Chemistry* 78 (24): 8421–29.

Castillo, Juan Camilo, Daniel Mejía, and Pascual Restrepo. 2014. "Scarcity without Leviathan: The Violent Effects of Cocaine Supply Shortages in the Mexican Drug War." *Center For Global Development - Working Papers*. http://www.cgdev.org/publication/scarcity-without-leviathan-violent-effects-cocaine-supply-shortages-mexican-drug-war.

Cattell, Raymond B. 1943. "The Description of Personality: Basic Traits Resolved into Clusters." *The Journal of Abnormal and Social Psychology* 38 (4): 476–506. doi:10.1037/h0054116.

Caulkins, Jonathan P. 1993. "Local Drug Market's Response to Focused Police Enforcement." *Oper. Res.* 41 (5): 848–863. doi:10.1287/opre.41.5.848.

———. 1994. "What Is the Average Price of an Illicit Drug?" *Addiction* 89 (7): 815–19. doi:10.1111/j.1360-0443.1994.tb00984.x.

———. 1995a. *Developing Price Series for Cocaine*. Santa Monica, Calif: Rand Corp. http://www.rand.org/content/dam/rand/pubs/monograph_reports/2007/MR317.pdf.

———. 1995b. "Domestic Geographic Variation in Illicit Drug Prices." *Journal of Urban Economics* 37 (1): 38–56. doi:10.1006/juec.1995.1003.

———. 1995c. "Estimating Elasticities of Demand for Cocaine and Heroin with DUF Data." Pittsbugh: Carniege Mellon University.

———. 1998. "Is Crack Cheaper than (Powder) Cocaine?" Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/reprints/RP671.html.

———. 2001. "The Dynamic Character of Drug Problems." In *Bulletin on Narcotics*, 53:11–23. United Nations Publications.

———. 2002. "Law Enforcement's Role in a Harm Reduction Regime." 64. Crime and

Justice Bulletin. Sydney: New South Wales Bureau of Crime and Justice Research. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.555.5652&rep=rep1&type=pdf.

———. 2005. "Price and Purity Analysis for Illicit Drug: Data and Conceptual Issues." Research Showcase @ CMU. Carnegie Mellon University. https://pdfs.semanticscholar.org/fffc/d7b3205d497058d3966cdb3a980707187b6f.pdf.

———. 2007. "Price and Purity Analysis for Illicit Drug: Data and Conceptual Issues." *Drug and Alcohol Dependence*, Behavioral and Economic Perspectives in Drug Abuse Research, 90, Supplement 1: S61–68. doi:10.1016/j.drugalcdep.2006.08.014.

———. 2014. "Effects of Prohibition, Enforcement and Interdiction on Drug Use." In *Ending the Drug Wars*. London, UK: LSE IDEAS. http://www.lse.ac.uk/ideas/publications/reports/pdf/lse-ideas-drugs-report-final-web.pdf.

———. 2015. "After the Grand Fracture: Scenarios for the Collapse of the International Drug Control Regime." *Journal of Drug Policy Analysis* 0 (0). doi:10.1515/jdpa-2015-0008.

Caulkins, Jonathan P., Doris A. Behrens, Claudia Knoll, Gernot Tragler, and Doris Zuba. 2004. "Markov Chain Modeling of Initiation and Demand: The Case of the US Cocaine Epidemic." *Health Care Management Science* 7 (4): 319–29. doi:10.1007/s10729-004-7540-4.

Caulkins, Jonathan P., and Brittany M. Bond. 2012. "Marijuana Price Gradients Implications for Exports and Export-Generated Tax Revenue for California after Legalization." *Journal of Drug Issues* 42 (1): 28–45.

Caulkins, Jonathan P., Emma Disley, Marina Tzvetkova, Mafalda Pardal, Hemali Shah, and Xiaoke Zhang. 2016. "Modeling the Structure and Operation of Drug Supply Chains: The Case of Cocaine and Heroin in Italy and Slovenia." *The International Journal on Drug Policy* 31: 64–73. doi:10.1016/j.drugpo.2016.02.003.

Caulkins, Jonathan P., Bruce Johnson, Angela Taylor, and Lowell Taylor. 1999. "What Drug Dealers Tell Us about Their Costs of Doing Business." *Journal of Drug Issues* 29 (2): 323–40. doi:10.1177/002204269902900211.

Caulkins, Jonathan P., and Mark A. R. Kleiman. 2011. *Drugs and Crime*. Oxford University Press.

Caulkins, Jonathan P., Rosalie L. Pacula, Jeremy Arkes, Peter H. Reuter, Susan Paddock, Martin Iguchi, and Jack Riley. 2004. "The Price and Purity of Illicit Drugs: 1981 Through the Second Quarter of 2003." Washington D.C.: RAND Corporation. http://www.whitehousedrugpolicy.gov/.

Caulkins, Jonathan P., and Rosalie Liccardo Pacula. 2006. "Marijuana Markets: Inferences from Reports by the Household Population." *Journal of Drug Issues* 36 (1): 173–200. doi:10.1177/002204260603600108.

Caulkins, Jonathan P., and Rema Padman. 1993. "Quantity Discounts and Quality Premia for Illicit Drugs." *Journal of the American Statistical Association* 88 (423): 748–57. doi:10.1080/01621459.1993.10476335.

Caulkins, Jonathan P., and Peter H. Reuter. 1996. "The Meaning and Utility of Drug Prices." *Addiction (Abingdon, England)* 91 (9): 1261–64.

———. 1998. "What Price Data Tell Us about Drug Markets." *Journal of Drug Issues* 28 (3): 593–612. doi:10.1177/002204269802800302.

———. 2006. "Illicit Drug Markets and Economic Irregularities." *Socio-Economic Planning Sciences* 40 (1): 1–14. doi:10.1016/j.seps.2004.08.002.

———. 2009. "Towards a Harm-Reduction Approach to Enforcement." *Safer Communities* 8 (1): 9–23. doi:10.1108/17578043200900003.

———. 2010. "How Drug Enforcement Affects Drug Prices." In *Crime and Justice: A Review of Research*, by Michael Tonry. Vol. 39 (1): 213–271. University of Chicago Press. http://faculty.publicpolicy.umd.edu/sites/default/files/reuter/files/Drug%20Enforcement%20and%20Drug%20Price.pdf.

Caulkins, Jonathan P., Peter H. Reuter, and Lowell J. Taylor. 2006. "Can Supply Restrictions Lower Price? Violence, Drug Dealing and Positional Advantage." *The B.E. Journal of Economic Analysis & Policy* 5 (1). doi:10.1515/1538-0645.1387.

Cave, Jonathan A., and Peter H. Reuter. 1988. "The Interdictor's Lot: A Dynamic Model of the Market for Drug Smuggling Services." Santa Monica, CA: RAND Corporation.

Center for Systemic Peace. 2014. "Data Page." *Center for Systemic Peace*. http://www.systemicpeace.org/inscrdata.html.

Chabat, Jorge. 2006. "Mexico: The Security Challenge." 140. Documentos de Trabajo Del CIDE. Mexico City, Mexico: Centro de Investigación y Docencia Económicas. http://www.cide.edu/publicaciones/status/dts/DTEI%20140.pdf.

———. 2010. "Combatting Drugs in Mexico under Calder´on: The Inevitable War." *CIDE* Working Paper 205. http://libreriacide.com/librospdf/DTEI-205.pdf.

Chaiken, Jan M., and Marcia R. Chaiken. 1982. "Varieties of Criminal Behavior." Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/reports/R2814.html.

Chalk, Peter. 2011. *The Latin American Drug Trade: Scope, Dimensions, Impact, and Response*. Rand Corporation.

Chandra, Siddharth, and Matthew Barkell. 2013. "What the Price Data Tell Us about Heroin Flows across Europe." *International Journal of Comparative and Applied Criminal Justice* 37 (1): 1–13. doi:10.1080/01924036.2012.708120.

Chandra, Siddharth, Matthew Barkell, and Kelly Steffen. 2011. "Inferring Cocaine Flows across Europe: Evidence from Price Data : Journal of Drug Policy Analysis." *Journal of Drug Policy Analysis* 4 (1): 1–18.

Chandra, Siddharth, and Johnathan Joba. 2015. "Transnational Cocaine and Heroin Flow Networks in Western Europe: A Comparison." *International Journal of Drug Policy* 26 (8): 772–80. doi:10.1016/j.drugpo.2015.04.016.

Chandra, Siddharth, Yan-Liang Yu, and Vinay Bihani. 2016. "How MDMA Flows across the USA: Evidence from Price Data." *Global Crime* 0 (0): 1–18. doi:10.1080/17440572.2016.1179632.

Charuvastra, Anthony, and Marylene Cloitre. 2008. "Social Bonds and Posttraumatic Stress Disorder." *Annual Review of Psychology* 59: 301–28. doi:10.1146/annurev.psych.58.110405.085650.

Che, Ying, and Bruce L. Benson. 2014. "Drug Trafficking Wars Enforcement Versus Smugglers and Smugglers Versus Smugglers." *Journal of Drug Issues* 44 (2): 150–79. doi:10.1177/0022042613494839.

Chepesiuk, Ron. 1999. *The War on Drugs: An International Encyclopedia*. ABC-CLIO.

Chi, Jocelyn, Lila Hayatdavoudi, Sarah Kruszona, and Brad Rowe. 2013. "Reducing Drug Violence in Mexico: Options for Implementing Targeted Enforcement." Applied Policy Project. Los Angeles, CA: University of California, Los Angeles - Luskin School of Public Affairs. https://www.wilsoncenter.org/sites/default/files/reducing_drug_violence_mexico.pdf.

Chimeli, Ariaster B., and Rodrigo R. Soares. 2011. "The Use of Violence in Illegal Markets: Evidence from Mahogany Trade in the Brazilian Amazon." IZA Discussion Paper 5923. Institute for the Study of Labor (IZA). http://ideas.repec.org/p/iza/izadps/dp5923.html.

Chintrakarn, Pandej, and Dierk Herzer. 2012. "More Inequality, More Crime? A Panel Cointegration Analysis for the United States." *Economics Letters* 116 (3): 389–91. doi:10.1016/j.econlet.2012.04.014.

Chouvy, Pierre-Arnaud. 2002. *Les territoires de l'opium: conflits et trafics du Triangle d'Or et du Croissant d'Or (Birmanie, Laos, Thaïlande et Afghanistan, Iran, Pakistan)*. Editions Olizane.

CIA. 2012. *The World Factbook 2012*. Washington, DC.: Central Intelligence Agency. https://www.cia.gov/library/publications/the-world-factbook/index.html.

Clark, David E, and Manfred Wildner. 2000. "Violence and Fear of Violence in East and West Germany." *Social Science & Medicine* 51 (3): 373–79. doi:10.1016/S0277-9536(99)00470-0.

Clawson, Patrick, and Rensselaer Lee. 1996. *The Andean Cocaine Industry*. Springer.

Cloward, Richard A., and L. E. Ohlin. 1960. *Delinquency and Opportunity: A Study of Delinquent Gangs*. The Free Press.

Cockayne, James, and Summer Walker. 2015. "What Comes After the War on Drugs – Flexibility, Fragmentation or Principled Pluralism?" New York, NY: United Nations University. http://collections.unu.edu/eserv/UNU:3304/UNU_Drug_Policy_Online_Final.pdf.

Cohen, Albert K. 1955. *Delinquent Boys*. New York: Free Press.

Cohen, Dov, Richard E. Nisbett, Brian F. Bowdle, and Norbert Schwarz. 1996. "Insult, Aggression, and the Southern Culture of Honor: An 'experimental Ethnography.'" *Journal of Personality and Social Psychology* 70 (5): 945–59.

Cohen, Jacqueline, Daniel Cork, John Engberg, and George Tita. 1998. "The Role of Drug Markets and Gangs in Local Homicide Rates." *Homicide Studies* 2 (3): 241–62. doi:10.1177/1088767998002003007.

Cohen, Lawrence E., and Marcus Felson. 1979. "Social Change and Crime Rate Trends: A Routine Activity Approach." *American Sociological Review* 44 (4): 588. doi:10.2307/2094589.

Cohen, Lawrence E., Marcus Felson, and Kenneth C. Land. 1980. "Property Crime Rates in the United States: A Macrodynamic Analysis, 1947-1977; With Ex Ante Forecasts for the Mid-1980s." *American Journal of Sociology* 86 (1): 90–118.

Cohen, Lawrence E., James R. Kluegel, and Kenneth C. Land. 1981. "Social Inequality and Predatory Criminal Victimization: An Exposition and Test of a Formal Theory." *American Sociological Review* 46 (5): 505–24. doi:10.2307/2094935.

Cohen, Lawrence E., and Kenneth C. Land. 1987. "Age Structure and Crime: Symmetry Versus Asymmetry and the Projection of CrimeRates Through the 1990s." *American Sociological Review* 52 (2): 170–83. doi:10.2307/2095446.

Cole, Claire, Lisa Jones, Jim McVeigh, Andrew Kicman, Qutub Syed, and Mark A. Bellis. 2010. "CUT. A Guide to Adulterants, Bulking Agents and Other Contaminants Found in Illicit Drugs." Liverpool: Centre for Public Health Faculty of Health and Applied Social Sciences Liverpool John Moores University. http://www.cph.org.uk/wp-content/uploads/2012/08/cut-a-guide-to-the-adulterants-bulking-agents-and-other-contaminants-found-in-illicit-drugs.pdf.

Cole, David. 1999. *No Equal Justice: Race and Class in the American Criminal Justice System*. The New Press.

Cole, Julio H., and Andrés Marroquín Gramajo. 2009. "Homicide Rates in a Cross-Section of Countries: Evidence and Interpretations." *Population and Development Review* 35 (4): 749–76. doi:10.1111/j.1728-4457.2009.00307.x.

Coleman, James. 1990. *Foundations of Social Theory*. Cambridge, Mass: Belknap Press.

Collins, David, Helen Lapsley, Serge Brochu, Brian Easton, Augusto Pérez Gómez, and Jürgen Rehm. 2006. "International Guidelines for the Estimation of the Avoidable Costs of Substance Abuse." Ottawa: Health Canada. http://www.alcsmart.ipin.edu.pl/files/cb04a_international_guidelines.pdf.

Collins, James J. 1990. "Summary Thoughts About Drugs and Violence." In *Drugs and Violence: Causes, Correlates, and Consequences*, 103:265–75. NIDA Research Monograph. Rockville, MD: National Institute on Drug Abuse.

Collins, James J., and Pamela M. Messerschmidt. 1993. "Epidemiology of Alcohol-Related Violence." *Alcohol Health & Research World* 17 (2): 93–101.

Collins, John. 2014. *Ending the Drug Wars*. London: LSE IDEAS. http://www.lse.ac.uk/ideas/publications/reports/pdf/lse-ideas-drugs-report-final-web.pdf.

Colón, Héctor M., Rafaela R. Robles, and Hardeo Sahai. 2001. "The Validity of Drug Use Responses in a Household Survey in Puerto Rico: Comparison of Survey Responses of Cocaine and Heroin Use with Hair Tests." *International Journal of Epidemiology* 30 (5): 1042–49. doi:10.1093/ije/30.5.1042.

Conklin, G.H., and M. E. Simpson. 1985. "Demographic Approach to the Cross-National Study of Homicide." *Comparative Social Research* 8: 171–85.

Connolly, Johnny. 2005. "The Illicit Drug Market in Ireland." Overview. Dublin: Health Research Board. http://www.hrb.ie/uploads/tx_hrbpublications/Overview2.pdf.

Cook, Philip J. 1986. "The Demand and Supply of Criminal Opportunities." *Crime and Justice* 7: 1–27.

Cook, Philip J., Jens Ludwig, and David Hemenway. 1997. "The Gun Debate's New Mythical number:How Many Defensive Uses per Year?" *Journal of Policy Analysis and Management* 16 (3): 463–69. doi:10.1002/(SICI)1520-6688(199722)16:3<463::AID-PAM6>3.0.CO;2-F.

Cook, Philip J., and Michael J. Moore. 1993. "Drinking and Schooling." *Journal of Health Economics* 12 (4): 411–29. doi:10.1016/0167-6296(93)90003-W.

———. 2002. "The Economics Of Alcohol Abuse And Alcohol-Control Policies." *Health Affairs* 21 (2): 120–33. doi:10.1377/hlthaff.21.2.120.

Coomber, Ross. 2006. *Pusher Myths: Re-Situating the Drug Dealer*. Free Association Books.

Copes, Heith, Andy Hochstetler, and Sveinung Sandberg. 2015. "Using a Narrative Framework to Understand the Drugs and Violence Nexus." *Criminal Justice Review* 40 (1): 32–46. doi:10.1177/0734016814560436.

Cork, Daniel. 1999. "Examining Space–Time Interaction in City-Level Homicide Data: Crack Markets and the Diffusion of Guns Among Youth." *Journal of Quantitative*

Criminology 15 (4): 379–406. doi:10.1023/A:1007540007803.

Cornell, Svante E. 2005. "The Interaction of Narcotics and Conflict." *Journal of Peace Research* 42 (6): 751–60. doi:10.1177/0022343305057895.

———. 2007. "Narcotics and Armed Conflict: Interaction and Implications." *Studies in Conflict and Terrorism* 30 (3): 207–27.

Cornish, Derek B., and Ronald V. Clarke, eds. 1986. *The Reasoning Criminal: Rational Choice Perspectives on Offending (Research in Criminology)*. Springer-Verlag. New York: Springer.

———. 1987. "Understanding Crime Displacement: An Application of Rational Choice Theory." *Criminology* 25 (4): 933–48. doi:10.1111/j.1745-9125.1987.tb00826.x.

Corso, Phaedra S., James A. Mercy, Thomas R. Simon, Eric A. Finkelstein, and Ted R. Miller. 2007. "Medical Costs and Productivity Losses Due to Interpersonal and Self-Directed Violence in the United States." *American Journal of Preventive Medicine* 32 (6): 474–482.e2. doi:10.1016/j.amepre.2007.02.010.

Coscia, Michele, and Viridiana Rios. 2012. "Knowing Where and How Criminal Organizations Operate Using Web Content." CIKM. http://projects.iq.harvard.edu/files/ptr/files/cosciarios.pdf.

Costa Storti, Cláudia, and Paul De Grauwe. 2008. "Modelling Disorganized Crime: The Cannabis Market." LX. Bulletin on Narcotics: Measurement Issues in Drug Policy Analysis. Vienna: UNODC. https://www.unodc.org/documents/data-and-analysis/bulletin/2008/Bulletin2008_web.pdf.

———. 2009. "Globalization and the Price Decline of Illicit Drugs." *International Journal of Drug Policy* 20 (1): 48–61. doi:10.1016/j.drugpo.2007.11.016.

Count the Costs. 2013. "The War on Drugs: Wasting Billions and Undermining Economies." The War on Drugs: Count the Costs. http://www.countthecosts.org/sites/default/files/Economics-briefing.pdf.

Dalgarno, Phil, and David Shewan. 2005. "Reducing the Risks of Drug Use: The Case for Set and Setting." *Addiction Research & Theory* 13 (3): 259–65. doi:10.1080/16066350500053562.

Daly, Martin, and Margo Wilson. 1988. *Homicide*. Transaction Publishers.

Dasgupta, Partha, and Ismail Serageldin. 2001. *Social Capital: A Multifaceted Perspective*. World Bank Publications.

Davis, W. Rees, Bruce D. Johnson, Hilary James Liberty, and Doris D. Randolph. 2004. "Characteristics of Hidden Status among Users of Crack, Powder Cocaine, and Heroin in Central Harlem." *Journal of Drug Issues* 34 (1): 219–44. doi:10.1177/002204260403400110.

De Benedictis, Luca, and Lucia Tajoli. 2011. "The World Trade Network." *The World Economy* 34 (8): 1417–1454.

De Franco, Mario, and Ricardo Godoy. 1992. "The Economic Consequences of Cocaine Production in Bolivia: Historical, Local, and Macroeconomic Perspectives." *Journal of Latin American Studies* 24 (2): 375–406.

De la Rosa, M., E. Y. Lambert, and B. Gropper. 1990. "Introduction: Exploring the Substance Abuse-Violence Connection." *NIDA Research Monograph* 103: 1–7.

Decker, Scott, and Margaret Chapman. 2008. *Drug Smugglers on Drug Smuggling : Lessons from the Inside*. Philadelphia, PA, USA: Temple University Press. http://site.ebrary.com/lib/alltitles/docDetail.action?docID=10236070.

Decker, Scott H. 2003. *Policing Gangs and Youth Violence*. Belmont, CA: Wadsworth Publishing Co.

Decker, Scott H., Charles M. Katz, and Vincent J. Webb. 2007. "Understanding the Black Box of Gang Organization: Implications for Involvement in Violent Crime, Drug Sales, and Violent Victimization." *Crime & Delinquency*. doi:10.1177/0011128706296664.

Decker, Scott H., Susan Pennell, and Ami Caldwell. 1997. "Illegal Firearms: Access and Use By Arrestees." Research in Brief. Rockville, MD: National Institute of Justice (NIJ) US Department of Justice Office of Justice Programs United States of America. https://www.ncjrs.gov/pdffiles/163496.pdf.

Decker, Scott H., and Barrik van Winkle. 1996. *Life in the Gang: Family, Friends, and Violence*. Cambridge: Cambridge University Press.

Dell, Melissa. 2012. "Trafficking Networks and the Mexican Drug War." Harvard University Department of Economics. http://scholar.harvard.edu/files/dell/files/121113draft_0.pdf.

———. 2015. "Trafficking Networks and the Mexican Drug War." *American Economic Review* 105 (6): 1738–79. doi:10.1257/aer.20121637.

Dembo, Richard, Linda Williams, J. Schmeidler, Eric D. Wish, Alan Getreu, and Estrellita Berry. 1991. "Juvenile Crime and Drug Abuse: A Prospective Study of High Risk Youth." *Journal of Addictive Diseases* 11 (2): 5–31.

Demombynes, Gabriel. 2011. "Gabriel Demombynes." World Development Report 2011. Washington D.C.: The World Bank.

Department Of State. The Office of Website Management, Bureau of Public Affairs. 2015. "Methodology for US Government Estimates of Illegal Drug Production." Report. Department Of State. The Office of Website Management, Bureau of Public Affairs. http://www.state.gov/j/inl/rls/nrcrpt/2015/vol1/238919.htm.

Desroches, Frederick J. 2005. *The Crime That Pays: Drug Trafficking and Organized Crime in Canada*. Toronto: Canadian Scholars' Press.

———. 2007. “Research on Upper Level Drug Trafficking: A Review.” *Journal of Drug Issues* 37 (4): 827–44. doi:10.1177/002204260703700405.

Destrebecq, Denis, and Theodore Leggett. 2007. “Cocaine Traffickingin West Africa: Thethreat to Stability and Development (with Special Reference to Guinea-Bissau).” Vienna: UNODC. https://www.unodc.org/documents/data-and-analysis/Studies/Drug-Trafficking-WestAfrica-English.pdf.

Detotto, Claudio, and Edoardo Otranto. 2010. “Does Crime Affect Economic Growth?” *Kyklos* 63 (3): 330–45. doi:10.1111/j.1467-6435.2010.00477.x.

Diaz-Cayeros, Alberto, Beatriz Magaloni, Aila Matanock, and Vidal Romero. 2011. “Living in Fear: Mapping the Social Embeddedness of Drug Gangs and Violence in Mexico,” Working Paper edition. http://web.stanford.edu/~magaloni/dox/2011livinginfear.pdf.

Dickinson, Timothy. 2014. “Exploring the Drugs/Violence Nexus Among Active Offenders Contributions From the St. Louis School.” *Criminal Justice Review*, 734016814562422. doi:10.1177/0734016814562422.

Dills, Angela K., Jeffrey A. Miron, and Garrett Summers. 2010. “What Do Economists Know about Crime?” *NBER*, July, 269–302.

DiNardo, John. 1993. “Law Enforcement, the Price of Cocaine and Cocaine Use.” *Mathematical and Computer Modelling* 17 (2): 53–64.

Disney, Lynn, Ashley Hayward, and Robin LaVallee. 2010. “Illicit Drug Use and Criminal Behavior.” Washington D.C.: Office of National Drug Control Policy. https://www.whitehouse.gov/sites/default/files/ondcp/policy-and-research/illicit_drug_use_and_criminal_behavior_literature_review_2010.pdf.

Dixon, Jo, and Alan J. Lizotte. 1987. “Gun Ownership and the ‘Southern Subculture of Violence.’” *American Journal of Sociology* 93 (2): 383–405.

Donnelly, Robert A., and David A. Shirk. 2010. *Police and Public Security in Mexico*. University Readers. San Diego, CA. https://titles.universityreaders.com:443/police-and-public-security-in-mexico-9781935551508.html.

Donohue, John J., and Steven D. Levitt. 1998. “Guns, Violence and the Efficiency of Illagal Markets,” American Economic Review, 88 (2): 463–67.

d’Orbán, P. T. 1976. “Barbiturate Abuse.” *Journal of Medical Ethics* 2 (2): 63–67.

Dorn, Nicholas, Michael Levi, and Leslie King. 2005. “Literature Review on Upper Level Drug Trafficking.” Literature Review 22/05. Home Office Online Report. London, UK: Great Britain Home Office Research Development and Statistics Directorate. http://www.ehu.es/documents/1736829/2118745/Literature+review+on+upper+level+drug+trafficking.pdf.

Dorn, Nicholas, Karim Murji, and Nigel South, eds. 1992. *Traffickers: Drug Markets and*

Law Enforcement. London: Routledge.

Dorn, Nicholas, Lutz Oette, and Simone White. 1998. "Drugs Importation and the Bifurcation Of Risk Capitalization, Cut Outs and Organized Crime." *British Journal of Criminology* 38 (4): 537–60. doi:10.1093/bjc/38.4.537.

Drucker, Ernest. 1999. "Drug Prohibition and Public Health: 25 Years of Evidence." *Public Health Reports* 114 (1): 14–29.

———. 2002. "Population Impact of Mass Incarceration under New York's Rockefeller Drug Laws: An Analysis of Years of Life Lost." *Journal of Urban Health : Bulletin of the New York Academy of Medicine* 79 (3): 434–35. doi:10.1093/jurban/79.3.434.

Dube, Arindrajit, Oeindrila Dube, and Omar García-Ponce. 2013. "Cross-Border Spillover: U.S. Gun Laws and Violence in Mexico." *American Political Science Review* 107 (3): 397–417. doi:10.1017/S0003055413000178.

Dube, Oeindrila, and Juan Vargas. 2013. "Commodity Price Shocks and Civil Conflict: Evidence from Colombia." *The Review of Economic Studies*, 1384–1421. doi:10.1093/restud/rdt009.

Durkheim, Emile. 1893. *The Division of Labour in Society*. 1984 edition. London: The Macmillan Press Ltd.

———. 1895. *Rules of Sociological Method*. 1982 edition. Free Press.

———. 1897. *Suicide*. 2010 edition. The Free Press, Glencoe, Illinois

Eck, John E., and Jeffrey S. Gersh. 2000. "Drug Trafficking as a Cottage Industry." In *Illegal Drug Markets: From Research to Prevention Policy*, 241–272. Crime Prevention Studies 11. Monsey, NY.

Eck, John E., and Edward R. Maguire. 2000. *Have Changes in Policing Reduced Violent Crime? An Assessment of the Evidence*. Cambridge University Press.

Ehleringer, James R., John F. Casale, Janet E. Barnette, Xiaomei Xu, Michael J. Lott, and Janet Hurley. 2011. "14C Calibration Curves for Modern Plant Material from Tropical Regions of South America." *Radiocarbon* 53 (4): 585–94. doi:10.2458/azu_js_rc.53.13061.

———. 2012. "14C Analyses Quantify Time Lag between Coca Leaf Harvest and Street-Level Seizure of Cocaine." *Forensic Science International* 214 (1–3): 7–12. doi:10.1016/j.forsciint.2011.05.003.

Ehrlich, Isaac. 1973. "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation." *Journal of Political Economy* 81 (3): 521–65.

Eisner, Manuel. 2001. "Modernization, Self-Control and Lethal Violence. The Long-term Dynamics of European Homicide Rates in Theoretical Perspective." *British Journal of*

Criminology 41 (4): 618–38. doi:10.1093/bjc/41.4.618.

———. 2003. "Long-Term Historical Trends in Violent Crime." *Crime and Justice* 30: 83–142.

———. 2013. "What Causes Large-Scale Variation in Homicide Rates." In *Aggression in Humans and Other Primates: Biology, Psychology, Sociology*. Walter de Gruyter.

Ellinwood, Everett H. 1971. "Assault and Homicide Associated with Amphetamine Abuse." *American Journal of Psychiatry* 127 (9): 1170–75. doi:10.1176/ajp.127.9.1170.

Elliott, Delbert S., Suzanne S. Ageton, and Rachelle J. Canter. 1979. "An Integrated Theoretical Perspective on Delinquent Behavior." *Journal of Research in Crime and Delinquency* 16 (1): 3–27. doi:10.1177/002242787901600102.

Ellis, Anthony. 2015. *Men, Masculinities and Violence: An Ethnographic Study*. Routledge.

Ellis, Stephen. 2009. "West Africa's International Drug Trade." *African Affairs* 108 (431): 171–96. doi:10.1093/afraf/adp017.

EMCDDA. 2007a. "Cocaine and Crack Cocaine: A Growing Public Health Issue." Selected Issues. Luxembourg: European Monitoring Centre for Drugs and Drug Addiction. http://www.emcdda.europa.eu/attachements.cfm/att_44748_EN_TDSI07002ENC.pdf.

———. 2007b. "Drugs in Focus." Lisbon: EMCDDA - European Monitoring Centre for Drugs and Drug Addiction. http://www.emcdda.europa.eu/attachements.cfm/att_44774_EN_Dif16EN.pdf.

———. 2008. "Monitoring the Supply of Cocaine to Europe." Lisbon: EMCDDA - European Monitoring Centre for Drugs and Drug Addiction. http://www.emcdda.europa.eu/publications/technical-datasheets/cocaine-trafficking.

———. 2011. "Pilot Study on Wholesale Drug Prices in Europe." Lisbon.

———. 2013. "European Drug Report." Lisbon: European Monitoring Centre for Drugs and Drug Addiction. http://www.emcdda.europa.eu/edr2013.

———. 2014a. "European Drug Report 2014: Data and Statistics." Lisbon: European Monitoring Centre for Drugs and Drug Addiction European Monitoring Centre for Drugs and Drug Addiction. http://www.emcdda.europa.eu/data/2014/methods-gps.

———. 2014b. "European Drug Report. Trends and Development." Lisbon: European Monitoring Centre for Drugs and Drug Addiction. http://www.emcdda.europa.eu/publications/edr/trends-developments/2013.

———. 2015. "European Drug Report 2015. Trends and Development." Lisbon: European Monitoring Centre for Drugs and Drug Addiction. http://www.emcdda.europa.eu/publications/edr/trends-developments/2015.

EMCDDA, and Europol. 2010. "Cocaine: A European Union Perspective in the Global

Context." 2. EMCDDA–Europol Joint Publications. Luxembourg: European Monitoring Centre for Drugs and Drug Addiction, Europol.

———. 2013. "EU Drug Markets Report: A Strategic Analysis." Luxembourg: European Monitoring Centre for Drugs and Drug Addiction - Europol. http://www.emcdda.europa.eu/system/files/publications/741/TD3112366ENC_406102.pdf.

———. 2016. "EU Drug Markets Report. Strategic Overview." Luxembourg: European Monitoring Centre for Drugs and Drug Addiction and Europol,. http://www.emcdda.europa.eu/system/files/publications/2374/TD0416161ENN_1.PDF.

Enamorado, Ted, Luis F. López-Calva, Carlos Rodríguez-Castelán, and Hernán Winkler. 2016. "Income Inequality and Violent Crime: Evidence from Mexico's Drug War." *Journal of Development Economics* 120 (May): 128–43. doi:10.1016/j.jdeveco.2015.12.004.

Escalante Gonzalbo, Fernando. 2009. "Homicidios 1990-2007." http://www.nexos.com.mx/?p=13270.

Estrada, Fernando. 2013. "Strategic Games of the Violence in the Civil Wars."

Everingham, Susan S. 1994. "Controlling Cocaine: Supply Versus Demand Programs." Santa Monica, CA: RAND. http://www.rand.org/content/dam/rand/pubs/monograph_reports/2006/RAND_MR331.pdf.

Everingham, Susan S., and C. Peter Rydell. 1994. "Modeling the Demand for Cocaine." Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/monograph_reports/MR332.html.

Everingham, Susan S., Peter C. Rydell, and Jonathan P. Caulkins. 1995. "Cocaine Consumption in the United States: Estimating Past Trends and Future Scenarios." *Socio-Economic Planning Sciences* 29 (4): 305–14. doi:10.1016/0038-0121(95)00018-6.

Evrard, Isabelle, Stéphane Legleye, and Agnès Cadet-Taïrou. 2010. "Composition, Purity and Perceived Quality of Street Cocaine in France." *International Journal of Drug Policy* 21 (5): 399–406. doi:10.1016/j.drugpo.2010.03.004.

Executive Office of the President Office of National Drug Control Policy. 2004. "Technical Report for The Price and Purity of Illicit Drugs: 1981 Through the Second Quarter of 2003." Washington D.C. https://www.ncjrs.gov/ondcppubs/publications/pdf/price_purity_tech_rpt.pdf.

Fagan, Jeffrey. 1990. "Intoxication and Aggression." *Crime and Justice* 13 (13): 241–320.

———. 1993. "Interactions among Drugs, Alcohol, and Violence." *Health Affairs* 12 (4): 65–79. doi:10.1377/hlthaff.12.4.65.

Fagan, Jeffrey, and Ko-Lin Chin. 1990. "Violence as Regulation and Social Control in the Distribution of Crack." *NIDA Research Monograph* 103: 8–43.

Fajnzylber, Pablo, Daniel Lederman, and Norman Loayza. 1998. *Determinants of Crime Rates in Latin America and the World: An Empirical Assessment*. World Bank Publications.

———. 2002a. "What Causes Violent Crime?" *European Economic Review* 46 (7): 1323–57. doi:10.1016/S0014-2921(01)00096-4.

———. 2002b. "Inequality and Violent Crime." Journal of Law & Economics 45: 1. http://siteresources.worldbank.org/DEC/Resources/Crime%26Inequality.pdf

Fajnzylber, Pablo, Daniel Lederman, Norman Loayza, Peter H. Reuter, John Roman, and Alejandro Gaviria. 2000. "Crime and Victimization: An Economic Perspective [with Comments]." *Economía* 1 (1): 219–302.

Falk, Gerhard, and Clifford Falk. 1990. *Murder, an Analysis of Its Forms, Conditions, and Causes*. McFarland.

Fallon, Richard H. 1997. "'The Rule of Law' as a Concept in Constitutional Discourse." *Columbia Law Review* 97 (1): 1–56. doi:10.2307/1123446.

Farrell, Graham. 1995. "The Global Rate of Interception of Illicit Opiates and Cocaine 1980-1994." https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/823.

Farrell, Graham, Kashfia Mansur, and Melissa Tullis. 1996. "COCAINE AND HEROIN IN EUROPE 1983–93 A Cross-National Comparison of Trafficking and Prices." *British Journal of Criminology* 36 (2): 255–81.

Farrington, David P. 1986. "Age and Crime." *Crime and Justice* 7: 189–250.

———. 2003. "Developmental and Life-Course Criminology: Key Theoretical and Empirical Issues-the 2002 Sutherland Award Address." *Criminology* 41 (2): 221–25. doi:10.1111/j.1745-9125.2003.tb00987.x.

———. 2011. *Integrated Developmental and Life-Course Theories of Offending*. Vol. 14. New Brunswick, NJ: Transaction Publishers.

Farrington, David P., and Brandon C. Welsh. 2007. "Improved Street Lighting and Crime Prevention." Stoccolma: Brottsforebyggande radet.

FATF/OECD. 2014. "Financial Flows Linked to the Production and Trafficking of Afghan Opiates." Paris: Financial Action Task Force/Organisation for Economic Co-operation and Development.

Fauman, Michael A., and Beverly J. Fauman. 1979. "Violence Associated with Phencyclidine Abuse." *The American Journal of Psychiatry* 136 (12): 1584–86.

Favarin, Serena. 2014. "Democratization Processes and Homicide Rates in the Balkan

Region, Bulgaria and Romania." *European Journal on Criminal Policy and Research* 20 (2): 171–89. doi:10.1007/s10610-013-9227-1.

Felbab-Brown, Vanda. 2009. "The Violent Drug Market in Mexico and Lessons from Colombia." *Foreign Policy at Brookings* Policy Paper (12). http://www.brookings.edu/~/media/research/files/papers/2009/3/mexico-drug-market-felbabbrown/03_mexico_drug_market_felbabbrown.pdf.

Felson, Richard B., and Keri B. Burchfield. 2004. "Alcohol and the Risk of Physical and Sexual Assault Victimization*." *Criminology* 42 (4): 837–60. doi:10.1111/j.1745-9125.2004.tb00538.x.

Felson, Richard B., Allen E. Liska, Scott J. South, and Thomas L. McNulty. 1994. "The Subculture of Violence and Delinquency: Individual vs. School Context Effects." *Social Forces* 73 (1): 155–73. doi:10.1093/sf/73.1.155.

Felson, Richard B., Jukka Savolainen, Mark T. Berg, and Noora Ellonen. 2013. "Does Spending Time in Public Settings Contribute to the Adolescent Risk of Violent Victimization?" *Journal of Quantitative Criminology* 29 (2): 273–93.

Felson, Richard, Jukka Savolainen, Mikko Aaltonen, and Heta Moustgaard. 2008. "Is the Association Between Alcohol Use and Delinquency Causal or Spurious?*." *Criminology* 46 (3): 785–808. doi:10.1111/j.1745-9125.2008.00120.x.

Fendrich, Michael, Timothy P. Johnson, Seymour Sudman, Joseph S. Wislar, and Vina Spiehler. 1999. "Validity of Drug Use Reporting in a High-Risk Community Sample: A Comparison of Cocaine and Heroin Survey Reports with Hair Tests." *American Journal of Epidemiology* 149 (10): 955–62.

Fendrich, Michael, Timothy P. Johnson, Joseph S. Wislar, Amy Hubbell, and Vina Spiehler. 2004. "The Utility of Drug Testing in Epidemiological Research: Results from a General Population Survey." *Addiction* 99 (2): 197–208. doi:10.1111/j.1360-0443.2003.00632.x.

Fendrich, Michael, and Dennis P. Rosenbaum. 2003. "Recanting of Substance Use Reports in a Longitudinal Prevention Study." *Drug and Alcohol Dependence* 70 (3): 241–53. doi:10.1016/S0376-8716(03)00010-3.

Fendrich, Michael, and Yanchun Xu. 1994. "The Validity of Drug Use Reports from Juvenile Arrestees." *International Journal of the Addictions* 29 (8): 971–85. doi:10.3109/10826089409047921.

Ferri, Enrico. 1900. *Sociologia Criminale*. IV. Turin: Fratelli Bocca.

Fiala, Robert, and Gary LaFree. 1988. "Cross-National Determinants of Child Homicide." *American Sociological Review* 53 (3): 432–45. doi:10.2307/2095650.

Finckenauer, James O. 2005. "Problems of Definition: What Is Organized Crime?" *Trends in Organized Crime* 8 (3): 63–83. doi:10.1007/s12117-005-1038-4.

Fink, Ludwig, and Murray P. Hyatt. 1978. “Drug Use and Criminal Behavior.” *Journal of Drug Education* 8 (2): 139–49. doi:10.2190/L6U3-NURL-C67V-L0QV.

Finkelhor, David, and Richard Ormrod. 1999. “Reporting Crimes Against Juveniles. Juvenile Justice Bulletin.,” November. http://eric.ed.gov/?id=ED437451.

Fiorentini, Gianluca, and Sam Peltzman. 1997. *The Economics of Organised Crime*. Cambridge University Press.

Fischer, Thomas. 1995. “Colombia: The Narco-Perspective.” *Swiss Review of World Affairs.*, no. 4: 14–16.

Fitzpatrick, Kevin M., and Janet P. Boldizar. 1993. “The Prevalence and Consequences of Exposure to Violence among African-American Youth.” *Journal of the American Academy of Child & Adolescent Psychiatry* 32 (2): 424–30. doi:10.1097/00004583-199303000-00026.

Ford, Julie M., and Andrew A. Beveridge. 2006. “Neighborhood Crime Victimization, Drug Use and Drug Sales: Results from the ‘Fighting Back’ Evaluation.” *Journal of Drug Issues* 36 (2): 393–416. doi:10.1177/002204260603600208.

Fox, James, and Marianne W. Zawitz. 2000. “Homicide Trends in the United States: 1998 Update.” Washington D.C.: Department of Justice, Bureau of Justice Statistics. http://149.101.16.41/content/pub/pdf/htius98.pdf.

Frans, O., P.-A. Rimmö, L. Aberg, and M. Fredrikson. 2005. “Trauma Exposure and Post-Traumatic Stress Disorder in the General Population.” *Acta Psychiatrica Scandinavica* 111 (4): 291–99. doi:10.1111/j.1600-0447.2004.00463.x.

Fredriksson, Per G., Herman R. J. Vollebergh, and Elbert Dijkgraaf. 2004. “Corruption and Energy Efficiency in OECD Countries: Theory and Evidence.” *Journal of Environmental Economics and Management* 47 (2): 207–31. doi:10.1016/j.jeem.2003.08.001.

Freeman, Laurie. 2006. *State of Siege: Drug-Related Violence and Corruption in Mexico: Unintended Consequences of the War on Drugs*. Washington, D.C.: Washington Office on Latin America.

Freeman, Scott, Jeffrey Grogger, and Jon Sonstelie. 1996. “The Spatial Concentration of Crime.” *Journal of Urban Economics* 40 (2): 216–31. doi:10.1006/juec.1996.0030.

Friday, Paul C., and Jerald Hage. 1976. “Youth Crime in Postindustrial Societies. An Integrated Perspective.” *Criminology* 14 (3): 347–68. doi:10.1111/j.1745-9125.1976.tb00028.x.

Friedman, Alfred S., Kimberly Glassman, and Arlene B. Terras. 2001. “Violent Behavior as Related to Use of Marijuana and Other Drugs.” *Journal of Addictive Diseases* 20 (1): 49–72. doi:10.1300/J069v20n01_06.

Friesendorf, Cornelius. 2005. "Squeezing the Balloon?" *Crime, Law and Social Change* 44 (1): 35–78. doi:10.1007/s10611-006-9005-9.

Frijns, Tom, and Margriet van Laar. 2013. "Amphetamine, Ecstasy and Cocaine: Typology of Users, Availability and Consumption Estimates." In *Further Insights into Aspects of the Illicit EU Drugs Market*, edited by Franz Trautmann, Beau Kilmer, and Paul Turnbull, 183–242. Luxembourg: Publications Office of the European Union. http://ec.europa.eu/justice/anti-drugs/files/eu_market_full.pdf.

Fryer, Roland, Paul Heaton, Steven Levitt, and Kevin Murphy. 2013. "Measuring Crack Cocaine and Its Impact." *Economic Inquiry* 51 (3): 1651–81.

Galanter, Marc, and Herbert D. Kleber. 2008. *The American Psychiatric Publishing Textbook of Sustance Abuse Treatment*. 4 Har/Pas edition. Washington, DC: American Psychiatric Publishing, Inc.

Gambetta, Diego. 2009. *Codes of the Underworld: How Criminals Communicate*. Princeton, NJ: Princeton University Press.

Garfield, Richard, Llanten Morales, and Claudia Patricia. 2004. "The Public Health Context of Violence in Colombia." *Revista Panamericana de Salud Pública* 16 (4): 266–71. doi:10.1590/S1020-49892004001000006.

Gartner, Rosemary. 1990. "The Victims of Homicide: A Temporal and Cross-National Comparison." *American Sociological Review* 55 (1): 92–106. doi:10.2307/2095705.

———. 1991. "Family Structure, Welfare Spending, and Child Homicide in Developed Democracies." *Journal of Marriage and Family* 53 (1): 231–40. doi:10.2307/353147.

———. 1993. "Methodological Issues in Cross-Cultural Large-Survey Research on Violence." *Violence and Victims* 8 (3): 199–215.

Gartner, Rosemary, and Robert Nash Parker. 1990. "Cross-National Evidence on Homicide and the Age Structure of the Population." *Social Forces* 69 (2): 351–71. doi:10.1093/sf/69.2.351.

Gaviria, Alejandro. 2000. "Increasing Returns and the Evolution of Violent Crime: The Case of Colombia." *Journal of Development Economics* 61 (1): 1–25.

Gawryszewski, Vilma Pinheiro, and Eugênia Maria Silveira Rodrigues. 2006. "The Burden of Injury in Brazil, 2003." *Sao Paulo Medical Journal* 124 (4): 208–13. doi:10.1590/S1516-31802006000400007.

Gawryszewski, Vilma Pinheiro, Marta Maria Alves da Silva, Deborah Carvalho Malta, Scott R. Kegler, James A. Mercy, Márcio Dênis Medeiros Mascarenhas, Morais Neto, and Otaliba Libânio. 2008. "Violence-Related Injury in Emergency Departments in Brazil." *Revista Panamericana de Salud Pública* 24 (6): 400–408. doi:10.1590/S1020-49892008001200004.

Gayford, John J. 1975. “Wife Battering: A Preliminary Survey of 100 Cases.” *British Medical Journal* 1 (5951): 194–97.

Gelles, Richard J., and Ann Levine. 1999. *Sociology: An Introduction*. McGraw-Hill College.

Gerson, Lowell W., and Donald A. Preston. 1979. “Alcohol Consumption and the Incidence of Violent Crime.” *Journal of Studies on Alcohol* 40 (3): 307–12.

Gfroerer, Joseph C., and Arthur L. Hughes. 1991. “The Feasibility of Collecting Drug Abuse Data by Telephone.” *Public Health Reports (Washington, D.C.: 1974)* 106 (4): 384–93.

Giaconia, Rose M., Helen Z. Reinherz, Amy B. Silverman, Bilge Pakiz, Abbie K. Frost, and Elaine Cohen. 1995. “Traumas and Posttraumatic Stress Disorder in a Community Population of Older Adolescents.” *Journal of the American Academy of Child and Adolescent Psychiatry* 34 (10): 1369–80.

Gibson, Richard M., and John B. Haseman. 2003. “Prospects for Controlling Narcotics Production and Trafficking in Myanmar.” *Contemporary Southeast Asia* 25 (1): 1–19.

Giommoni, Luca. 2014. “The Retail Value of the Illicit Drug Market in Italy: A Consumption-Based Approach.” *Global Crime* 15 (1–2): 27–50. doi:10.1080/17440572.2013.875893.

———. 2015. “Illicit Drugs Market.” In *From Illegal Markets to Legitimate Businesses*, edited by Ernersto U. Savona and Michele Riccardi, 43–56. Trento: Transcrime – Università degli Studi di Trento. http://www.transcrime.it/pubblicazioni/the-portfolio-of-organised-crime-in-europe/.

Giommoni, Luca, Alberto Aziani, and Giulia Berlusconi. 2016. “How Do Illicit Drugs Move Across Countries? A Network Analysis of the Heroin Supply to Europe.” Journal of Drug Issues, December. doi:10.1177/0022042616682426.

Giraldo, Javier. 1999. “Corrupted Justice and the Schizophrenic State in Colombia.” *Social Justice* 26 (4 (78)): 31–54.

Glaeser, Edward L., Bruce Sacerdote, and José A. Scheinkman. 1996. “Crime and Social Interactions.” *The Quarterly Journal of Economics* 111 (2): 507–48. doi:10.2307/2946686.

Glueck, Sheldon, and Eleanor Glueck. 1950. “Unraveling Juvenile Delinquency.” *Juvenile Court Judges Journal* 2: 32.

Gmel, Gerhard. 2000. “The Effect of Mode of Data Collection and of Non-Response on Reported Alcohol Consumption: A Split-Sample Study in Switzerland.” *Addiction* 95 (1): 123–34. doi:10.1046/j.1360-0443.2000.95112313.x.

Gmel, Gerhard, and Jurgen Rehm. 2004. “Measuring Alcohol Consumption.” *Contemporary Drug Problems* 31: 467.

Goel, Rajeev K., and Michael A. Nelson. 2005. “Economic Freedom Versus Political Freedom: Cross-Country Influences on Corruption*.” *Australian Economic Papers* 44 (2): 121–33. doi:10.1111/j.1467-8454.2005.00253.x.

Goldstein, Paul J. 1985. “The Drugs/Violence Nexus: A Tripartite Conceptual Framework.” *Journal of Drug Issues* 15 (4): 143–74. doi:10.1177/002204268501500406.

Goldstein, Paul J., Henry H. Brownstein, and Patrick J. Ryan. 1992. “Drug-Related Homicide in New York: 1984 and 1988.” *Crime & Delinquency* 38 (4): 459–76. doi:10.1177/0011128792038004004.

Goldstein, Paul J., Henry H. Brownstein, Patrick J. Ryan, and Patricia A. Bellucci. 1989. “Crack and Homicide in New York City, 1988: A Conceptually Based Event Analysis.” *Contemporary Drug Problems* 16: 651–87.

———. 1990. “Most Drug-Related Murders Result from Crack Sales Not Use.” http://www.drugtext.org/Drug-Policy-Letter-march/april-1990/most-drug-related-murders-result-from-crack-sales-not-us.html.

Gómez-Johnson, Cristina. 2015. “From Economic Migration to Forced Migration Due to the Increase of Violence in El Salvador and Mexico.” *Estudios Políticos*, no. 47(December): 199–220. doi:10.17533/udea.espo.n47a12.

Goodhand, Jonathan. 2008. “Corrupting or Consolidating the Peace? The Drugs Economy and Post-Conflict Peacebuilding in Afghanistan.” *International Peacekeeping* 15 (3): 405–23. doi:10.1080/13533310802058984.

Goodman, Richard A., James A. Mercy, and Mark L. Rosenberg. 1986. “Drug Use and Interpersonal Violence: Barbiturates Detected in Homicide Victims.” *American Journal of Epidemiology* 124 (5): 851–55.

Gootenberg, Paul. 2006. “Cocaine in Chains: The Rise and Demise of a Global Commodity, 1860–1950.” In *From Silver to Cocaine: Latin American Commodity Chains and the Building of the World Economy, 1500–2000*, edited by Steven Topik, Carlos Marichal, and Zephyr Frank. Duke University Press.

Gordon, David M. 1971. “Class and the Economics of Crime.” *Review of Radical Political Economics* 3 (3): 51–75. doi:10.1177/048661347100300304.

Goring, Charles. 1918. “The Etiology of Crime.” *Journal of Mental Science* LXIV: 129–46.

Gossop, Michael, Victoria Manning, and Gayle Ridge. 2006. “Concurrent Use of Alcohol and Cocaine: Differences in Patterns of Use and Problems Among Users of Crack Cocaine and Cocaine Powder.” *Alcohol and Alcoholism* 41 (2): 121–25. doi:10.1093/alcalc/agh260.

Gounev, Philip, and Vincenzo Ruggiero. 2012. *Corruption and Organized Crime in Europe: Illegal Partnerships*. Routledge.

Graham, Kathryn, Sharon Bernards, Sharon C. Wilsnack, and Gerhard Gmel. 2010. "Alcohol May Not Cause Partner Violence But It Seems to Make It Worse: A Cross National Comparison of the Relationship Between Alcohol and Severity of Partner Violence." *Journal of Interpersonal Violence*, June. doi:10.1177/0886260510370596.

Gratius, Susanne, and David Palacios. 2012. "Europe and Latin America: Combating Drugs and Drug Trafficking." Brussels: European Parliament - Directorate-General for External Policies. http://www.europarl.europa.eu/RegData/etudes/etudes/join/2012/457107/EXPO-AFET_ET(2012)457107_EN.pdf.

Greenberg, David F. 1977. "Delinquency and the Age Structure of Society." *Contemporary Crises* 1 (2): 189–223. doi:10.1007/BF00728871.

———. 1985. "Age, Crime, and Social Explanation." *American Journal of Sociology* 91 (1): 1–21.

———, David. 1993. *Crime And Capitalism: Readings in Marxist Crimonology*. Temple University Press. https://muse.jhu.edu/book/9581.

———. 2001. "Time Series Analysis of Crime Rates." *Journal of Quantitative Criminology* 17 (4): 291–327. doi:10.1023/A:1012507119569.

Greene, William H. 2011. *Econometric Analysis*. 7 edition. Boston: Pearson.

Greenfeld, Lawrence A. 1998. "Alcohol and Crime: An Analysis of National Data on the Prevalence of Alcohol Involvement in Crime." Department of Justice, Bureau of Justice Statistics. http://www.bjs.gov/content/pub/pdf/ac.pdf.

Groenhuijsen, Marc S., Theo de Roos, and Tijs Kooijmans. 2010. *Fervet Opus: Liber Amicorum Anton Van Kalmthout*. Maklu.

Grosjean, Pauline. 2014. "A History of Violence: The Culture of Honor and Homicide in the Us South." *Journal of the European Economic Association* 12 (5): 1285–1316. doi:10.1111/jeea.12096.

Groves, W. Byron, Richard McCleary, and Graeme R. Newman. 1985. "Religion, Modernization, and World Crime." *Comparative Social Research* 8: 59–78.

Grupo Milenio. 2016. "DataLab - Grupo Milenio." *Milenio*. http://www.milenio.com/datalab/.

Guerrero, Eduardo. 2011. "La Raíz de La Violencia." Nexos. http:// www.nexos.com.mx/?p=14318.

Guerry, André Michel. 1833. *Essai Sur La Statistique Morale de La France*. Paris: Chez Crochard. https://archive.org/details/essaisurlastatis00gueruoft.

Guest, Avery M., and James A. Weed. 1976. "Ethnic Residential Segregation: Patterns of Change." *American Journal of Sociology* 81 (5): 1088–1111.

Guizado, Álvaro Camacho. 2005. "Drug Trafficking: Perspectives From Europe, Latin America and The United States." Bogotá: Observatorio de las Relaciones entre Europa y América Latina - OBREAL and Centro de Estudios Socioculturales e Internacionales - CESO. http://www.drugpolicy.org/docUploads/Drug_Trafficking_Europe_Latin_America_United_States.pdf.

Gurr, Ted Robert. 1981. "Historical Trends in Violent Crime: A Critical Review of the Evidence." *Crime and Justice* 3: 295–353.

Hackney, Sheldon. 1969. "Southern Violence." *The American Historical Review* 74 (3): 906–25. doi:10.2307/1873128.

Hagan, John. 1994. *Crime and Disrepute*. Thousand Oaks, CA: SAGE Publications.

Hamid, Ansley. 1992. "The Developmental Cycle of a Drug Epidemic: The Cocaine Smoking Epidemic of 1981–1991." *Journal of Psychoactive Drugs* 24 (4): 337–48. doi:10.1080/02791072.1992.10471658.

Han, Chirok, and Peter C. B. Phillips. 2010. "GMM Estimation for Dynamic Panels with Fixed Effects and Strong Instruments at Unity." *Econometric Theory* 26 (1): 119–151. doi:10.1017/S026646660909063X.

Hansen, Lars Peter. 1982. "Large Sample Properties of Generalized Method of Moments Estimators." *Econometrica* 50 (4): 1029–54. doi:10.2307/1912775.

Hansen, Lars Peter, and Kenneth J. Singleton. 1982. "Generalized Instrumental Variables Estimation of Nonlinear Rational Expectations Models." *The Econometric Society* 50 (5): 1269–86.

Hansmann, Henry B., and John M. Quigley. 1982. "Population Heterogeneity and the Sociogenesis of Homicide." *Social Forces* 61 (1): 206–24. doi:10.2307/2578082.

Haroscopos, Alex, and Mike Hough. 2005. *Drug Dealing in Open-Air Markets*. DIANE Publishing.

Harrison, Lana H., Steve S. Martin, Tihomir Enev, and Deborah Harrington. 2007. "Comparing Drug Testing and Self-Report of Drug Use among Youths and Young Adults in the General Population." Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Rockville, MD.

Hart, Rachel. 2015. "An Analysis of Global Homicide Patterns." Berkeley, CA: University of California, Berkeley. https://www.econ.berkeley.edu/sites/default/files/HART-Honors%20Thesis.pdf.

Harwood, Henrick J., Diane M. Napolitano, Patricia L. Kristiansen, and James J. Collins. 1984. "Economic Costs to Society of Alcohol and Drug Abuse and Mental Illness: 1980." Rockville, MD: US Dept of Health and Human Services Alcohol, Drug Abuse, and Mental Health Admin United States of America.

https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=117820.

Havnes, Ingrid Amalia, Thomas Clausen, Christina Brux, and Anne-Lise Middelthon. 2014. "The Role of Substance Use and Morality in Violent Crime - a Qualitative Study among Imprisoned Individuals in Opioid Maintenance Treatment." *Harm Reduction Journal* 11: 24. doi:10.1186/1477-7517-11-24.

Hayes, Christine. 2006. "Doublets and Contradictions, Seams and Sources: Genesis 5-11 and the Historical-Critical Method." Open Yale courses. http://oyc.yale.edu/transcript/946/rlst-145.

Hayes, Timothy C., and Matthew R. Lee. 2005. "The Southern Culture of Honor and Violent Attitudes." *Sociological Spectrum* 25 (5): 593–617. doi:10.1080/02732170500174877.

Haynie, Dana L., and Brian Soller. 2014. "Network Analysis in Criminology." In *Encyclopedia of Criminology and Criminal Justice*, edited by Gerben Bruinsma and David Weisburd, 3265–75. New York: Springer.

Health Canada. 2004. "Health Canada's Gender-Based Analysis Policy." Ottawa: Minister of Health.

Heinemann, Alessandra, and Dorte Verner. 2006. "Crime and Violence in Development: A Literature Review of Latin America and The Caribbean." *World Bank Policy Research*, Policy Research Working Papers, Working Paper 4041. http://elibrary.worldbank.org/doi/book/10.1596/1813-9450-4041.

Heinle, Kimberly, Cory Molzahn, and David A. Shirk. 2015. "Drug Violence in Mexico. Data and Analysis Through 2014." San Diego, CA: Justice in Mexico Project - University of San Diego. https://justiceinmexico.org/wp-content/uploads/2015/04/2015-Drug-Violence-in-Mexico-final.pdf.

Hemenway, David, and Matthew Miller. 2000. "Firearm Availability and Homicide Rates across 26 High-Income Countries." *The Journal of Trauma* 49 (6): 985–88.

Henry, Andrew F., and James F. Short. 1964. *Suicide and Homicide: Some Economic, Sociological Aspects of Aggression*. Oxford, England: Free Press Glencoe.

Hepburn, Lisa M, and David Hemenway. 2004. "Firearm Availability and Homicide: A Review of the Literature." *Aggression and Violent Behavior* 9 (4): 417–40. doi:10.1016/S1359-1789(03)00044-2.

Hernandez, Diego, and Alexandra Rudolph. 2015. "Modern Day Slavery: What Drives Human Trafficking in Europe?" *European Journal of Political Economy* 38 (June): 118–39. doi:10.1016/j.ejpoleco.2015.02.002.

Hickman, Matthew, and C. Taylor. 2002. "Estimating the Prevalence of Problematic Drug Use: A Review of Methods and Their Application." *Offprint from Bulletin on Narcotics* LIV (1 and 2).

Hindelang, Michael J., Michael R. Gottfredson, and James Garofalo. 1978. *Victims of Personal Crime: An Empirical Foundation for a Theory of Personal Victimization*. Ballinger Pub. Co.

Hirschi, Travis. 1969. *Causes of Delinquency*. University of California Press.

Hirschi, Travis, and Michael R. Gottfredson. 1983. "Age and the Explanation of Crime." *American Journal of Sociology* 89 (3): 552–84. doi:10.1086/227905.

Hoaken, Peter N. S., and Sherry H. Stewart. 2003. "Drugs of Abuse and the Elicitation of Human Aggressive Behavior." *Addictive Behaviors*, Interpersonal Violence and Substance Use, 28 (9): 1533–54. doi:10.1016/j.addbeh.2003.08.033.

Hobbes, Thomas. 1651. *Leviathan or The Matter, Forme and Power of a Common Wealth Ecclesiasticall and Civil*.

Hodess, Robin, Jessie Banfield, and Toby Wolfe. 2001. "Global Corruption Report 2001." Global Corruption Report. Berlin: Transparency International. https://issuu.com/transparencyinternational/docs/2001_gcr_inaugural_en?backgroundColor=.

Hoechle, Daniel. 2007. "Robust Standard Errors for Panel Regressions with Cross-Sectional Dependence." *The Stata Journal* 7 (3): 281–312.

Holder, Yvette, Margie Peden, Etienne G. Krug, Johan Lund, Gopalakrishna Gururaj, and Olive Kobusingye. 2001. *Injury Surveillance Guidelines*. Geneva: World Health Organization. http://www.who.int/violence_injury_prevention/media/en/136.pdf.

Holmes, Jennifer S., Sheila Amin Gutiérrez de Piñeres, and Kevin M. Curtin. 2006. "Violence, and Development in Colombia: A Department-Level Analysis." *Latin American Politics and Society* 48 (3): 157–84.

Holtz-Eakin, Douglas, Whitney Newey, and Harvey S. Rosen. 1988. "Estimating Vector Autoregressions with Panel Data." *Econometrica* 56 (6): 1371–95. doi:10.2307/1913103.

Hopkins, Matt, Nick Tilley, and Kate Gibson. 2013. "Homicide and Organized Crime in England." *Homicide Studies* 17 (3): 291–313. doi:10.1177/1088767912461786.

Hough, Michael, and Mangai Natarajan. 2000. "Introduction: Illegal Drug Markets, Research and Policy." In *Illegal Drug Markets: From Research to Policy*, 1–18. Monsey, NJ: Criminal Justice Press.

Hser, Yih-Ing, Margaret Maglione, and Kathleen Boyle. 1999. "Validity of Self-Report of Drug Use Among STD Patients, ER Patients, and Arrestees." *The American Journal of Drug and Alcohol Abuse* 25 (1): 81–91. doi:10.1081/ADA-100101847.

Hsieh, Ching-Chi, and Meredith D. Pugh. 1993. "Poverty, Income Inequality, and Violent Crime: A Meta-Analysis of Recent Aggregate Data Studies." *Criminal Justice Review*

18 (2): 182–202. doi:10.1177/073401689301800203.

Huang, W. S. Wilson. 2001. "A Research Note on Reporting Discrepancies in International Homicide Data." *International Journal of Comparative and Applied Criminal Justice* 25 (2): 167–81. doi:10.1080/01924036.2001.9678672.

Hughes, Caitlin E., Jenny Chalmers, David A. Bright, Francis Matthew-Simmons, and Natasha Sindicich. 2012. "Examining Supply Changes in Australia's Cocaine Market." *Drug and Alcohol Review* 31 (3): 263–72. doi:10.1111/j.1465-3362.2011.00350.x.

Humphries, Drew, and Don Wallace. 1980. "Capitalist Accumulation and Urban Crime, 1950-1971." *Social Problems* 28 (2): 179–93. doi:10.2307/800150.

Hunter, Albert Dale. 1974. "Symbolic Communities: The Persistence and Change of Chicago's Local Communities." https://www.scholars.northwestern.edu/en/publications/symbolic-communities-the-persistence-and-change-of-chicagos-local.

Hutchinson, Allan C., and Patrick J. Monahan. 1987. *The Rule of Law: Ideal or Ideology*. Toronto: Transnational Pub.

Hutson, H. Range, Deirdre Anglin, Demetrios N. Kyriacou, Joel Hart, and Kelvin Spears. 1995. "The Epidemic of Gang-Related Homicides in Los Angeles County from 1979 through 1994." *JAMA* 274 (13): 1031–36.

Iadicola, Peter, and Anson Shupe. 2012. *Violence, Inequality, and Human Freedom*. Rowman & Littlefield.

IDPC. 2016. "East and South East Asia." http://idpc.net/policy-advocacy/regional-work/east-and-south-east-asia.

Ignatieff, Michael. 2005. *The Lesser Evil: Political Ethics in an Age of Terror*. Princeton: Princeton University Press.

Imbusch, Peter. 2003. "The Concept of Violence." In *International Handbook of Violence Research*, edited by Wilhelm Heitmeyer and John Hagan, 13–39. Springer Netherlands. http://link.springer.com/chapter/10.1007/978-0-306-48039-3_2.

INCB. 2002. "Illicit Drugs and Economic Development." Vienna, Austria: United Nations: International Narcotics Control Board. https://www.incb.org/documents/Publications/AnnualReports/Thematic_chapters/English/AR_2002_E_Chapter_I.pdf.

———. 2013. "Report of the International Narcotics Control Board for 2012." Vienna, Austria: United Nations: International Narcotics Control Board. https://www.incb.org/documents/Publications/AnnualReports/AR2012/AR_2012_E.pdf.

———. 2014. "Economic Consequences of Drug Abuse." In *Report of the International*

Narcotics Control Board for 2013. Report of the International Narcotics Control Board. Vienna, Austria: United Nations: International Narcotics Control Board. https://www.incb.org/incb/en/publications/annual-reports/annual-report-2013.html.

Inciardi, James A. 1991. *The War on Drugs II: The Continuing Epic of Heroin, Cocaine, Crack, Crime, AIDS, And Public Policy*. Mountain View, CA: Mayfield Pub Co.

Inciardi, James A., Ruth Horowitz, and Anne E. Pottieger. 1992. *Street Kids, Street Drugs, Street Crime: An Examination of Drug Use and Serious Delinquency in Miami*. Belmont, Calif: Brooks/Cole Pub Co.

Isham, Jonathan, and Daniel Kaufmann. 1999. "The Forgotten Rationale for Policy Reform: The Productivity of Investment Projects." *The Quarterly Journal of Economics* 114 (1): 149–84. doi:10.1162/003355399555972.

Ito, Tiffany A., Norman Miller, and Vicki E. Pollock. 1996. "Alcohol and Aggression: A Meta-Analysis on the Moderating Effects of Inhibitory Cues, Triggering Events, and Self-Focused Attention." *Psychological Bulletin* 120 (1): 60–82. doi:10.1037/0033-2909.120.1.60.

Jackson, Jonathan, Aziz Z. Huq, Ben Bradford, and Tom R. Tyler. 2013. "Monopolizing Force? Police Legitimacy and Public Attitudes toward the Acceptability of Violence." *Psychology, Public Policy, and Law* 19 (4): 479–97. doi:10.1037/a0033852.

Jacobs, Bruce A. 1999a. "Crack to Heroin? Drug Markets and Transition." *British Journal of Criminology* 39 (4): 555–74.

———. 1999b. *Dealing Crack: The Social World of Streetcorner Selling*. 1 edition. Boston: Northeastern.

———. 2000. *Robbing Drug Dealers: Violence Beyond the Law*. 1st edition. New York: Aldine Transaction.

———. 2004. "A Typology of Street Criminal Retaliation." *Journal of Research in Crime and Delinquency* 41 (3): 295–323. doi:10.1177/0022427803262058.

Jacobs, Bruce A., Volkan Topalli, and Richard Wright. 2000. "Managing Retaliation: Drug Robbery and Informal Sanction Threats." *Criminology* 38 (1): 171–98. doi:10.1111/j.1745-9125.2000.tb00887.x.

Jacobs, Bruce A., and Richard Wright. 2006. *Street Justice: Retaliation in the Criminal Underworld*. Cambridge University Press.

Jacobs, David, and Amber M. Richardson. 2008. "Economic Inequality and Homicide in the Developed Nations From 1975 to 1995." *Homicide Studies* 12 (1): 28–45. doi:10.1177/1088767907311849.

Jacques, Scott, and Richard Wright. 2011. "Informal Control and Illicit Drug Trade." *Criminology* 49 (3): 729–65. doi:10.1111/j.1745-9125.2011.00234.x.

Jacques, Scott, Richard Wright, and Andrea Allen. 2014. "Drug Dealers, Retaliation, and Deterrence." *International Journal of Drug Policy* 25 (4): 656–62. doi:10.1016/j.drugpo.2014.03.001.

Jansen, Floor. 2012. "Georganiseerde Hennepteelt: Criminaliteitsbeeldanalyse 2012." Driebergen: KLPD – Dienst Nationale Recherche. https://www.politie.nl/binaries/content/assets/politie/documenten-algemeen/nationaal-dreigingsbeeld-2012/cba-georganiseerde-hennepteelt-2012.pdf.

Jelsma, Martin. 2010. *The Development of International Drug Control Lessons Learned and Strategic Challenges for the Future*. Legislative Reform of Drug Policies 10. Amsterdam: Transnational Institute (TNI).

Jenner, Matthew. 2011. "International Drug Trafficking: A Global Problem with a Domestic Solution." *18 Indiana Journal of Global Legal Stuides 901 (2011)* 18 (2). http://www.repository.law.indiana.edu/ijgls/vol18/iss2/10.

Jiménez-Brobeil, Silvia A., Patrick du Souich, and Ihab Al Oumaoui. 2009. "Possible Relationship of Cranial Traumatic Injuries with Violence in the South-East Iberian Peninsula from the Neolithic to the Bronze Age." *American Journal of Physical Anthropology* 140 (3): 465–75. doi:10.1002/ajpa.21089.

Johnson, Bruce D. 2003. "Patterns of Drug Distribution: Implications and Issues." *Substance Use & Misuse* 38 (11–13): 1789–1806. doi:10.1081/JA-120024241.

Johnson, Bruce D., Paul J. Goldstein, Edward Preble, James Schmeidler, Douglas S. Lipton, Barry J. Spunt, and Thomas Miller. 1985. *Taking Care of Business: The Economics of Crime by Heroin Abusers*. Lexington, MA: Lexington Books.

Johnson, Bruce D., Andrew Golub, and Eloise Dunlap. 2005. "The Rise and Decline of Hard Drugs, Drug Markets, and Violence in Inner-City New York." In *The Crime Drop in America*, Second edition. Cambridge Studies in Criminology. Cambridge University Press. http://dx.doi.org/10.1017/CBO9780511616167.007.

Johnson, Bruce D., Terry Williams, Kojo A. Dei, and Harry Sanabria. 1990. "Drug Abuse in the Inner City: Impact on Hard-Drug Users and the Community." *Crime and Justice* 13: 9–67.

Johnson, Bruce D., Ansley Hamid, and Harry Sanabria. 1992. "Emerging Models of Crack Distribution." In *Drugs, Crime, and Social Policy: Research, Issues, and Concerns*, edited by Tom Mieczkowski. Boston, MA: Allyn and Bacon.

Johnson, David T. 2008. "The Homicide Drop in Postwar Japan." *Homicide Studies* 12 (1): 146–60. doi:10.1177/1088767907310854.

Johnson, Emanuel L., and Stephen D. Emche. 1994. "Variation of Alkaloid Content in Erythroxylum Coca Leaves from Leaf Bud to Leaf Drop." *Annals of Botany* 73 (6): 645–50. doi:10.1006/anbo.1994.1081.

Johnson, Sharon D., L. Gibson, and Rafael Linden. 1978. "Alcohol and Rape in Winnipeg, 1966-1975." *Journal of Studies on Alcohol* 39 (11): 1887–94.

Johnson, Timothy P. 2014. "Sources of Error in Substance Use Prevalence Surveys." *International Scholarly Research Notices* 2014 (November): e923290. doi:10.1155/2014/923290.

Jones, Michael K. 2014. "The Effects of the Mexican Drug Trade over the Past Sixty Years." *E-International Relations*. http://www.e-ir.info/2014/10/05/the-effects-of-the-mexican-drug-trade-over-the-past-sixty-years/.

Justice in Mexico. 2014. "Homicides." *Justice in Mexico*. https://justiceinmexico.org/data-portal/homicides/.

Jütersonke, Oliver, Robert Muggah, and Dennis Rodgers. 2009. "Gangs, Urban Violence, and Security Interventions in Central America." *Security Dialogue* 40 (4–5): 373–97. doi:10.1177/0967010609343298.

Kalmanovitz, Salomón. 1990. *Violencia y narcotráfico en Colombia*. Columbia University-New York University Consortium.

Kaplan, John. 1983. *Hardest Drug: Heroin and Public Policy*. Chicago: University of Chicago Press.

Karstedt, Susanne. 2003. "Legacies of a Culture of Inequality: The Janus Face of Crime in Post-Communist Countries." *Crime, Law and Social Change* 40 (2–3): 295–320. doi:10.1023/A:1025767204705.

Karstedt, Susanne, and Gary LaFree. 2006. "Democracy, Crime, and Justice." *The Annals of the American Academy of Political and Social Science* 605: 6–23.

Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi. 2007. "Worldwide Governance Indicators Project: Answering the Critics." 4149. World Bank Policy Research Working Paper. http://papers.ssrn.com/abstract=965077.

———. 2010. "The Worldwide Governance Indicators: Methodology and Analytical Issues." World Bank Policy Research Working Paper. World Bank. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130.

———. 2011. "The Worldwide Governance Indicators: Methodology and Analytical Issues." *Hague Journal on the Rule of Law* 3 (2): 220–46. doi:10.1017/S1876404511200046.

Keefer, Philip, and Norman Loayza. 2010. "Innocent Bystanders: Developing Countries and the War on Drugs." New York, NY: PalgraveMacmillan and the World Bank. https://openknowledge.worldbank.org/bitstream/handle/10986/2420/536410PUB0Inno101Official0Use0Only1.pdf?sequence=1.

Keeley, Lawrence H. 1996. *War Before Civilization: The Myth of the Peaceful Savage*. New York, NY: Oxford University Press.

Kelling, George L., Mark Harrison Moore, United States Office of Justice Programs, and National Institute of Justice (U.S.). 1988. *The Evolving Strategy of Policing*. U.S. Dept. of Justice, Office of Justice Programs, National Institute of Justice.

Kelly, Morgan. 2000. "Inequality and Crime." *Review of Economics and Statistics* 82 (4): 530–39. doi:10.1162/003465300559028.

Kennedy, Bruce P., Ichiro Kawachi, Deborah Prothrow-Stith, Kimberly Lochner, and Vanita Gupta. 1998. "Social Capital, Income Inequality, and Firearm Violent Crime." *Social Science & Medicine* 47 (1): 7–17. doi:10.1016/S0277-9536(98)00097-5.

Kennedy, Leslie W., Robert A. Silverman, and David R. Forde. 1991. "Homicide in Urban Canada: Testing the Impact of Economic Inequality and Social Disorganization." *The Canadian Journal of Sociology / Cahiers Canadiens de Sociologie* 16 (4): 397–410. doi:10.2307/3340961.

Kenneth E., Leonard, and Theodore Jacob. 1988. "Alcohol, Alcoholism, and Family Violence." In *Handbook of Family Violence*, edited by Vincent B. van Hasselt, Randall L. Morrison, Alan S. Bellack, and Hersen Michel, 383–406. Springer US. http://link.springer.com/chapter/10.1007/978-1-4757-5360-8_16.

Kenney, Michael. 2007. "The Architecture of Drug Trafficking: Network Forms of Organisation in the Colombian Cocaine Trade." *Global Crime* 8 (3): 233–59. doi:10.1080/17440570701507794.

Kerr, Thomas, Will Small, and Evan Wood. 2005. "The Public Health and Social Impacts of Drug Market Enforcement: A Review of the Evidence." *International Journal of Drug Policy* 16 (4): 210–20. doi:10.1016/j.drugpo.2005.04.005.

Kezdi, Gabor. 2003. "Robust Standard Error Estimation in Fixed-Effects Panel Models." SSRN Scholarly Paper ID 596988. Rochester, NY: Social Science Research Network. http://papers.ssrn.com/abstract=596988.

Killias, Martin 1993. "International Correlations between Gun Ownership and Rates of Homicide and Suicide." *CMAJ: Canadian Medical Association Journal* 148 (10): 1721–25.

Kilmer, Beau, Jonathan P. Caulkins, Brittany M. Bond, and Peter H. Reuter. 2010. "Reducing Drug Trafficking Revenues and Violence in Mexico: Would Legalizing Marijuana in California Help?" Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/occasional_papers/OP325.html. Also available in print form.

Kilmer, Beau, Jonathan P. Caulkins, Gregory Midgette, Linden Dahlkemper, Robert J. MacCoun, and Rosalie Liccardo Pacula. 2013. "Before the Grand Opening: Measuring Washington State's Marijuana Market in the Last Year Before Legalized Commercial Sales." Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/research_reports/RR466.html.

Kilmer, Beau, Jonathan P. Caulkins, Rosalie Liccardo Pacula, and Peter H. Reuter. 2011.

"Bringing Perspective to Illicit Markets: Estimating the Size of the U.S. Marijuana Market." *Drug and Alcohol Dependence* 119 (1–2): 153–60.

Kilmer, Beau, Susan S. Everingham, Jonathan P. Caulkins, Gregory Midgette, Rosalie Liccardo Pacula, Peter H. Reuter, Rachel M. Burns, Bing Han, and Russel Lundberg. 2014. "What America's Users Spend on Illegal Drugs: 2000–2010." Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/research_reports/RR534.html.

Kilmer, Beau, and Stijn Hoorens. 2010. "Understanding Illicit Drug Markets, Supply-Reduction Efforts, and Drug-Related Crime in the European Union." Product Page. http://www.rand.org/pubs/technical_reports/TR755.html.

Kilmer, Beau, and Rosalie Liccardo Pacula. 2009. "Estimating the Size of the Global Drug Market: A Demand-Side Approach." Product Page. http://www.rand.org/pubs/technical_reports/TR711.html.

Kilmer, Beau, Peter H. Reuter, and Luca Giommoni. 2015. "What Can Be Learned from Cross-National Comparisons of Data on Illegal Drugs?" *Crime and Justice* 44 (1): 227–96.

Kilmer, Beau, Jirka Taylor, Priscillia Hunt, and Peter McGee. 2013. "Sizing National Heroin Markets in the EU. Insights from Self-Reported Expenditures in the Czech Republic and England." In *Further Insights into Aspects of the EU Illicit Drugs Market*, edited by Franz Trautmann, Beau Kilmer, and Paul Turnbull. Luxembourg: Publications Office of the European Union. http://ec.europa.eu/justice/anti-drugs/files/eu_market_full.pdf.

Kilpatrick, Dean G., R. Acierno, Heidi S. Resnick, Benjamin E. Saunders, and C. L. Best. 1997. "A 2-Year Longitudinal Analysis of the Relationships between Violent Assault and Substance Use in Women." *Journal of Consulting and Clinical Psychology* 65 (5): 834–47.

Kinlock, Timothy W. 1991. "Does Phencyclidine (PCP) Use Increase Violent Crime?" *Journal of Drug Issues* 21 (4): 795–816. doi:10.1177/002204269102100408.

Kitsuse, John I., and David C. Dietrick. 1959. "Delinquent Boys: A Critique." *American Sociological Review* 24 (2): 208–15. doi:10.2307/2089431.

Kleck, Gary. 1997. *Targeting Guns: Firearms and Their Control*. Transaction Publishers.

Kleck, Gary, Tomislav Kovandzic, and Mark Schaffer. 2005. "Gun Prevalence, Homicide Rates and Causality: A GMM Approach to Endogeneity Bias." CEPR Discussion Paper 5357. C.E.P.R. Discussion Papers. http://econpapers.repec.org/paper/cprceprdp/5357.htm.

Kleiman, Mark A. R. 1989. *Marijuana: Costs of Abuse, Costs of Control*. New York: Praeger.

———. 1992. *Against Excess: Drug Policy for Results*. New York, NY: Basic Books.

———. 1997. "Reducing the Prevalence of Cocaine and Heroin Dealing Among

Adolescents." *Valparaiso University Law Review* 31 (2): 551–64.

———. 2004. "Illicit Drugs and the Terrorist Threat: Causal Links and Implications for Domestic Drug Control Policy," 24.

———. 2009. *When Brute Force Fails: How to Have Less Crime and Less Punishment*. Princeton, N.J.; Woodstock: Princeton University Press.

———. 2011. "Surgical Strikes in the Drug Wars. Smarter Policies for Both Sides of the Border." *Foreign Affairs* 89–101 (5): 89–101.

Kleiman, Mark A. R., Jonathan P. Caulkins, and Angela Hawken. 2011. *Drugs and Drug Policy: What Everyone Needs to Know*. 1 edition. Oxford ; New York: Oxford University Press.

Kleiman, Mark A. R., Jonathan P. Caulkins, Angela Hawken, and Beau Kilmer. 2012. "Eight Questions for Drug Policy Research." *Issues in Science and Technology* 28 (4): 79–88.

Kleiman, Mark A. R., Jonathan P. Caulkins, Thomas Jacobson, and Brad Rowe. 2015. "Violence and Drug Control Policy." In *Oxford Textbook of Violence Prevention: Epidemiology, Evidence, and Policy*. Oxford University Press.

Kleiman, Mark A. R., and Kerry D. Smith. 1990. "State and Local Drug Enforcement: In Search of a Strategy." *Crime and Justice* 13: 69–108.

Klein, Malcolm W., Cheryl L. Maxson, and Lea C. Cunningham. 1991. "'Crack,' Street Gangs, and Violence*." *Criminology* 29 (4): 623–50. doi:10.1111/j.1745-9125.1991.tb01082.x.

KLPD. 2012. "National Threat Assessment 2012." Zoetermeer: Information Service of the National Investigation Service.

Knibbe, Ronald A., and Kim Bloomfield. 2001. "Alcohol Consumption Estimates in Surveys in Europe: Comparability and Sensitivity for Gender Differences." *Substance Abuse* 22 (1): 23–38. doi:10.1080/08897070109511443.

Knight, Alan. 2012. "Narco-Violence and the State in Modern Mexico." In *Violence, Coercion, and State-Making in Twentieth-Century Mexico: The Other Half of the Centaur*. Stanford University Press.

Koenen, Karestan C., Jeanne Mager Stellman, Steven D. Stellman, and John F. Sommer. 2003. "Risk Factors for Course of Posttraumatic Stress Disorder among Vietnam Veterans: A 14-Year Follow-up of American Legionnaires." *Journal of Consulting and Clinical Psychology* 71 (6): 980–86. doi:10.1037/0022-006X.71.6.980.

Koonings, Kees, and Dirk Krujit. 1999. *Societies of Fear: The Legacy of Civil War, Violence and Terror in Latin America*. Zed Books.

Kopp, Pierre. 2004. *Political Economy of Illegal Drugs*. Routledge.

Kornhauser, Ruth Rosner. 1978. *Social Sources of Delinquency: An Appraisal of Analytic Model*. Chicago, IL: University of Chicago Press.

Kovandzic, Tomislav V., Mark E. Schaffer, Lynne M. Vieraitis, Erin A. Orrick, and Alex R. Piquero. 2016. "Police, Crime and the Problem of Weak Instruments: Revisiting the 'More Police, Less Crime' Thesis." *Journal of Quantitative Criminology* 32 (1): 133–58. doi:10.1007/s10940-015-9257-6.

Krahn, Harvey, Timothy F. Hartnagel, and John W. Gartrell. 1986. "Income Inequality and Homicide Rates: Cross-National Data and Criminological Theories." *Criminology* 24 (2): 269–94. doi:10.1111/j.1745-9125.1986.tb01496.x.

Kraus, Ludwig, Rita Augustin, Martin Frischer, Petra Kümmler, Alfred Uhl, and Lucas Wiessing. 2003. "Estimating Prevalence of Problem Drug Use at National Level in Countries of the European Union and Norway." *Addiction (Abingdon, England)* 98 (4): 471–85.

Kripfganz, Sebastian, and Claudia Schwarz. 2015. "Estimation of Linear Dynamic Panel Data Models with Time-Invariant Regressors." 1838. European Central Bank. Frankfurt: Social Science Research Network. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2650425.

Krohn, Marvin D. 1976. "Inequality, Unemployment and Crime: A Cross-National Analysis." *The Sociological Quarterly* 17 (3): 303–13.

———. 1978. "A Durkheimian Analysis of International Crime Rates." *Social Forces* 57 (2): 654–70. doi:10.1093/sf/57.2.654.

Krug, Etienne G. 1999. "Injury: A Leading Cause of the Global Burden of Disease." Geneva: World Health Organization. http://apps.who.int/iris/bitstream/10665/66160/1/WHO_HSC_PVI_99.11.pdf.

Krug, Etienne G., James A. Mercy, Linda L. Dahlberg, and Anthony B. Zwi. 2002. "The World Report on Violence and Health." *The Lancet* 360 (9339): 1083–88. doi:10.1016/S0140-6736(02)11133-0.

Krug, Etienne G., Gyanendra K. Sharma, and Rafael Lozano. 2000. "The Global Burden of Injuries." *American Journal of Public Health* 90 (4): 523–26.

Kubrin, Charis E., and Ronald Weitzer. 2003a. "New Directions in Social Disorganization Theory." *Journal of Research in Crime and Delinquency* 40 (4): 374–402. doi:10.1177/0022427803256238.

———. 2003b. "Retaliatory Homicide: Concentrated Disadvantage and Neighborhood Culture." *Social Problems* 50 (2): 157–80. doi:10.1525/sp.2003.50.2.157.

Kubrin, Charis E., and James C. Wo. 2016. "Social Disorganization Theory's Greatest Challenge: Linking Structural Characteristics to Crime in Socially Disorganized Communities." In *The Handbook of Criminological Theory*. Blackwell Publishing.

http://www.blackwellreference.com/public/book?id=g9781118512388_9781118512388.

Kulick, Jonathan, James E. Prieger, and Mark A. R. Kleiman. 2015. "Unintended Consequences of Cigarette Prohibition, Regulation, and Taxation." ID 2630411. http://papers.ssrn.com/abstract=2630411.

Kuziemko, Ilyana, and Steven D Levitt. 2004. "An Empirical Analysis of Imprisoning Drug Offenders." *Journal of Public Economics* 88 (9–10): 2043–66.

Kyvsgaard, Britta. 2004. "Youth Justice in Denmark." *Crime and Justice* 31: 349–90.

Lacey, Marc. 2008. "Grenade Attack in Mexico Breaks From Deadly Script." *The New York Times*. http://www.nytimes.com/2008/09/25/world/americas/25mexico.html.

LaFree, Gary. 1999. "Declining Violent Crime Rates In The 1990s: Predicting Crime Booms and Busts." *Annual Review of Sociology* 25 (1): 145–68. doi:10.1146/annurev.soc.25.1.145.

LaFree, Gary, and Kriss A. Drass. 2002. "Counting Crime Booms Among Nations: Evidence for Homicide Victimization Rates, 1956 to 1998*." *Criminology* 40 (4): 769–800. doi:10.1111/j.1745-9125.2002.tb00973.x.

LaFree, Gary, and Andromachi Tseloni. 2006. "Democracy and Crime: A Multilevel Analysis of Homicide Trends in Forty-Four Countries, 1950-2000." *The ANNALS of the American Academy of Political and Social Science* 605 (1): 25–49. doi:10.1177/0002716206287169.

Lahr, M. Mirazón, F. Rivera, R. K. Power, A. Mounier, B. Copsey, F. Crivellaro, J. E. Edung, et al. 2016. "Inter-Group Violence among Early Holocene Hunter-Gatherers of West Turkana, Kenya." *Nature* 529 (7586): 394–98. doi:10.1038/nature16477.

Land, Kenneth C., Patricia L. McCall, and Lawrence E. Cohen. 1990. "Structural Covariates of Homicide Rates: Are There Any Invariances Across Time and Social Space?" *The American Journal of Sociology* 95 (4): 922–63.

Landefeld, J. Steven. 2000. "GDP: One of the Great Inventions of the 20th Century." *Survey of Current Business*, January. http://www.highbeam.com/doc/1G1-62290079.html.

Landesco, John. 1932. "Crime and the Failure of Institutions in Chicago's Immigrant Areas." *Journal of the American Institute of Criminal Law and Criminology* 23: 238.

Latin American Commission on Drugs and Democracy. 2009. "Drugs and Democracy: Toward a Paradigm Shift." Latin American Commission on Drugs and Democracy. http://www.drogasedemocracia.org/Arquivos/declaracao_ingles_site.pdf.

Lattimore, Pamela K. 1997. *Homicide In 8 U.s. Cities: Trends, Context, And Policy Implications*. DIANE Publishing.

Laufer, William. 2012. *Criminology*. 7th ed. Just the Facts101. Cram101 Textbook Reviews.

Lavine, Rick. 1997. "Psychopharmacological Treatment of Aggression and Violence in the Substance Using Population." *Journal of Psychoactive Drugs* 29 (4): 320–29. doi:10.1080/02791072.1997.10400558.

Law Enforcement Affairs of the United States Department of State. 2015. "2015 International Narcotics Control Strategy Report - Volume I: Drug and Chemical Control." Report. The International Narcotics Control Strategy Report (INCSR). Washington D.C.: Department Of State. The Office of Website Management, Bureau of Public Affairs. http://www.state.gov/j/inl/rls/nrcrpt/2015/.

———. 2016. "2016 International Narcotics Control Strategy Report - Volume I: Drug and Chemical Control." Report. The International Narcotics Control Strategy Report (INCSR). Washington D.C.: Department Of State. The Office of Website Management, Bureau of Public Affairs. http://www.state.gov/j/inl/rls/nrcrpt/2016/vol1/index.htm.

Lederman, Daniel, Norman Loayza, and Ana María Menéndez. 2002. "Violent Crime: Does Social Capital Matter?" *Economic Development and Cultural Change* 50 (3): 509–39. doi:10.1086/edcc.2002.50.issue-3.

Lee, Brianna. 2014. "Mexico's Drug War." Council on Foreign Relations. http://www.cfr.org/mexico/mexicos-drug-war/p13689.

Lee, Matthew R. 2001. "Population Growth, Economic Inequality, and Homicide." *Deviant Behavior* 22 (6): 491–516. doi:10.1080/016396201753227709.

Leeuw, Edith D. de, Joop Hox, and Don Dillman, eds. 2008. *International Handbook of Survey Methodology*. 1 edition. New York; London: Routledge.

Lessing, Benjamin. 2012. "The Logic of Violence in Criminal War: Cartel-State Conflict in Mexico, Colombia, and Brazil." UNIVERSITY OF CALIFORNIA, BERKELEY. http://gradworks.umi.com/35/27/3527063.html.

Levitt, Steven D. 1997. "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime." http://papers.ssrn.com/abstract=10075.

———. 2004. "Understanding Why Crime Fell in the 1990s: Four Factors That Explain the Decline and Six That Do Not." *The Journal of Economic Perspectives* 18 (1): 163–90. doi:10.1257/089533004773563485.

Levitt, Steven D., and Sudhir Alladi Venkatesh. 2000. "An Economic Analysis of a Drug-Selling Gang's Finances." *The Quarterly Journal of Economics* 115 (3): 755–89.

Levitt, Steven D., and Mauricio Rubio. 2005. "Understanding Crime in Colombia and What Can Be Done about It." In *Institutional Reforms: The Case of Colombia*. MIT Press.

Leyton, Elliott. 1995. *Men of Blood: Murder in Modern England*. 1St Edition edition. Constable.

Light, Michael T., and Casey T. Harris. 2012. "Race, Space, and Violence: Exploring Spatial Dependence in Structural Covariates of White and Black Violent Crime in US Countries." *Journal of Quantitative Criminology*, on-line publication.

Lilly, J. Robert, Francis T. Cullen, and Richard A. Ball. 1989. *Criminological Theory: Context and Consequences*. Thousand Oaks, CA: SAGE Publications, Inc.

Lin, Ming-Jen. 2007. "Does Democracy Increase Crime? The Evidence from International Data." *Journal of Comparative Economics* 35 (3): 467–83. doi:10.1016/j.jce.2007.06.001.

Lind, Jo T., Karl O. Moene, and Fredrik Willumsen. 2009. "Opium for the Masses? Conflict-Induced Narcotics Production in Afghanistan." SSRN Scholarly Paper ID 1357242. Rochester, NY: Social Science Research Network. http://papers.ssrn.com/abstract=1357242.

Lind, Jo T., Karl O. Moene, and Fredrik Willumsen. 2013. "Opium for the Masses? Conflict-Induced Narcotics Production in Afghanistan." *Review of Economics and Statistics* 96 (5): 949–66. doi:10.1162/REST_a_00418.

Lintner, Bertil. 1999. *Burma in Revolt: Opium and Insurgency Since 1948*. Silkworm Books.

Lippert, Owen, and Michael Walker. 1997. "The Underground Economy." Vancouver: The Fraser Institute. https://www.fraserinstitute.org/sites/default/files/UndergroundEconomy.pdf#page=33.

Liska, Allen E., and Paul E. Bellair. 1995. "Violent-Crime Rates and Racial Composition: Covergence Over Time." *American Journal of Sociology* 101 (3): 578–610.

Loftin, Colin. 1986. "Assaultive Violence as a Contagious Social Process." *Bulletin of the New York Academy of Medicine* 62 (5): 550–55.

Loftin, Colin, and Robert H. Hill. 1974. "Regional Subculture and Homicide: An Examination of the Gastil-Hackney Thesis." *American Sociological Review* 39 (5): 714–24. doi:10.2307/2094316.

Lombroso, Cesare. 1876. *L'uomo Delinquente*. Milano: Hoepli.

Lopes, Claudia S., Eduardo Faerstein, Dóra Chor, and Guilherme L. Werneck. 2008. "Higher Risk of Common Mental Disorders after Experiencing Physical Violence in Rio de Janeiro, Brazil: The Pró-Saúde Study." *The International Journal of Social Psychiatry* 54 (2): 112–17.

Louwage, Florent E. 1951. "Delinquency in Europe after World War II." *Journal of Criminal Law and Criminology* 42 (1): 53.

Lu, Natalie T., Bruce G. Taylor, and K. Jack Riley. 2001. "The Validity of Adult Arrestee Self-Reports of Crack Cocaine Use*." *The American Journal of Drug and Alcohol Abuse* 27 (3): 399–419. doi:10.1081/ADA-100104509.

Lynch, James P. 1995. "Crime in International Perspective." In *Crime and Public Policy*, by James Q. Wilson and Joan Petersilia. San Francisco, CA: ICS Press.

MacCoun, Robert, Beau Kilmer, and Peter H. Reuter. 2003. "Research on Drugs-Crime Linkages: The Next Generation." Drugs and Crime: A Research Agenda for the 21st Century. Washington, DC: US Department of Justice. https://www.ncjrs.gov/pdffiles1/nij/194616c.pdf.

MacCoun, Robert, and Peter H. Reuter. 2001a. *Drug War Heresis: Learning from Other, Vices, Times, & Places*. New York: Cambridge University Press.

———. 2001b. "Evaluating Alternative Cannabis Regimes." *The British Journal of Psychiatry* 178 (2): 123–28. doi:10.1192/bjp.178.2.123.

MacDonald, John Marshall. 1961. *The Murderer and His Victim*. 1St Edition. Springfield, IL: Charles C Thomas Pub Ltd.

Madeira, Luís Filipe, Stéphane Laurent, and Sílvia Roque. 2011. "The International Cocaine Trade in Guinea-Bissau: Current Trends and Risks." Noref Working Paper. Oslo: Norwegian Peacebuilding Centre. http://noref.no/var/ezflow_site/storage/original/application/7563aa361160ef275ddd4f0812c6f41e.pdf.

Maguire, Mike, Rod Morgan, and Robert Reiner. 2007. *The Oxford Handbook of Criminology*. 4 edizione. Oxford: OUP Oxford.

Magura, Stephen, and Sung-Yeon Kang. 1997. "The Validity of Self-Reported Cocaine Use in Two High-Risk Populations." *NIDA Research Monograph* 167: 227–46.

Maher, Lisa, and David Dixon. 1999. "Policing and Public Health: Law Enforcement and Harm Minimization in a Street-Level Drug Market." *The British Journal of Criminology* 39 (4): 488–512.

———. 2001. "The Cost of Crackdowns: Policing Cabramatta's Heroin Market." *Current Issues in Criminal Justice* 13 (1): 5.

Manning, Peter. 1978. "The Police: Mandate, Strategies and Appearances." In *Policing: A View from the Street*, edited by Peter Manning and John van Maanen. Santa Monica, CA: Goodyear.

Markowitz, Sara. 2005. "Alcohol, Drugs and Violent Crime." *International Review of Law and Economics* 25 (1): 20–44. doi:10.1016/j.irle.2005.05.003.

Marks, Howard. 1997. *Mr. Nice: An Autobiography*. London: Vintage.

Marshall, Monty G. 2016. "Major Episodes of Political Violence (MEPV) and Conflict Regions, 1946-2015." Center for Systemic Peace. http://www.systemicpeace.org/inscr/MEPVcodebook2015.pdf.

Martin, Ian, Anita Palepu, Evan Wood, Kathy Li, Julio Montaner, and Thomas Kerr. 2009. "Violence among Street-Involved Youth: The Role of Methamphetamine." *European Addiction Research* 15 (1): 32–38. doi:10.1159/000173007.

Martínez Ortiz, Astrid. 2001. "Análisis Económico de La Violencia En Colombia. Nota Sobre La Literatura." *Cuadernos de Economía* 20 (34): 157–87.

Marx, Gary T. 1988. *Undercover: Police Surveillance in America*. University of California Press.

Marx, Karl. 1853. "Capital Punishment.— Mr. Cobden's Pamphlet.— Regulations of the Bank of England." *New York Daily Tribune*, February 18. https://www.marxists.org/archive/marx/works/1853/02/18.htm.

———. 1859a. *A Contribution to the Critique of Political Economy*.

———. 1859b. "Europe: Population, Crime, and Pauperism." *New York Daily Tribune*, September 16.

Massey, Douglas S. 1990. "American Apartheid: Segregation and the Making of the Underclass." *American Journal of Sociology* 96 (2): 329–57.

May, Tiggey, and Michael Hough. 2001. "Illegal Dealings: The Impact of Low-Level Police Enforcement on Drug Markets." *European Journal on Criminal Policy and Research* 9 (2): 137–62. doi:10.1023/A:1011201112490.

Mayer, Susan E., and Ankur Sarin. 2005. "Some Mechanisms Linking Economic Inequality and Infant Mortality." *Social Science & Medicine (1982)* 60 (3): 439–55. doi:10.1016/j.socscimed.2004.06.005.

Mazzitelli, Antonio L. 2011. "The New Transatlantic Bonanza: Cocaine on Highway 10." *Western Hemisphere Security Analysis Center*, March. http://digitalcommons.fiu.edu/whemsac/22.

McBride, Duane C., and Clyde B. McCoy. 1982. "Crime and Drugs: The Issues and Literature." *Journal of Drug Issues* 12 (2): 137–52. doi:10.1177/002204268201200202.

———. 1993. "The Drugs-Crime Relationship: An Analytical Framework." *The Prison Journal* 73 (3): 257–78. doi:10.1177/0032855593073003002.

McCall, Patricia L., and Paul Nieuwbeerta. 2007. "Structural Covariates of Homicide Rates A European City Cross-National Comparative Analysis." *Homicide Studies* 11 (3): 167–88. doi:10.1177/1088767907304072.

McCall, Patricia L., Karen F. Parker, and John M. MacDonald. 2008. "The Dynamic Relationship between Homicide Rates and Social, Economic, and Political Factors from 1970 to 2000." *Social Science Research* 37 (3): 721–35. doi:10.1016/j.ssresearch.2007.09.007.

McCarthy, Dennis M. P. 2011. *An Economic History of Organized Crime*. New York, NY: Routledge.

McCollister, Kathryn E., Michael T. French, and Hai Fang. 2010. "The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation." *Drug and Alcohol Dependence* 108 (1–2): 98–109. doi:10.1016/j.drugalcdep.2009.12.002.

McCoy, H. Virginia, James A. Inciardi, Lisa R. Metsch, and Anne E. Pottieger. 1995. "Women, Crack, and Crime: Gender Comparisons of Criminal Activity among Crack Cocaine Users." *Contemporary Drug Problems* 22: 435.

McDonald, Lynn. 1976. *The Sociology of Law and Order*. Montreal; Boulder, Colo.: Westview Press.

McGee, Kara, Margie Peden, Rick Waxweiler, and David Sleet. 2003. "Injury Surveillance." *Injury Control and Safety Promotion* 10 (1–2): 105–8. doi:10.1076/icsp.10.1.105.14118.

McGinty, Emma E., Seema Choksy, and Garen J. Wintemute. 2016. "The Relationship Between Controlled Substances and Violence." *Epidemiologic Reviews*, February, mxv008. doi:10.1093/epirev/mxv008.

McIlwaine, Cathy, and Caroline O. N. Moser. 2001. "Violence and Social Capital in Urban Poor Communities: Perspectives from Colombia and Guatemala." *Journal of International Development* 13 (7): 965–84. doi:10.1002/jid.815.

McKetin, Rebecca, Dan I. Lubman, Jake M. Najman, Sharon Dawe, Peter Butterworth, and Amanda L. Baker. 2014. "Does Methamphetamine Use Increase Violent Behaviour? Evidence from a Prospective Longitudinal Study." *Addiction (Abingdon, England)* 109 (5): 798–806. doi:10.1111/add.12474.

McLaughlin, Eugene, and John Muncie. 2001. *The SAGE Dictionary of Criminology*. London: SAGE Publications, Inc.

Mejía, Daniel, and Carlos Esteban Posada. 2008. "Cocaine Production and Trafficking: What Do We Know?" Borradores de Economia 444. Banco de la Republica de Colombia. http://ideas.repec.org/p/bdr/borrec/444.html.

Mejía, Daniel, and Pascual Restrepo. 2013. "Bushes and Bullets: Illegal Cocaine Markets and Violence in Colombia." *Documentos CEDE* 2013 (53). http://crimelab.stanford.edu/clftp/uploads/182/7448.pdf.

———. 2014. "Why Is Strict Prohibition Collapsing? A Perspective from Producer and Transit Countries." In *Ending the Drug Wars*. London, UK: LSE IDEAS. http://www.lse.ac.uk/ideas/publications/reports/pdf/lse-ideas-drugs-report-final-web.pdf.

Meldrum, Ryan C., Alex R. Piquero, and Jim Clark. 2013. "Does Low Self-Control Predict Fictitious Drug Use and Untruthfulness?" *Deviant Behavior* 34 (3): 242–54. doi:10.1080/01639625.2012.707555.

Méndez, Fabio, and Facundo Sepúlveda. 2006. "Corruption, Growth and Political Regimes: Cross Country Evidence." *European Journal of Political Economy* 22 (1): 82–98. doi:10.1016/j.ejpoleco.2005.04.005.

Mendez, Juan E., Guillermo A. O'Donnell, and Paulo Sergio Pinheiro, eds. 1999. *The*. Notre Dame, Ind: University of Notre Dame Press.

Merriman, David. 2002. "Understand, Measure, and Combat Tobacco Smuggling." Economics of Tobacco Toolkit. Washington, DC: The World Bank. http://siteresources.worldbank.org/INTPH/Resources/7Smuggling.pdf.

Merton, Robert King. 1938. "Social Structure and Anomie." *American Sociological Review* 3 (5): 672–82. doi:10.2307/2084686.

———. 1949. *Social Theory and Social Structure*. Simon and Schuster.

Mesquida, Christian G., and Neil I. Wiener. 1996. "Human Collective Aggression: A Behavioral Ecology Perspective." *Ethology and Sociobiology* 17 (4): 247–62. doi:10.1016/0162-3095(96)00035-0.

Messner, Steven F. 1982a. "Poverty, Inequality, and the Urban Homicide Rate: Some Unexpected Findings." *Criminology* 20 (1): 103–14. doi:10.1111/j.1745-9125.1982.tb00450.x.

———. 1982b. "Societal Development, Social Equality, and Homicide: A Cross-National Test of a Durkheimian Model." *Social Forces* 61 (1): 225–40. doi:10.1093/sf/61.1.225.

———. 1983a. "Regional and Racial Effects on the Urban Homicide Rate: The Subculture of Violence Revisited." *American Journal of Sociology* 88 (5): 997–1007.

———. 1983b. "Regional Differences in the Economic Correlates of the Urban Homicide Rate." *Criminology* 21 (4): 477–88. doi:10.1111/j.1745-9125.1983.tb00275.x.

———. 1989. "Economic Discrimination and Societal Homicide Rates: Further Evidence on the Cost of Inequality." *American Sociological Review* 54 (4): 597–611. doi:10.2307/2095881.

Messner, Steven F., Lawrence E. Raffalovich, and Peter Shrock. 2002. "Reassessing the Cross-National Relationship Between Income Inequality and Homicide Rates: Implications of Data Quality Control in the Measurement of Income Distribution." *Journal of Quantitative Criminology* 18 (4): 377–95. doi:10.1023/A:1021169610837.

Messner, Steven F., Lawrence E. Raffalovich, and Gretchen M. Sutton. 2010. "Poverty, Infant Mortality, and Homicide Rates in Cross-National Perspective: Assessments of Criterion and Construct Validity." *Criminology* 48 (2): 509–37. doi:10.1111/j.1745-9125.2010.00194.x.

Messner, Steven F., and Richard Rosenfeld. 1997. "Political Restraint of the Market and Levels of Criminal Homicide: A Cross-National Application of Institutional-Anomie

Theory." *Social Forces* 75 (4): 1393–1416. doi:10.1093/sf/75.4.1393.

Midanik, Lorraine. 1982. "The Validity of Self-Reported Alcohol Consumption and Alcohol Problems: A Literature Review." *British Journal of Addiction* 77 (4): 357–82. doi:10.1111/j.1360-0443.1982.tb02469.x.

Mieczkowski, Thomas M. 1994. "The Experiences of Women Who Sell Crack: Some Descriptive Data from the Detroit Crack Ethnography Project." *Journal of Drug Issues* 24 (2): 227–48. doi:10.1177/002204269402400203.

———. 1996. "The Prevalence of Drug Use in the United States." *Crime and Justice* 20: 349–414.

Miethe, Terance D., Michael Hughes, and David McDowall. 1991. "Social Change and Crime Rates: An Evaluation of Alternative Theoretical Approaches." *Social Forces* 70 (1): 165–85. doi:10.1093/sf/70.1.165.

Miguel, Edward, Shanker Satyanath, and Ernest Sergenti. 2004. "Economic Shocks and Civil Conflict: An Instrumental Variables Approach." *Journal of Political Economy* 112 (4): 725–53.

Miller, Jody. 1998. "Up It up: Gender and the Accomplishment of Street Robbery*." *Criminology* 36 (1): 37–66. doi:10.1111/j.1745-9125.1998.tb01239.x.

Miller, Ted R., David T. Levy, Mark A. Cohen, and Kenya L. C. Cox. 2006. "Costs of Alcohol and Drug-Involved Crime." *Prevention Science* 7 (4): 333–42. doi:10.1007/s11121-006-0041-6.

Miller, Walter B. 1958. "Lower Class Culture as a Generating Milieu of Gang Delinquency." *Journal of Social Issues* 14 (3): 5–19. doi:10.1111/j.1540-4560.1958.tb01413.x.

Miroff, Nick, and William Booth. 2010. "Mexican Drug Cartels Bring Violence with Them in Move to Central America." *The Washington Post*, July 27, sec. World. http://www.washingtonpost.com/wp-dyn/content/article/2010/07/26/AR2010072605661.html.

Miron, Jeffrey A. 1999. "Violence and the U.S. Prohibitions of Drugs and Alcohol." *American Law and Economics Review* 1 (1): 78–114. doi:10.1093/aler/1.1.78.

———. 2001. "Violence, Guns, and Drugs: A Cross-Country Analysis." http://www.freerepublic.com/focus/news/713887/posts.

Miron, Jeffrey A., and Jeffrey Zwiebel. 1995. "The Economic Case Against Drug Prohibition." *Journal of Economic Perspectives* 9 (4): 175–92. doi:10.1257/jep.9.4.175.

Mitra, Amitava. 2006. "Multicollinearity." In *Encyclopedia of Measurement and Statistics*, by Neil J. Salkind, 1:638–40. Thousand Oaks, CA: SAGE Publications.

Moeller, Kim. 2012. "Costs and Revenues in Street-Level Cannabis Dealing." *Trends in*

Organized Crime 15 (1): 31–46. doi:10.1007/s12117-011-9146-9.

Moeller, Kim, and Morten Hesse. 2013. "Drug Market Disruption and Systemic Violence: Cannabis Markets in Copenhagen." *European Journal of Criminology*, January, 1477370812467568. doi:10.1177/1477370812467568.

Mohapatra, Nalin Kumar. 2007. "Political and Security Challenges in Central Asia The Drug Trafficking Dimension." *International Studies* 44 (2): 157–74. doi:10.1177/002088170704400205.

Montenegro, A., and C.E. Posada. 1995. "Criminalidad En Colombia." *Coyuntura Económica* 25 (1): 81–100.

Moore, Mark Harrison, and Mark A. R. Kleiman. 1989. "The Police and Drugs." 11. U.S. Dept. of Justice, Office of Justice Programs, National Institute of Justice. https://www.ncjrs.gov/pdffiles1/nij/117447.pdf.

Moore, Timothy J., Jonathon P. Caulkins, Alison Ritter, Shannon Monagle, and Jonathon Pruden. 2005. "Monograph No. 09: Heroin Markets in Australia: Current Understandings and Future Possibilities." DPMP Monograph Series. Fitzroy: Turning Point Alcohol and Drug Centre.

Moore, Todd M., and Gregory L. Stuart. 2005. "A Review of the Literature on Marijuana and Interpersonal Violence." *Aggression and Violent Behavior* 10 (2): 171–92. doi:10.1016/j.avb.2003.10.002.

Morenoff, Jeffrey D., and Robert J. Sampson. 1997. "Violent Crime and the Spatial Dynamics of Neighborhood Transition: Chicago, 1970-1990." *Social Forces* 76 (1): 31–64.

Morselli, Carlo. 2009a. "Hells Angels in Springtime." *Trends in Organized Crime* 12 (2): 145–58.

———. 2009b. *Inside Criminal Networks*. Studies of Organized Crime. New York, NY: Springer.

Moser, Caroline O. N., S Lister, Cathy McIlwaine, E. Shrader, and A. Tornqvist. 1999. *Violence in Colombia: Building Sustainable Peace and Social Capital*. World Bank Publications.

Murray, Joseph, Daniel Ricardo de Castro Cerqueira, and Tulio Kahn. 2013. "Crime and Violence in Brazil: Systematic Review of Time Trends, Prevalence Rates and Risk Factors." *Aggression and Violent Behavior* 18 (5): 471–83. doi:10.1016/j.avb.2013.07.003.

Murray, Michael P. 2006. "Avoiding Invalid Instruments and Coping with Weak Instruments." *The Journal of Economic Perspectives* 20 (4): 111–32.

Musto, David F. 1973. *The American Disease. Origins of Narcotic Control*. New Haven, CT: Yale University Press.

Nadanovsky, Paulo, and Joana Cunha-Cruz. 2009. “The Relative Contribution of Income Inequality and Imprisonment to the Variation in Homicide Rates among Developed (OECD), South and Central American Countries.” *Social Science & Medicine (1982)* 69 (9): 1343–50. doi:10.1016/j.socscimed.2009.08.013.

Nadelmann, Ethan. 1989. *Latin America and the Drug Trade*. Britannica Book of the Year.

Naik, Ashich V., Alok Baveja, Rajan Batta, and Jonathan P. Caulkins. 1996. “Scheduling Crackdowns on Illicit Drug Markets.” *European Journal of Operational Research* 88 (2): 231–50. doi:10.1016/0377-2217(94)00201-0.

Nannicini, Tommaso. 2010. “Estensioni Del Modello Lineare.” Milan: Universit`a Bocconi. http://www.tommasonannicini.eu/media/courses/files/appunti_econometria_2.pdf.

Nash, Jay Robert. 1992. *Dictionary of Crime: Criminal Justice, Criminology, and Law Enforcement*. Rowman & Littlefield.

Natarajan, Mangai. 2000. “Understanding the Structure of a Drug Trafficking Organization: A Conversational Analysis. Crime Prevention Studies.” In *Illegal Drug Markets: From Research to Prevention Policy. Crime Prevention Studies*, 11:273–298. Monsey, NY: Criminal Justice Press/Willow Tree Press.

Natarajan, Mangai, Marco Zanella, and Christopher Yu. 2015. “Classifying the Variety of Drug Trafficking Organizations.” *Journal of Drug Issues*, 22042615603391. doi:10.1177/0022042615603391.

Neapolitan, Jerome L. 1994. “Cross-National Variation in Homicides: The Case of Latin America.” *International Criminal Justice Review* 4 (1): 4–22. doi:10.1177/105756779400400102.

———. 1996. “Cross-National Crime Data: Some Unaddressed Problems.” *Journal of Crime and Justice* 19 (1): 95–112. doi:10.1080/0735648X.1996.9721531.

———. 1997. *Cross-National Crime: A Research Review and Sourcebook*. Greenwood Publishing Group.

———. 1998. “Cross-National Variation in Homicides: Is Race a Factor?” *Criminology* 36 (1): 139–56. doi:10.1111/j.1745-9125.1998.tb01243.x.

———. 1999. “A Comparative Analysis of Nations with Low and High Levels of Violent Crime.” *Journal of Criminal Justice* 27 (3): 259–74. doi:10.1016/S0047-2352(98)00064-6.

Nettler, Gwynn. 1978. *Explaining Crime*. New York, NY: McGraw-Hill Inc.

Neuman, W. Lawrence, and Ronald J. Berger. 1988. “Competing Perspectives on Cross-National Crime: An Evaluation of Theory and Evidence.” *The Sociological Quarterly* 29 (2): 281–313.

Neumayer, Eric. 2003. “Good Policy Can Lower Violent Crime: Evidence from a Cross-National Panel of Homicide Rates, 1980–97.” *Journal of Peace Research* 40 (6): 619–40. doi:10.1177/00223433030406001.

Newman, Mark E.J. 2004. “Analysis of Weighted Networks.” *Physical Review E* 70 (5). doi:10.1103/PhysRevE.70.056131.

Nickell, Stephen. 1981. “Biases in Dynamic Models with Fixed Effects.” *Econometrica* 49 (6): 1417. doi:10.2307/1911408.

Nicol, Andrew, Lisa Marie Knowlton, Nadine Schuurman, Richard Matzopoulos, Eiman Zargaran, Jonathan Cinnamon, Vanessa Fawcett, Tracey Taulu, and S. Morad Hameed. 2014. “Trauma Surveillance in Cape Town, South Africa: An Analysis of 9236 Consecutive Trauma Center Admissions.” *JAMA Surgery* 149 (6): 549–56. doi:10.1001/jamasurg.2013.5267.

Núñez, Luis García. 2010. “Economía de Evaluación de Impacto.” 238. Documento de Trabajo. Lima, Peru: Departamento de Economía – Pontificia Universidad Católica del Perú. http://departamento.pucp.edu.pe/economia/images/documentos/DDD283.pdf.

OAS. 2008. “Results from the 2008 National Survey on Drug Use and Health, National Findings.” Rockville, MD: US Department of Health and Human Services. http://www.dpft.org/resources/NSDUHresults2008.pdf.

Olcott, Martha Brill, and Natalia Udalova. 2000. “Drug Trafficking on the Great Silk Road: The Security Environment in Central Asia.” 11. Working Paper. Washington, D.C.: Carnegie Endowment for International Peace. http://carnegieendowment.org/files/drugs.pdf.

ONDCP. 2000. “The National Drug Control Strategy: 2000 Annual Report.” Washington, D.C.: Office of National Drug Control Policy. https://www.ncjrs.gov/ondcppubs/publications/policy/ndcs00/strategy2000.pdf.

———. 2008. “The Price and Purity of Illicit Drugs: 1981-2007.” Alexandria, Virginia: Institute for Defense Analysis. https://www.whitehouse.gov/sites/default/files/ondcp/policy-and-research/price_purity_tech_rpt07.pdf.

———. 2012. “What America’s Users Spend on Illegal Drugs: 2000-2006.” Washington D.C.: Executive Office of the President, Office of National Drug Control Policy. https://www.whitehouse.gov/sites/default/files/page/files/wausid_report_final_1.pdf.

ONDCP, and Abt Associates. 2001. “What America’s Users Spend on Illegal Drugs: 1988-2000.” Washington D.C.: Executive Office of the President, Office of National Drug Control Policy. https://www.ncjrs.gov/ondcppubs/publications/pdf/american_users_spend_2002.pdf.

Ortega, Suzanne T., Jay Corzine, Cathleen Burnett, and Tracey Poyer. 1992. “Modernization, Age Structure, and Regional Context: A Cross-national Study of Crime.” *Sociological*

Spectrum 12 (3): 257–77. doi:10.1080/02732173.1992.9982000.

Oser, Carrie B., Jennifer Mooney Palmer, Michele Staton Tindall, and Carl G. Leukefeld. 2009. "The Drugs-Violence Nexus among Rural Felony Probationers." *Journal of Interpersonal Violence* 24 (8): 1285–1303. doi:10.1177/0886260508322183.

Osorio, Javier. 2013. "Democratization and Drug Violence in Mexico," 69.

———. 2015. "The Contagion of Drug Violence Spatiotemporal Dynamics of the Mexican War on Drugs." *Journal of Conflict Resolution* 59 (8): 1403–32. doi:10.1177/0022002715587048.

Otieno, George, Edmore Marinda, Till Bärnighausen, and Frank Tanser. 2015. "High Rates of Homicide in a Rural South African Population (2000-2008): Findings from a Population-Based Cohort Study." *Population Health Metrics* 13: 20. doi:10.1186/s12963-015-0054-0.

Ousey, Graham C. 1999. "Homicide, Structural Factors, and the Racial Invariance Assumption." *Criminology* 37 (2): 405–26. doi:10.1111/j.1745-9125.1999.tb00491.x.

———. 2000. "Explaining Regional and Urban Variation in Crime: A Review of Research." In *The Nature of Crime: Continuity and Change*, by Janet Reno, Daniel Marcus, Mary Lou Leary, and Julie E. Samuels, 1:261–308. Washington D.C.: U.S. Department of Justice, Office of Justice Programs, National Institute of Justice.

Ousey, Graham C., and Matthew R. Lee. 2002. "Examining the Conditional Nature of the Illicit Drug Market-Homicide Relationship: A Partial Test of the Theory of Contingent Causation." *Criminology* 40 (1): 73–102. doi:10.1111/j.1745-9125.2002.tb00950.x.

———. 2004. "Investigating the Connections Between Race, Illicit Drug Markets, and Lethal Violence, 1984-1997." *Journal of Research in Crime and Delinquency* 41 (4): 352–83. doi:10.1177/0022427803262059.

———. 2007. "Homicide Trends and Illicit Drug Markets: Exploring Differences Across Time." *Justice Quarterly* 24 (1): 48–79. doi:10.1080/07418820701200976.

Ousey, Graham C., and Pamela Wilcox. 2005. "Subcultural Values and Violent Delinquency A Multilevel Analysis in Middle Schools." *Youth Violence and Juvenile Justice* 3 (1): 3–22. doi:10.1177/1541204004270942.

Owens, Emily Greene. 2011. "Are Underground Markets Really More Violent? Evidence from Early 20th Century America." *American Law and Economics Review* 13 (1): 1–44. doi:10.1093/aler/ahq017.

Oxford Dictionaries. 2016. "Definition of Drug in English." http://www.oxforddictionaries.com/definition/english/drug.

Pacula, Rosalie Liccardo, and Beau Kilmer. 2003. "Marijuana and Crime: Is There a Connection Beyond Prohibition?" Working Paper 10046. National Bureau of Economic

Research. http://www.nber.org/papers/w10046.

Painter, James. 1994. *Bolivia and Coca; A Study in Dependency*. United Nations University Press.

Palomo, Jesús, Jerónimo Márquez, and Pilar Laguna. 2016. "From Drug Trafficking to Wholesale Trade Business. Organised Crime Infiltration in Spain." In *Organised Crime in European Businesses*, edited by Ernesto U. Savona, Michele Riccardi, and Giulia Berlusconi, 64–83. Routledge.

Pampel, Fred C., and Rosemary Gartner. 1995. "Age Structure, Socio-Political Institutions, and National Homicide Rates." *European Sociological Review* 11 (3): 243–60.

Paoli, Letizia. 1994. "An Underestimated Criminal Phenomenon: The Calabrian 'Ndrangheta." *European Journal of Crime, Criminal Law and Criminal Justice* 2 (3): 212–38.

———. 2001. "Drug Trafficking in Russia: A Form of Organized Crime?" *Journal of Drug Issues* 31 (4): 1007–37. doi:10.1177/002204260103100411.

———. 2002. "The Paradoxes of Organized Crime." *Crime, Law and Social Change* 37 (1): 51–97. doi:10.1023/A:1013355122531.

———. 2004. "The Illegal Drugs Market." *Journal of Modern Italian Studies* 9 (2): 186–207.

Paoli, Letizia, Victoria A. Greenfield, and Peter H. Reuter. 2009. *The World Heroin Market: Can Supply Be Cut?* Oxford University Press.

Paoli, Letizia, Victoria A. Greenfield, and Andries Zoutendijk. 2013. "The Harms of Cocaine Trafficking: Applying a New Framework for Assessment." *Journal of Drug Issues*, February, 22042613475614. doi:10.1177/0022042613475614.

Paoli, Letizia, and Peter H. Reuter. 2008. "Drug Trafficking and Ethnic Minorities in Western Europe." *European Journal of Criminology* 5 (1): 13–37. doi:10.1177/1477370807084223.

Parekh, Ranna. 2015. "What Is Addiction?" American Psychiatric Association. https://www.psychiatry.org/patients-families/addiction/what-is-addiction.

Parey, Matthias, and Imran Rasul. 2015. "Measuring the Market Size for Cannabis: A New Approach Using Forensic Economics." http://www.ucl.ac.uk/~uctpimr/research/forensic.pdf.

Park, Robert E., Ernest W. Burgess, and Roderick D. McKenzie. 1925. *The City*. Chicago, IL: Chicago University Press.

Parker, Karen F., Patricia L. McCall, and Kenneth C. Land. 1999. "Determining Social-Structural Predictors of Homicide: Units of Analysis and Related Methodological Concerns." In *Homicide: A Sourcebook of Social Research*, by M. Dwayne Smith and

Margaret A. Zahn, 107–24. Thousand Oaks, CA: SAGE Publications.

Parker, Robert Nash, and Kathleen Auerhahn. 1998. "Alcohol, Drugs, and Violence." *Annual Review of Sociology* 24: 291–311.

Parker, Robert Nash, and M. Dwayne Smith. 1979. "Deterrence, Poverty, and Type of Homicide." *American Journal of Sociology* 85 (3): 614–24.

Parra, Clara E. 1998. "Determinantes de La Inversión En Colombia: Evidencia Sobre El Capital Humano Y La Violencia." 84. Archivos de Economía. Departamento Nacional de Planeación.

Pastore, Doris R., Martin Fisher, and Stanford B. Friedman. 1996. "Violence and Mental Health Problems among Urban High School Students." *Journal of Adolescent Health* 18 (5): 320–24. doi:10.1016/1054-139X(95)00063-X.

Pearsons, Geoffrey, and Dick Hobbs. 2001. "Middle Market Drug Distribution." London: Home Office.

Pecaut, Daniel, and Liliana González. 1997. "Presente, Pasado Y Futuro de La Violencia En Colombia." *Desarrollo Económico* 36 (144): 891. doi:10.2307/3467131.

Pedroni, Peter L., and Concepcion Verdugo. 2011. "The Relationship Between Illicit Coca Production and Formal Economic Activity in Peru." IMF Working Paper 11/182. Washington D.C.: International Monetary Fund. https://www.imf.org/external/pubs/ft/wp/2011/wp11182.pdf.

Peri, Giovanni. 2004. "Socio-Cultural Variables and Economic Success: Evidence from Italian Provinces 1951-1991." *The B.E. Journal of Macroeconomics* 4 (1): 1–36.

Pernanen, Kai. 1991. *Alcohol in Human Violence*. Vol. xiii. The Guilford Substance Abuse Series. New York, NY, US: Guilford Press.

Peterson, Dana, Terrance J. Taylor, and Finn-Aage Esbensen. 2004. "Gang Membership and Violent Victimization." *Justice Quarterly* 21 (4): 793–815. doi:10.1080/07418820400095991.

Peterson, Ruth D., and Lauren J. Krivo. 1993. "Racial Segregation and Black Urban Homicide." *Social Forces* 71 (4): 1001–26. doi:10.2307/2580128.

Peyrouse, Sébastien. 2012. "Drug Trafficking in Central Asia – A Poorly Considered Fight?" 218. Policy Memo. PONARS Eurasia. https://www.gwu.edu/~ieresgwu/assets/docs/ponars/pepm_218_Peyrouse_Sept2012.pdf.

Piazza, James A. 2011. "The Illicit Drug Trade, Counternarcotics Strategies and Terrorism." *Public Choice* 149 (3–4): 297–314. doi:10.1007/s11127-011-9846-3.

Pinker, Steven. 2011. *The Better Angels of Our Nature: Why Violence Has Declined*. First

Edition edition. New York: Viking.

Pinotti, Paolo. 2011. "The Economic Costs of Organized Crime: Evidence from Southern Italy." Rome, Italy: Bank of Italy and Italian Antimafia Commission. https://www.cesifo-group.de/portal/pls/portal/!PORTAL.wwpob_page.show?_docname=1207335.PDF.

Piomelli, Daniele. 2014. "Neurobiology of Marijuana." In *Textbook of Substance Abuse Treatment*, 335–50. American Psychiatric Pub.

Plowman, Timothy. 1979. "Botanical Perspectives on Coca." *Journal of Psychedelic Drugs* 11 (1–2): 103–17.

Poveda, Alexander Cotte. 2011. "Economic Development, Inequality and Poverty: An Analysis of Urban Violence in Colombia." *Oxford Development Studies* 39 (4): 453–68. doi:10.1080/13600818.2011.620085.

Powell, Michael. 2011. "A Comprehensive Analysis of the Drug-Crime Relationship." *Research Papers*. http://opensiuc.lib.siu.edu/gs_rp/100.

Pratt, Travis C., and Francis T. Cullen. 2005. "Assessing Macro-Level Predictors and Theories of Crime: A Meta-Analysis." *Crime and Justice* 32: 373–450.

Pratt, Travis C., and Timothy W. Godsey. 2003. "Social Support, Inequality, and Homicide: A Cross-National Test of an Integrated Theoretical Model*." *Criminology* 41 (3): 611–44. doi:10.1111/j.1745-9125.2003.tb00999.x.

Prichard, Jeremy, Wayne Hall, Pim de Voogt, and Ettore Zuccato. 2014. "Sewage Epidemiology and Illicit Drug Research: The Development of Ethical Research Guidelines." *The Science of the Total Environment* 472 (February): 550–55. doi:10.1016/j.scitotenv.2013.11.039.

Pridemore, William Alex. 2008. "A Methodological Addition to the Cross-National Empirical Literature on Social Structure and Homicide: A First Test of the Poverty-Homicide Thesis." *Criminology* 46 (1): 133–54. doi:10.1111/j.1745-9125.2008.00106.x.

———. 2011. "Poverty Matters: A Reassessment of the Inequality–Homicide Relationship in Cross-National Studies." *British Journal of Criminology* 51 (5): 739–72. doi:10.1093/bjc/azr019.

Prieger, James E., and Jonathan Kulick. 2014. "Unintended Consequences of Enforcement in Illicit Markets." *Economics Letters* 125 (2): 295–97. doi:10.1016/j.econlet.2014.09.025.

Prinzleve, Michael, Christian Haasen, Heike Zurhold, Josep Lluis Matali, Eugeni Bruguera, József Gerevich, Erika Bácskai, et al. 2004. "Cocaine Use in Europe - a Multi-Centre Study: Patterns of Use in Different Groups." *European Addiction Research* 10 (4): 147–55. doi:10.1159/000079835.

Pudney, Stephen, Celia Badillo, Mark Bryan, Jon Burton, Gabriella Conti, and Maria

Iacovou. 2006. “Estimating the Size of the UK Illicit Drug Market.” In *Measuring Different Aspects of Problem Drug Use: Methodological Developments*. London: Home office.

Querubín, P. 2003. “Crecimiento Departamental Y Violencia Criminal En Colombia.” CEDE 200 12. Universidad de los Andes-CEDE.

Quételet, Adolphe. 1831. *Adolphe Quetelet’s Research on the Propensity for Crime at Different Ages*. Cincinnati, OH. https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=94009.

Quinney, Richard. 1966. “Structural Characteristics, Population Areas, and Crime Rates in the United States.” *The Journal of Criminal Law, Criminology, and Police Science* 57 (1): 45–52. doi:10.2307/1140954.

———. 1974. *Criminal Justice in America: A Critical Understanding.* Little Brown & Company.

RAND Corporation. 2014. “What America’s Users Spend on Illegal Drugs.” RR-534-ONDCP. Santa Monica, CA: Office of National Drug Control Policy Office of Research and Data Analysis. https://www.whitehouse.gov/ondcp/research-and-data/estimation-drug-expenditures-consumption-supply.

Rasmussen, David W., and Bruce L. Benson. 1994. *The Economic Anatomy of a Drug War*. Lanham, MD: Rowman & Littlefield Publishers.

Rasmussen, David W., Bruce L. Benson, and David L. Sollars. 1993. “Spatial Competition In Illicit Drug Markets: The Consequences Of Increased Drug Law Enforcement.” *The Review of Regional Studies* 23 (3): 219–36.

Rehm, Jürgen, Robin Room, Maristela Monteiro, Gerhard Gmel, Kathryn Graham, Nina Rehn, Christopher T. Sempos, Ulrich Frick, and David Jernigan. 2004. “Alcohol Use.” In *Comparative Quantification of Health Risks*. Vol. 1. Geneva, Switzerland: World Health Organization. http://www.who.int/publications/cra/chapters/volume1/0959-1108.pdf.

Reid, Malcolm J, Katherine H Langford, Merete Grung, Hallvard Gjerde, Ellen J Amundsen, Jorg Morland, and Kevin V Thomas. 2012. “Estimation of Cocaine Consumption in the Community: A Critical Comparison of the Results from Three Complimentary Techniques.” *BMJ Open* 2 (6). doi:10.1136/bmjopen-2012-001637.

Reiss, Albert J., and Jeffrey A. Roth. 1993. “Alcohol, Other Psychoactive Drugs and Violence.” In *Understanding and Preventing Violence*, 182–220. Washington, D.C.: National Academy Press.

Resa Nestares, Carlos. 2003. “El Valor de Las Exportaciones Mexicanas de Drogas Ilegales, 1961- 2000.” Colección de Documentos. Madrid, Spain: Universidad Autónoma de Madrid. Madrid. http://www.uam.es/personal_pdi/economicas/cresa/uam2003.pdf.

Resignato, Andrew J. 2000. "Violent Crime: A Function of Drug Use or Drug Enforcement?" *Applied Economics* 32 (6): 681–88. doi:10.1080/000368400322291.

Resnick, Heidi S., Ron Acierno, and Dean G. Kilpatrick. 1997. "Health Impact of Interpersonal Violence 2: Medical and Mental Health Outcomes." *Behavioral Medicine* 23 (2): 65–78. doi:10.1080/08964289709596730.

Restrepo, Elvira Maria. 2015. "Colombia and Its Wars against Drug Trafficking, 1970–2010." In *Drug Trafficking, Organized Crime, and Violence in the Americas Today*. Gainesville: University Press of Florida.

Rettig, Richard A., and Adam Yarmolinsky. 1995. *Federal Regulation of Methadone Treatment*. Washington, D.C.: National Academies Press.

Reuter, Peter H. 1983. *Disorganized Crime: The Economics of the Visible Hand*. Cambridge, MA: MIT Press.

———. 1984. "The (Continued) Vitality of Mythical Numbers." *The Public Interest* 75: 135–147.

———. 1985. "The Organization of Illegal Markets: An Economic Analysis." Washington D.C: National Institute of Justice.

———. 1986. "The Social Costs of the Demand for Quantification." *Journal of Policy Analysis and Management* 5 (4): 807–12. doi:10.1002/pam.4050050410.

———. 1996. "The Mismeasurement of Illegal Drug Markets: The Implications of Its Irrelavance." In *The Underground Economy*, edited by S. Pozzo. Kalamazoo: Upjon Institute for Employment Research.

———. 2008. "Can Production and Trafficking of Illicit Drugs Be Reduced or Merely Shifted?" The World Bank. Policy Reearch Working Paper 4564.

———. 2009a. "Assessing the Operation of the Global Drug Market." Report 1. Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/technical_reports/TR705.

———. 2009b. "Systemic Violence in Drug Markets." *Crime, Law and Social Change* 52 (3): 275–84. doi:10.1007/s10611-009-9197-x.

———. 2014. "The Mobility of Drug Trafficking." In *Ending the Drug Wars. Report of the LSE Expert Group on the Economics of Drug Policy*, edited by LSE. London: The London School of Economics and Political Science.

———. 2016. "On the Multiple Sources of Violence in Drug Markets." *Criminology & Public Policy*. doi:10.1111/1745-9133.12224.

Reuter, Peter H., and Jonathan P. Caulkins. 2004. "Illegal 'lemons': Price Dispersion in Cocaine and Heroin Markets." *Bulletin on Narcotics* 51 (1–2): 141–65.

Reuter, Peter H., Mathea Falco, and Robert J. MacCoun. 1993. "Comparing Western

European and North American Drug Policies." RAND Monograph Report. Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/monograph_reports/MR237.html.

Reuter, Peter H., and Victoria Greenfield. 2001. "Measuring Global Drug Markets. How Good Are the Numbers and Why Should We Care about Them?" *World Economics* 2 (4): 159–73.

Reuter, Peter H., and John Haaga. 1989. "The Organization of High-Level Drug Markets: An Exploratory Study." Santa Monica, CA: RAND Corporation.

Reuter, Peter H., and Mark A. R. Kleiman. 1986. "Risks and Prices: An Economic Analysis of Drug Enforcement." *Crime and Justice* 7: 289–340.

Reuter, Peter H., Robert J. MacCoun, Patrick Murphy, Allan Abrahamse, and Barbara Simon. 1990. "Money from Crime: A Study of the Economics of Drug Dealing in Washington, D.C." Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/reports/R3894.html.

Reuter, Peter H., and Malay Majmundar. 2015. "Understanding the U.S. Illicit Tobacco Market: Characteristics, Policy Context, and Lessons from International Experiences." Washington: Committee on the Illicit Tobacco Market: Collection and Analysis of the International Experience; National Research Council. http://www.nap.edu/catalog/19016/understanding-the-us-illicit-tobacco-market-characteristics-policy-context-and.

Rhodes, William, Stacia Langenbahn, Ryan Kling, and Paul Scheiman. 1997. "What America's Users Spend on Illegal Drugs: 1988–1995." Washington D.C.: Executive Office of the President, Office of National Drug Control Policy. http://purl.access.gpo.gov/GPO/LPS53101.

Rhodes, William, and D. McDonald. 1991. "What America's Users Spend on Illegal Drugs." Washington D.C.: Executive Office of the President, Office of National Drug Control Policy.

Riascos, Alvaro J., and Juan F. Vargas. 2011. "Violence and Growth in Colombia: A Review of the Quantitative Literature." *Universidad Del Rosario. Serie Documentos de Trabajo* 102 (June). http://www.urosario.edu.co/urosario_files/21/212b346b-fe92-4173-a99a-d7a6cc23673b.pdf.

Richter, Linda, and Patrick B. Johnson. 2001. "Current Methods of Assessing Substance Use: A Review of Strengths, Problems, and Developments." *Journal of Drug Issues* 31 (4): 809–32. doi:10.1177/002204260103100401.

Riley, K. Jack. 1998. "Homicide and Drugs A Tale of Six Cities." *Homicide Studies* 2 (2): 176–205. doi:10.1177/1088767998002002005.

Rios, Viridiana. 2008. "Evaluating the Economic Impact of Mexico's Drug Trafficking Industry." In. Cambridge, MA: Harvard University.

———. 2012. “Government Coordination Promotes Citizen Security: Crime and Violence Deterrence in Mexico’s Drug War.” Department of Government Harvard University. http://cddrl.fsi.stanford.edu/sites/default/files/124.governmentcoord.pdf.

———. 2013. “Why Did Mexico Become so Violent? A Self-Reinforcing Violent Equilibrium Caused by Competition and Enforcement.” *Trends in Organized Crime* 16 (2): 138–55.

Rios, Viridiana, and David A. Shirk. 2011. “Drug Violence in Mexico Data and Analysis through 2010.” San Diego, CA: Trans-Border Institute, University of San Diego. https://justiceinmexico.files.wordpress.com/2011/03/2011-tbi-drugviolence.pdf.

Rivera, Mauricio. 2016. “The Sources of Social Violence in Latin America An Empirical Analysis of Homicide Rates, 1980–2010.” *Journal of Peace Research* 53 (1): 84–99. doi:10.1177/0022343315598823.

Robles, Gustavo, Gabriela Calderón, and Beatriz Magaloni. 2013. “The Economic Consequences of Drug Trafficking Violence in Mexico.” Working Paper. Stanford, CA: Stanford University - Center on Democracy, Development and the Rule of Law. http://cddrl.stanford.edu/publications/the_economic_costs_of_drugtrafficking_violence_in_mexico/.

Rocha, Ricardo Ernesto. 1997. “Aspectos economicos de las drogas ilegales.” In *Drogas Ilícitas en Colombia: Su Impacto Económico, Político y Social*, by Francisco E. Thoumi. PNUD.

Rocha, Ricardo Ernesto, and Hermes Fernando Martinez. 2003. “Pobreza, Crimen Y Crecimiento Regional En Colombia. (Versión Para Comentarios).” ARCHIVOS DE ECONOMÍA. DEPARTAMENTO NACIONAL DE PLANEACIÓN. http://econpapers.repec.org/paper/col000118/003327.htm.

Romero-Daza, Nancy, Margaret Weeks, and Merrill Singer. 2003. “‘Nobody Gives a Damn If I Live or Die’: Violence, Drugs, and Street-Level Prostitution in Inner-City Hartford, Connecticut.” *Medical Anthropology* 22 (3): 233–59. doi:10.1080/01459740306770.

Roodman, David. 2009a. “How to Do xtabond2: An Introduction to Difference and System GMM in Stata.” *The Stata Journal* 9 (1): 86–136.

———. 2009b. “A Note on the Theme of Too Many Instruments.” *Oxford Bulletin of Economics and Statistics* 71 (1): 135–58. doi:10.1111/j.1468-0084.2008.00542.x.

Rose-Ackerman, Susan, and Bonnie J. Palifka. 1999. *Corruption and Government: Causes, Consequences, and Reform*. Cambridge University Press.

Rosenfeld, Richard, Bruce A. Jacobs, and Richard Wright. 2003. “Snitching and the Code of the Street.” *British Journal of Criminology* 43 (2): 291–309. doi:10.1093/bjc/43.2.291.

Rossi, Carla, and Roberto Ricci. 2009. “Modelling and Estimating Illicit Drug Market as a Tool to Evaluate Drug Policy: The Case of Italy.” Rome: University of Rome Tor

Vergata.

Rossow, Ingeborg. 2001. "Alcohol and Homicide: A Cross-Cultural Comparison of the Relationship in 14 European Countries." *Addiction* 96 (1s1): 77–92. doi:10.1046/j.1360-0443.96.1s1.7.x.

Roth, J.A. 1994. "Psychoactive Substances and Violence." Research in Brief. Rockville, MD: National Institute of Justice (NIJ) US Department of Justice Office of Justice Programs United States of America. https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=145534.

Rubio, Mauricio. 1995. "Crimen Y Crecimiento En Colombia." *Coyuntura Económica* 25 (1): 101–28.

Rupesinghe, Kumar, and Marcial Rubio C. 1994. *Culture of Violence, The*. United Nations University Press.

Rushton, Philippe J., and Glayde Whitney. 2002. "Cross-National Variation in Violent Crime Rates: Race, R-K Theory, and Income." *Population and Environment* 23 (6): 501–11.

Saffer, Henry, and Frank Chaloupka. 1999. "The Demand for Illicit Drugs." *Economic Inquiry* 37 (3): 401–11. doi:10.1111/j.1465-7295.1999.tb01439.x.

Sah, Raaj. 1991. "Social Osmosis and Patterns of Crime." *Journal of Political Economy* 99 (6): 1272–95.

Sala, Nohemi, Juan Luis Arsuaga, Ana Pantoja-Pérez, Adrián Pablos, Ignacio Martínez, Rolf M. Quam, Asier Gómez-Olivencia, José María Bermúdez de Castro, and Eudald Carbonell. 2015. "Lethal Interpersonal Violence in the Middle Pleistocene." *PLOS ONE* 10 (5): e0126589. doi:10.1371/journal.pone.0126589.

Salmelainen, Pia. 1995. *The Correlates of Offending Frequency : A Study of Juvenile Theft Offenders in Detention*. General Report Series. Sydney: NSW Bureau of Crime Statistics and Research.

Sampson, Robert J. 1987. "Communities and Crime." In *Positive Criminology: Michael R. Gottfredson, Travis Hirschi*, 91–114. Newbury Park, CA: Sage.

Sampson, Robert J., and Byron W. Groves. 1989. "Community Structure and Crime: Testing Social-Disorganization Theory." *American Journal of Sociology* 94: 774–802.

Sampson, Robert J., Stephen W. Raudenbush, and Felton Earls. 1997. "Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy." *Science* 277 (5328): 918–24. doi:10.1126/science.277.5328.918.

Sampson, Robert J., and William Julius Wilson. 1995. "Toward a Theory of Race, Crime, and Urban Inequality." In *Crime and Inequality*, 37–56. Stanford, CA: Stanford University Press.

Sanchez, Fabio, and María Díaz. 2006. “The Relationship Between Conflict, Homicidal Violence and Crime in Colombia.” In *Focus on Urban and Regional Economics*, by Lawrence Yee, 2–35. Nova Publishers.

Sargan, John D. 1958. “The Estimation of Economic Relationships Using Instrumental Variables.” *Econometrica* 26 (3): 393–415. doi:10.2307/1907619.

———. 1988. “Testing for Misspecification after Estimation Using Instrumental Variables.” In *Contributions to Econometrics: John Denis Sargan*, edited by E. Maasoumi. Vol. I. Cambdirge: Cambridge University Press.

Sarna, Nahum M. 1970. *Understanding Genesis*. New York: Schocken.

Savolainen, Jukka. 2000. “Inequality, Welfare State, and Homicide: Further Support for the Institutional Anomie Theory*.” *Criminology* 38 (4): 1021–42. doi:10.1111/j.1745-9125.2000.tb01413.x.

Savona, Ernesto U. 2012. “Italian Mafias’ Asymmetries.” In *Traditional Organized Crime in the Modern World: Responses to Socioeconomic Change*. Springer Science & Business Media.

———. 2013. “Infiltration of the Public Construction Industry by Italian Organised Crime.” In *Situational Prevention of Organised Crimes*, by Ronald V. Clarke and Nick Tilley, 138–49. Routledge.

Savona, Ernesto U., and Francesco Calderoni. 2016. *Criminal Markets and Mafia Proceeds*. Routledge.

Schelling, Thomas C. 1967. “Economics and Criminal Enterprise.” *The Public Interest*, no. 7(Spring): 61–78.

Schifano, Fabrizio, and John Corkery. 2008. “Cocaine/crack Cocaine Consumption, Treatment Demand, Seizures, Related Offences, Prices, Average Purity Levels and Deaths in the UK (1990—2004).” *Journal of Psychopharmacology* 22 (1): 71–79. doi:10.1177/0269881107079170.

Schoepfer, Andrea, and Alex R. Piquero. 2006. “Self-Control, Moral Beliefs, and Criminal Activity.” *Deviant Behavior* 27 (1): 51–71. doi:10.1080/016396290968326.

Schrag, Joel, and Suzanne Scotchmer. 1997. “The Self-Reinforcing Nature of Crime.” *International Review of Law and Economics* 17 (3): 325–35. doi:10.1016/S0144-8188(97)00025-2.

Scott, James C. 1969. “Corruption, Machine Politics, and Political Change.” *American Political Science Review* 63 (4): 1142–1158. doi:10.1017/S0003055400263247.

Seddon, Toby. 2006. “Drugs, Crime and Social Exclusion Social Context and Social Theory in British Drugs–Crime Research.” *British Journal of Criminology* 46 (4): 680–703. doi:10.1093/bjc/azi079.

Sellin, Thorsten. 1938. “Culture Conflict and Crime.” *American Journal of Sociology* 44 (1): 97–103.

Serrano-Berthet, Rodrigo, and Humberto Lopez. 2011. “Crime and Violence in Central America: A Development Challenge.” The World Bank. http://siteresources.worldbank.org/INTLAC/Resources/FINAL_VOLUME_I_ENGLISH_CrimeAndViolence.pdf.

Shams, Rasul. 1992. “The Drugs Economy and Anti-Drug Policy in Developing Countries.” *Intereconomics* 27 (3): 139–44. doi:10.1007/BF02926324.

Shaw, Clifford R., and Henry D. McKay. 1942. *Juvenile Delinquency and Urban Areas*. Chicago: University of Chicago Press.

Sheley, Joseph F. 1994. “Drug Activity and Firearms Possession and Use by Juveniles.” *Journal of Drug Issues* 24 (3): 363–82. doi:10.1177/002204269402400301.

Shelley, Louise. 2001. “Corruption and Organized Crime in Mexico in the Post-PRI Transition.” *Journal of Contemporary Criminal Justice* 17 (3): 213–31.

Shepard, Edward M., and Paul R. Blackley. 2005. “Drug Enforcement and Crime: Recent Evidence from New York State*.” *Social Science Quarterly* 86 (2): 323–342. doi:10.1111/j.0038-4941.2005.00305.x.

Sherman, Lawrence W., Denise C. Gottfredson, Doris L. MacKenzie, John Eck, Peter H. Reuter, and Shawn D. Bushway. 1998. “Preventing Crime: What Works, What Doesn’t, What’s Promising. Research in Brief. National Institute of Justice.,” July. http://eric.ed.gov/?id=ED423321.

Shichor, David. 1990. “Crime Patterns and Socioeconomic Development: A Cross-National Analysis.” *Criminal Justice Review* 15 (1): 64–78. doi:10.1177/073401689001500107.

Shirk, David A. 2010. “Drug Violence in Mexico: Data and Analysis from 2001–2009.” *Trends in Organized Crime* 13 (2–3): 167–74. doi:10.1007/s12117-010-9096-7.

———. 2011. *The Drug War in Mexico: Confronting a Shared Threat*. Council on Foreign Relations.

Shirk, David, and Joel Wallman. 2015. “Understanding Mexico’s Drug Violence.” *Journal of Conflict Resolution* 59 (8): 1348–76. doi:10.1177/0022002715587049.

Shleifer, Andrei, and Robert W. Vishny. 1993. “Corruption.” *The Quarterly Journal of Economics* 108 (3): 599–617. doi:10.2307/2118402.

Shoemaker, Donald J. 2009. *Theories of Delinquency: An Examination of Explanations of Delinquent Behavior*. Oxford University Press.

Shover, Neal. 1996. *Great Pretenders: Pursuits And Careers Of Persistent Thieves*. Boulder, Colo: Westview Press.

Siegel, Dina, and Henk van de Bunt. 2012. *Traditional Organized Crime in the Modern World: Responses to Socioeconomic Change*. Springer Science & Business Media.

Siegel, Michael, Craig S. Ross, and Charles King. 2013. "The Relationship Between Gun Ownership and Firearm Homicide Rates in the United States, 1981–2010." *American Journal of Public Health* 103 (11): 2098–2105. doi:10.2105/AJPH.2013.301409.

Silverman, Kenneth, Conrad J. Wong, Annie Umbricht-Schneiter, Ivan D. Montoya, Charles R. Schuster, and Kenzie L. Preston. 1998. "Broad Beneficial Effects of Cocaine Abstinence Reinforcement among Methadone Patients." *Journal of Consulting and Clinical Psychology* 66 (5): 811–24. doi:10.1037/0022-006X.66.5.811.

Singer, Merrill. 2008. "Drugs and Development: The Global Impact of Drug Use and Trafficking on Social and Economic Development." *International Journal of Drug Policy* 19 (6): 467–78. doi:10.1016/j.drugpo.2006.12.007.

Sinha, Jay. 2001. "The History and Development of the Leading International Drug Control Conventions." The Senate Special Committee On Illegal Drugs. https://www.researchgate.net/publication/242113704_THE_HISTORY_AND_DEVELOPMENT_OF_THE_LEADING_INTERNATIONAL_DRUG_CONTROL_CONVENTIONS.

Škařupová, Kateřina. 2014. "The Levels of Use of Opioids, Amphetamines and Cocaine and Associated Levels of Harm: Summary of Scientific Evidence." Lisbon: EMCDDA - European Monitoring Centre for Drugs and Drug Addiction. http://www.emcdda.europa.eu/system/files/publications/780/Levels_of_drug_use_and_harm_Literature_review_465346.pdf.

Skogan, Wesley G. 1989. "Social Change and the Future of Violent Crime." In *Violence in America*, 1:235–50. Newbury Park, CA: SAGE Publications. http://skogan.org/files/Social_Change_Future_of_Violent_Crime.Gurr_1989.pdf.

Small, Melvin, and Joel David Singer. 1981. *Resort to Arms: International and Civil Wars, 1816-1980*. Sage Publications.

Smit, Paul R., Rinke R. de Jong, and Catrien C. J. H. Bijleveld. 2012. "Homicide Data in Europe: Definitions, Sources, and Statistics." In *Handbook of European Homicide Research*, edited by Marieke C. A. Liem and William Alex Pridemore, 5–23. Springer New York. http://link.springer.com/chapter/10.1007/978-1-4614-0466-8_2.

Smith, M. Dwayne, and Robert Nash Parker. 1980. "Type of Homicide and Variation in Regional Rates." *Social Forces* 59 (1): 136–47. doi:10.1093/sf/59.1.136.

Smith, Maria Ostendorf. 2003. "Beyond Palisades: The Nature and Frequency of Late Prehistoric Deliberate Violent Trauma in the Chickamauga Reservoir of East Tennessee." *American Journal of Physical Anthropology* 121 (4): 303–18. doi:10.1002/ajpa.10232.

Smith, Michael E., Michele Sviridoff, Susan Sadd, Richard Curtis, and Randolph. Grinc.

1992. “The Neighborhood Effects of Street-Level Drug Enforcement - Tactical Narcotics Teams in New York - An Evaluation of TNT.” New York, NY: The Vera Institute of Justice. http://www.vera.org/sites/default/files/resources/downloads/1226.pdf.

Snyder, Richard, and Angélica Durán Martínez. 2009. 2009. “Does Illegality Breed Violence? Drug Trafficking and State-Sponsored Protection Rackets.” *Crime, Law and Social Change* 52 (3): 253–73. doi:10.1007/s10611-009-9195-z.

Sobel, Russell S., and Brian J. Osoba. 2009. “Youth Gangs as Pseudo-Governments: Implications for Violent Crime.” *Southern Economic Journal* 75 (4): 996–1018.

Sorrells, James M. 1977. “Kids Who Kill.” *Crime & Delinquency* 23 (3): 312–20. doi:10.1177/001112877702300307.

Spapens, Toine, Henk van de Bunt, and Laura Rastovac. 2007. “De Wereld Achter de Wietteelt.” Tilburg/ Rotterdam: Erasmus Universiteit Rotterdam/Universiteit van Tilburg. http://wodc.nl/images/volledige-tekst_tcm44-83489.PDF.

Spencer, Susan Dale. 2012. “Detecting Violence in the Archaeological Record: Clarifying the Timing of Trauma and Manner of Death in Cases of Cranial Blunt Force Trauma among Pre-Columbian Amerindians of West-Central Illinois.” *International Journal of Paleopathology*, Body parts and parts of bodies: Traces of violence in past cultures, 2 (2–3): 112–22. doi:10.1016/j.ijpp.2012.09.007.

Staley, Sam. 1992. *Drug Policy and the Decline of American Cities*. New Brunswick, NJ: Transaction Publishers.

Steele, Claude M., and Robert A. Josephs. 1990. “Alcohol Myopia: Its Prized and Dangerous Effects.” *American Psychologist* 45 (8): 921–33. doi:10.1037/0003-066X.45.8.921.

Steiner, Roberto. 1998. “Colombia’s Income from the Drug Trade.” *World Development* 26 (6): 1013–31. doi:10.1016/S0305-750X(98)00028-X.

Stevenson, Richard J., and Lubica M. Forsythe. 1998. “Stevenson, R. and Forsythe, L. (1998). The Stolen Goods Market in New South Wales: An Interview Study with Imprisoned Burglar.” Sydney: NSW Bureau of Crime Statistics and Research. http://www.bocsar.nsw.gov.au/Documents/r44.pdf.

Stewart, Eric A., and Ronald L. Simons. 2010. “Race, Code of The Street, And Violent Delinquency: A Multilevel Investigation of Neighborhood Street Culture And Individual Noorms of Violence.” *Criminology; an Interdisciplinary Journal* 48 (2): 569–605. doi:10.1111/j.1745-9125.2010.00196.x.

Sung, Hung-En. 2004. “Democracy and Organized Crime Activities: Evidence from 59 Countries.” *Security Journal* 17 (4): 21–34. doi:10.1057/palgrave.sj.8340181.

Sutherland, Edwin Hardin, and Donald Ray Cressey. 1934. *Principles of Criminology*.

Symeonidou-Kastanidou, Elisabeth. 2007. "Towards a New Definition of Organised Crime in the European Union." *European Journal of Crime, Criminal Law and Criminal Justice* 15: 83.

Taylor, Bruce, and Trevor Bennett. 1999. "Comparing Drug Use Rates of Detained Arrestees in the United States and England." DIANE Publishing. www.ncjrs.org/pdffiles1/175052.pdf.

Taylor, Bruce, and Henry H. Brownstein. 2003. "Toward the Operationalization of Drug Market Stability: An Illustration Using Arrestee Data from Crack Cocaine Markets in Four Urban Communities." *Journal of Drug Issues* 33 (1): 73–98. doi:10.1177/002204260303300104.

Taylor, Matthew, and Gary R. Potter. 2013. "From 'Social Supply' to 'Real Dealing': Drift, Friendship, and Trust in Drug Dealing Careers." *Journal of Drug Issues*, 22042612474974. doi:10.1177/0022042612474974.

The World Bank. 2006. "Brazil - Crime, Violence and Economic Development in Brazil : Elements for Effective Public Policy." 36525. The World Bank. http://documents.worldbank.org/curated/en/2006/06/7742317/brazil-crime-violence-economic-development-brazil-elements-effective-public-policy.

———. 2014. "Worldwide Governance Indicators." The World Bank. http://info.worldbank.org/governance/wgi/index.aspx#reports.

———. 2015. "World Bank Open Data." World Bank. http://data.worldbank.org/.

Thobani, M. 1992. "Peru - Agricultural Policies for Economic Efficiency." 10605. Sector Report. Washington, D.C.: The World Bank. http://documents.worldbank.org/curated/en/1992/09/736544/peru-agricultural-policies-economic-efficiency.

Thoumi, Francisco E. 1995. *Political Economy and Illegal Drugs in Colombia*. United Nations University Press.

———. 2002. "Illegal Drugs in Colombia: From Illegal Economic Boom to Social Crisis." *Annals of the American Academy of Political and Social Science* 582: 102–16.

———. 2005. "The Numbers Game: Let's All Guess the Size of the Illegal Drug Industry!" *Journal of Drug Issues* 35 (1): 185–200. doi:10.1177/002204260503500109.

Tinklenberg, Jared R., and Kenneth M. Woodrow. 1973. "Drug Use among Youthful Assaultive and Sexual Offenders." *Research Publications - Association for Research in Nervous and Mental Disease* 52: 209–24.

Tonry, Michael. 2010. *Crime and Justice: A Review of Research*. University of Chicago Press.

Topalli, Volkan, and Richard Wright. 2014. "Affect and the Dynamic Foreground of

Predatory Street Crime: Desperation, Anger, and Fear." In *Affect and Cognition in Criminal Decision Making*. New York, NY: Routledge.

Topalli, Volkan, Richard Wright, and Robert Fornango. 2002. "Drug Dealers, Robbery and Retaliation. Vulnerability, Deterrence and the Contagion of Violence." *British Journal of Criminology* 42 (2): 337–51. doi:10.1093/bjc/42.2.337.

Transparency International. 2016. "What Is The Corruption Perceptions Index?" *Transparency International*. http://www.transparency.org/cpi2011/in_detail#myAnchor1.

Trautmann, Franz, Beau Kilmer, and Paul Turnbull. 2013. "Further Insights into Aspects of the Illicit EU Drugs Market." Luxembourg: Publications Office of the European Union. http://ec.europa.eu/justice/anti-drugs/files/eu_market_full.pdf.

Trickey, David, Andy P. Siddaway, Richard Meiser-Stedman, Lucy Serpell, and Andy P. Field. 2012. "A Meta-Analysis of Risk Factors for Post-Traumatic Stress Disorder in Children and Adolescents." *Clinical Psychology Review* 32 (2): 122–38. doi:10.1016/j.cpr.2011.12.001.

Trumbore, Peter F., and Byungwon Woo. 2014. "Smuggler's Blues: Examining Why Countries Become Narcotics Transit States Using the New International Narcotics Production and Transit (INAPT) Data Set." *International Interactions* 40 (5): 763–87. doi:10.1080/03050629.2014.917297.

Tunnell, Kenneth D. 1993. "Inside the Drug Trade: Trafficking from the Dealer's Perspective." *Qualitative Sociology* 16 (4): 361–81. doi:10.1007/BF00989970.

Turner, Charles F., Maria A. Villarroel, Susan M. Rogers, Elizabeth Eggleston, Laxminarayana Ganapathi, Anthony M. Roman, and Alia Al-Tayyib. 2005. "Reducing Bias in Telephone Survey Estimates of the Prevalence of Drug Use: A Randomized Trial of Telephone Audio-CASI." *Addiction (Abingdon, England)* 100 (10): 1432–44. doi:10.1111/j.1360-0443.2005.01196.x.

UCDP. 2016. "Uppsala Conflict Data Program." *Department of Peace and Conflict Research, Uppsala Universitet*. http://www.pcr.uu.se/research/ucdp/.

Ulmer, Jeffery T., and Darrell Steffensmeier. 2014. "The Age and Crime Relationship: Social Variation, Social Explanations." In *The Nurture Versus Biosocial Debate in Criminology: On the Origins of Criminal Behavior and Criminality*, 1 edition. SAGE Publications, Inc.

UNDCP. 1998. "Economic and Social Consequences of Drug Abuse and Illicit Trafficking." Vienna: United Nations International Drug Control Programme.

United Nations. 1961. "Single Convention on Narcotic Drugs of 1961 as Amended by the 1972 Protocol." United Nations. https://www.unodc.org/pdf/convention_1961_en.pdf.

———. 1971. "Convention on Psychotropic Substances of 1971." United Nations.

https://www.unodc.org/pdf/convention_1971_en.pdf.

———. 1988. “United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988.” United Nations. https://www.unodc.org/pdf/convention_1988_en.pdf.

———. 2000. “World Drug Report 2000.” Vienna: United Nation Office for Drug Control and Crime Prevention. http://www.unodc.org/pdf/world_drug_report_2000/report_2001-01-22_1.pdf.

———. 2010. “Struggle against Organized Crime, Corruption, Drug Trafficking Connected; Too Big for Countries to Confront on Their Own, Third Committee Told.” In. New York, NY: United Nations. http://www.un.org/press/en/2010/gashc3975.doc.htm.

———. 2015. “World Population Prospects, the 2015 Revision.” *UN Department of Economic and Social Affairs*. http://esa.un.org/unpd/wpp/Download/Standard/Population/.

United States Department of Justice. 2014. “System to Retrieve Information from Drug Evidence (STRIDE) Database.” Washington, D.C.: Drug Enforcement Administration. http://www.justice.gov/dea/resource-center/stride-data.shtml.

UNODC. 2002. “Developing an Integrated Drug Information System.” Toolkit. Vienna: United Nation Office on Drugs and Crime. https://www.unodc.org/documents/data-and-analysis/statistics/Drugs/GAP_module_1.pdf.

———. 2003a. “Model Legislation on Laundering, Confiscation and International Cooperation in Relation to the Proceeds of Crime.” Vienna: United Nations Office on Drug and Crime.

———. 2003b. “Peru. Monitoreo de Cultivos de Coca 2002.” Coca Cultivation Survey. Vienna, Austria: United Nations Office on Drugs and Crime. https://www.unodc.org/pdf/publications/peru_monitoreo_coca_2002.pdf.

———. 2005. “World Drug Report 2005.” Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/pdf/WDR_2005/volume_1_web.pdf.

———. 2006. “World Drug Report 2006.” Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/pdf/WDR_2006/wdr2006_volume1.pdf.

———. 2007a. “Notes On Illicit Drug Seizure Reports.” United Nations Office on Drugs and Crime.

———. 2007b. “World Drug Report 2007.” Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/pdf/research/wdr07/WDR_2007.pdf.

———. 2008a. “Primer Estudio Comparativo Sobre Consumo de Drogas Y Factores Asociados En Población de 15 a 64 Años.” 1. Lima, Peru: United Nation Office on Drugs and Crime. http://www.unodc.org/documents/peru/ElementosOrientadores-Peru-

June08.pdf.

———. 2008b. *Review of the World Cannabis Situation*. Vol. 58. 1 and 2 vols. Bulletin on Narcotics. UNODC. http://dag.un.org/handle/11176/89831.

———. 2008c. "World Drug Report 2008." Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/documents/wdr/WDR_2008/WDR_2008_eng_web.pdf.

———. 2009. "World Drug Report 2009." Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/documents/wdr/WDR_2009/WDR2009_eng_web.pdf.

———. 2010a. "Methodology – World Drug Report 2010." UNODC. https://www.unodc.org/documents/data-and-analysis/WDR2010/WDR2010methodology.pdf.

———. 2010b. *The Globalization of Crime: A Transnational Organized Crime Threat Assessment*. Vienna, Austria: United Nations Publications. http://www.unodc.org/documents/data-and-analysis/tocta/TOCTA_Report_2010_low_res.pdf.

———. 2010c. "World Drug Report 2010." Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/documents/wdr/WDR_2010/World_Drug_Report_2010_lo-res.pdf.

———. 2011a. "Estimating Illicit Financial Flows Resulting from Drug Trafficking and Other Transnational Organized Crimes. Research Report." Report. Vienna: United Nations Office on Drugs and Crime. http://www.drugsandalcohol.ie/16151/.

———. 2011b. "Global Study on Homicide." Vienna: United Nations Office on Drugs and Crime. http://www.unodc.org/documents/data-and-analysis/statistics/Homicide/Globa_study_on_homicide_2011_web.pdf.

———. 2011c. "The Transatlantic Cocaine Market - Research Paper." UNODC. http://www.refworld.org/docid/4e809c692.html.

———. 2011d. "World Drug Report 2011." Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/documents/data-and-analysis/WDR2011/World_Drug_Report_2011_ebook.pdf.

———. 2011e. "World Drug Report - Statistical Annex: Illicit Drug Production." UNODC. http://www.unodc.org/documents/data-and-analysis/WDR2011/StatAnnex-production.pdf.

———. 2012a. "Transnational Organized Crime in Central America and the Caribbean: A Threat Assessment." Vienna: United Nations Office on Drugs and Crime. https://www.unodc.org/documents/data-and-analysis/Studies/TOC_Central_America_and_the_Caribbean_english.pdf.

———. 2012b. “World Drug Report 2012.” Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/unodc/en/data-and-analysis/WDR-2012.html.

———. 2013a. “Colombia: Coca Cultivation Survey 2012.” Coca Cultivation Survey. Vienna, Austria: United Nations Office on Drugs and Crime. https://www.unodc.org/unodc/en/crop-monitoring/?tag=Colombia.

———. 2013b. “Estado Plurinacional de Bolivia. Monitoreo de Cultivos de Coca 2012.” Coca Cultivation Survey. Vienna, Austria: United Nations Office on Drugs and Crime. http://www.unodc.org/documents/crop-monitoring/Bolivia/BOLIVIA_Coca_Survey_2012_web.pdf.

———. 2013c. “Transnational Organized Crime in West Africa: A Threat Assessment.” Vienna: UNODC. https://www.unodc.org/documents/data-and-analysis/tocta/West_Africa_TOCTA_2013_EN.pdf.

———. 2013d. “World Drug Report 2013.” Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/wdr2013/.

———. 2014a. “Delta Annual Reports Questionnaire Database.” UNODC.

———. 2014b. “Global Study on Homicide 2013.” 14.IV.1. Global Study on Homicide. Vienna: United Nations Office on Drugs and Crime. https://www.unodc.org/documents/data-and-analysis/statistics/GSH2013/2014_GLOBAL_HOMICIDE_BOOK_web.pdf.

———. 2014c. “Individual Drug Seizures.” *Drugs Monitoring Platform*. https://data.unodc.org/#state:0.

———. 2014d. “Peru. Monitoreo de Cultivos de Coca 2013.” Coca Cultivation Survey. Vienna: United Nations Office on Drugs and Crime. http://www.unodc.org/documents/crop-monitoring/Peru/Peru_Monitoreo_de_cultivos_de_coca_2013_web.pdf.

———. 2014e. “World Drug Report 2014.” Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/wdr2014/.

———. 2015a. “Annual Report Questionnaire. Part Four: Extent and Patterns of and Trends in Drug Crop Cultivation and Drug Manufacture and Trafficking.” United Nations Office on Drugs and Crime. https://www.unodc.org/documents/arq/ARQ_Part_4_English.pdf.

———. 2015b. “Composition of Macro Geographical (Continental) Regions, Geographical Sub-Regions, and Selected Economic and Other Groupings.” UNODC. http://unstats.un.org/unsd/methods/m49/m49regin.htm.

———. 2015c. “Crime and Criminal Justice Statistics.” *UNODC*. https://www.unodc.org/unodc/en/data-and-analysis/statistics/crime.html.

———. 2015d. “Drug Money and Opiate Trafficking on the Balkan Route.” Vienna: UNODC. http://www.unodc.org/unodc/en/frontpage/2015/November/drug-money-and-opiate-trafficking-on-the-balkan-route--focus-of-new-unodc-report.html?ref=fs1.

———. 2015e. “Drug Money: The Illicit Proceeds of Opiates Trafficked on the Balkan Route.” Vienna: United Nation Office on Drugs and Crime. https://www.unodc.org/documents/data-and-analysis/Studies/IFF_report_2015_final_web.pdf.

———. 2015f. “Estado Plurinacional de Bolivia. Monitoreo de Cultivos de Coca 2014.” Coca Cultivation Survey. Vienna: United Nations Office on Drugs and Crime. https://www.unodc.org/documents/bolivia/Bolivia_Informe_Monitoreo_Coca_2014.pdf.

———. 2015g. “Perú. Monitoreo de Cultivos de Coca 2014.” Coca Cultivation Survey. Vienna: United Nations Office on Drugs and Crime. https://www.unodc.org/documents/crop-monitoring/Peru/Peru_Informe_monitoreo_coca_2014_web.pdf.

———. 2015h. “The Economics of the Balkan Route.” Vienna: UNODC.

———. 2015i. “UNODC Statistics.” UNODC. https://data.unodc.org/.

———. 2015j. “World Drug Report.” *UNODC Statistics*. https://data.unodc.org/.

———. 2015k. “World Drug Report 2015.” Vienna: United Nations Office on Drugs and Crime. https://www.unodc.org/documents/wdr2015/World_Drug_Report_2015.pdf.

———. 2015l. “Colombia: Coca Cultivation Survey 2014.” Coca Cultivation Survey. Vienna, Austria: United Nations Office on Drugs and Crime. https://www.unodc.org/documents/crop-monitoring/Colombia/censo_INGLES_2014_WEB.pdf.

———. 2016a. “Global Health Observatory (GHO) Data.” *World Health Organization*. https://www.unodc.org/unodc/en/data-and-analysis/statistics/crime.html.

———. 2016b. “Information about Drugs.” United Nations Office on Drugs and Crime. https://www.unodc.org/unodc/en/illicit-drugs/definitions/.

———. 2016c. “World Drug Report 2016.” Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/doc/wdr2016/WORLD_DRUG_REPORT_2016_web.pdf.

———. 2016d. “World Drug Report 2016 - Methodology.” Vienna: United Nation Office on Drugs and Crime. http://www.unodc.org/doc/wdr2016/WORLD_DRUG_REPORT_2016_web.pdf.

UNODC, Afghan Opiate Trade Project, and Paris Pact. 2014. “Drugs Monitoring Platform.” *Drugs Monitoring Platform*. http://drugsmonitoring.unodc-roca.org/.

Van Dijk, Jan. 2007. *The World of Crime: Breaking the Silence on Problems of Security, Justice and Development Across the World*. Sage Publications, Inc.

Van Dijk, Jan, Andromachi Tseloni, and Graham Farrell. 2012. *The International Crime Drop: New Directions in Research*. Palgrave Macmillan.

Van Laar, Margriet, Franz Trautmann, and Tom Frijns. 2013. "Introduction." In *Further Insights into Aspects of the Illicit EU Drugs Market*, edited by Franz Trautmann, Beau Kilmer, and Paul Turnbull, 59–72. Luxembourg: Publications Office of the European Union. http://ec.europa.eu/justice/anti-drugs/files/eu_market_full.pdf.

Van Nuijs, Alexander L. N., Jean-François Mougel, Isabela Tarcomnicu, Lieven Bervoets, Ronny Blust, Philippe G. Jorens, Hugo Neels, and Adrian Covaci. 2011. "Sewage Epidemiology — A Real-Time Approach to Estimate the Consumption of Illicit Drugs in Brussels, Belgium." *Environment International* 37 (3): 612–21. doi:10.1016/j.envint.2010.12.006.

Vanhove, Wouter, Tim Surmont, Patrick Van Damme, and Brice De Ruyver. 2012. "Yield and Turnover of Illicit Indoor Cannabis (Cannabis Spp.) Plantations in Belgium." *Forensic Science International* 220 (1–3): 265–70. doi:10.1016/j.forsciint.2012.03.013.

Varese, Federico. 2006. "How Mafias Migrate: The Case of the 'Ndrangheta in Northern Italy." *Law & Society Review* 40 (2): 411–44.

Vargas, Ricardo M. 2005. *Narcotráfico, Guerra y Política Antidrogas: Una Perspectiva Sobre Las Drogas en el Conflicto Armado Colombiano*. Acción Andina Colombia.

Veillette, Connie. 2005. "Plan Colombia: A Progress Report." Congressional Research Service. http://www.securityassistance.org/sites/default/files/050217crs.pdf.

Violante, Luciano. 1987. *La mafia dell'eroina*. Riuniti.

Virkkunen, Matti. 1974. "Alcohol as a Factor Precipitating Aggression and Conflict Behaviour Leading to Homicide." *British Journal of Addiction to Alcohol & Other Drugs* 69 (2): 149–54. doi:10.1111/j.1360-0443.1974.tb01295.x.

Vlassoff, Carol. 2007. "Gender Differences in Determinants and Consequences of Health and Illness." *Journal of Health, Population, and Nutrition* 25 (1): 47–61.

Walker, John, and Brigitte Unger. 2009. "Measuring Global Money Laundering: 'The Walker Gravity Model.'" *Review of Law & Economics* 5 (2): 821–53.

Walker, Samuel. 1984. "'Broken Windows' and Fractured History: The Use and Misuse of History in Recent Police Patrol Analysis." *Justice Quarterly* 1 (1): 75–90. doi:10.1080/07418828400088041.

Warner, Barbara D., and Glenn L. Pierce. 1993. "Reexamining Social Disorganization Theory Using Calls to the Police as a Measure of Crime." *Criminology* 31 (4): 493–517. doi:10.1111/j.1745-9125.1993.tb01139.x.

Watts, Rob, Judith Bessant, and Richard Hil. 2008. *International Criminology: A Critical Introduction*. 1st ed. London and New York: Routledge.

Werb, Dan, Greg Rowell, Gordon Guyatt, Thomas Kerr, Julio Montaner, and Evan Wood. 2011. "Effect of Drug Law Enforcement on Drug Market Violence: A Systematic Review." *International Journal of Drug Policy* 22 (2): 87–94. doi:10.1016/j.drugpo.2011.02.002.

White, Helen R., and Dennis M. Gorman. 2000. "Dynamics of the Drug-Crime Relationship." In *Criminal Justice 2000 Volume 1.The Nature of Crime: Continuity and Change.*, 151–218. Washington: U.S. Department of Justice. http://www.drugsandalcohol.ie/4326/.

Whitehead, T. L., J. Peterson, and L. Kaljee. 1994. "The 'hustle': Socioeconomic Deprivation, Urban Drug Trafficking, and Low-Income, African-American Male Gender Identity." *Pediatrics* 93 (6 Pt 2): 1050–54.

WHO. 1996. *Violence: A Public Health Priority : WHO Global Consultation on Violence and Health, Geneva, 2-3 December 1996*. World Health Organization.

———. 2002. "World Report on Violence and Health: Summary." Geneva: World Health Organization. http://www.who.int/violence_injury_prevention/violence/world_report/en/summary_en.pdf.

———. 2008. "Violence, Injuries and Disability Biennial Report, 2006–2007." Violence, Injuries and Disability Biennial Report. Geneva: World Health Organization. http://apps.who.int/iris/bitstream/10665/43955/1/9789241597081_eng.pdf.

———. 2014. "Global Status Report on Violence Prevention 2014." Luxembourg: World Health Organization.

———. 2015. "Health Statistics and Information Systems." *World Health Organization*. http://www.who.int/healthinfo/statistics/mortality_rawdata/en/.

Wilkins, Chris, Krishna Bhatta, and Sally Casswell. 2002. "A 'Demand Side' Estimate of the Dollar Value of the Cannabis Black Market in New Zealand." *Drug and Alcohol Review* 21 (2): 145–51. doi:10.1080/09595230220139046.

Wilkins, Chris, James L. Reilly, Megan Pledger, and Sally Casswell. 2005. "Estimating the Dollar Value of the Illicit Market for Cannabis in New Zealand." *Drug and Alcohol Review* 24 (3): 227–34. doi:10.1080/09595230500170290.

Wilkins, Chris, and Paul Sweetsur. 2007. "Individual Dollar Expenditure and Earnings from Cannabis in the New Zealand Population." *The International Journal on Drug Policy* 18 (3): 187–93. doi:10.1016/j.drugpo.2006.11.002.

Willis, Henry H., Joel B. Predd, Paul K. Davis, and Wayne P. Brown. 2010. "Measuring the Effectiveness of Border Security Between Ports-of-Entry." Santa Monica, CA: RAND. http://www.rand.org/content/dam/rand/pubs/technical_reports/2010/RAND_TR837.pdf.

Wilson, William J. 1987. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy, Second Edition*. University of Chicago Press.

Winkler, Doris, Jonathan P. Caulkins, Doris A. Behrens, and Gernot Tragler. 2004. "Estimating the Relative Efficiency of Various Forms of Prevention at Different Stages of a Drug Epidemic." *Socio-Economic Planning Sciences*, Special Issue on Dynamic Drug Policy, 38 (1): 43–56. doi:10.1016/S0038-0121(03)00027-2.

Wirth, Louis. 1938. "Urbanism as a Way of Life." *American Journal of Sociology* 44 (1): 1–24.

Witte, Ann Dryden. 1980. "Estimating the Economic Model of Crime with Individual Data." *The Quarterly Journal of Economics* 94 (1): 57–84. doi:10.2307/1884604.

Wolfgang, Marvin E., and Franco Ferracuti. 1967. *The Subculture of Violence: Towards an Integrated Theory in Criminology*. London: Tavistock.

Wolfgang, Marvin E., Robert M. Figlio, and Sellin Thorsten. 1972. *Delinquency in a Birth Cohort*. http://www.press.uchicago.edu/ucp/books/book/chicago/D/bo5976934.html.

Woolcock, Michael, and Deepa Narayan. 2000. "Social Capital: Implications for Development Theory, Research, and Policy." *The World Bank Research Observer* 15 (2): 225–49. doi:10.1093/wbro/15.2.225.

Wooldridge, Jeffrey M. 2012. *Introductory Econometrics: A Modern Approach*. 5 edition. Mason, OH: South-Western College Pub.

World Bank. 1998. "Helping Countries Combat Corruption: The Role of the World Bank." http://www1.worldbank.org/publicsector/anticorrupt/corruptn/cor02.htm.

———. 2015a. "The World Bank Databases." The World Bank. http://data.worldbank.org/indicator/NY.GDP.MKTP.CD.

———. 2015b. "The Worldwide Governance Indicators (WGI) Project." *Worldwide Governance Indicators*. http://info.worldbank.org/governance/wgi/index.aspx#home.

———. 2016a. "GINI Index (World Bank Estimate)." http://data.worldbank.org/indicator/SI.POV.GINI.

———. 2016b. "World Development Indicators." *The World Bank*. http://databank.worldbank.org/data/reports.aspx?source=2&series=NY.GDP.MKTP.CD&country=.

Wortley, Scot. 2008. *The Root Causes of Youth Violence: A Review of Major Theoretical Perspectives*. Vol. 5. 5 vols. Toronto: ServiceOntario Publications. http://www.children.gov.on.ca/htdocs/English/topics/youthandthelaw/roots/volume5/index.aspx.

Wright, Richard, and Scott H. Decker. 1994. *Burglars on the Job: Streetlife and Residential*

Break-Ins. Northeastern University Press.

———. 1997. *Armed Robbers in Action: Stickups and Street Culture*. UPNE.

Wright, Richard, and Scott Jacques. 2010. *Drugs and Crime*. Oxford University Press. doi: 10.1093/OBO/9780195396607-0061

Yinger, J. Milton. 1960. "Contraculture and Subculture." *American Sociological Review* 25 (5): 625–35. doi:10.2307/2090136.

Zaluar, Alba. 2000. "Perverse Integration: Drug Trafficking and Youth in the 'Favelas' of Rio de Janeiro." *Journal of International Affairs* 53 (2): 653–71.

———. 2001. "Violence in Rio de Janeiro: Styles of Leisure, Drug Use, and Trafficking." *International Social Science Journal* 53 (169): 369–78. doi:10.1111/1468-2451.00324.

Zedillo, Ernesto, and Haynie Wheeler. 2012. "Rethinking the 'War on Drugs' Through the US-Mexico Prism." New Haven, CT: Yale Center for the Study of Globalization. http://www.ycsg.yale.edu/assets/downloads/rethinking-war-on-drugs.pdf.

Zembroski, David. 2011. "Sociological Theories of Crime and Delinquency." *Journal of Human Behavior in the Social Environment* 21 (3): 240–54. doi:10.1080/10911359.2011.564553.

Zimring, Franklin E., and Gordon Hawkins. 1997. *Crime Is Not the Problem: Lethal Violence in America*. New York, NY: Oxford University Press.

Zinberg, Norman. 1984. *Drug, Set, and Setting: The Basis for Controlled Intoxicant Use*. New Haven, CT: Yale University Press.

Zion, Noam, and Steve Israel. 2004. *The Origins of Human Violence and the Crisis of the Biblical First Family*. Shalom Hartman Institute.

Zuccato, Ettore, and Sara Castiglioni. 2012. "Consumi Di Sostanze Stupefacenti Nelle Città Europee." *Ricerca E Pratica*, no. 28: 252–60.

Annex I: flow/network model

a. Sizing the markets

The model assumes that every country imports a volume of cocaine (I_{it}) equal to the sum of consumed cocaine (C_{it}), national seizures (S_{it}), and exports (E_{it}): [$I_{it} = C_{it} + S_{it} + E_{it}$].

The size of national market (NMS_{it}) corresponds to cocaine consumption (C_{it}) plus national seizures (S_{it}): [$NMS_{it} = C_{it} + S_{it}$].

a.i Calculating the consumption of cocaine

The study calculates the national consumption (C_{it}) of illicit cocaine by multiplying the national number of cocaine users (U_{it}) by the annual consumption per-user (CPUi): [$C_{it} = U_{it} \cdot CPU_i$].

a.i.i. Number of users

The country/year-specific number of cocaine users (U_{it}) is a product of the prevalence of cocaine use ($prev_{it}$) among those in the population aged between 15-64 in the same year (POP_{it}): [$U_{it} = prev_{it} \cdot POP_{it}$].

Information on the prevalence of cocaine use comes from UNODC and the EMCDDA. Population data comes from the World Bank. UNODC provides three estimates of the prevalence of cocaine use (i.e., best estimate, low estimate, high estimate). High (U_h_{it}) and low (U_l_{it}) estimates of the number of users of cocaine in a given country rely on the low and high estimate of the prevalence of cocaine use provided by the UNODC. Data on population are punctual.

Missing estimates of the prevalence for a given year are imputed by linearly interpolating closest available estimates: [$prev_{it} = \overline{prev_{it-1}; prev_{it+1}}$].

a.i.ii. Underreporting an uncertainty in the estimates

The study corrects the number of users to account for uncertainty in estimates and underreporting.

The adjusted best estimate of the number of users (U_bADJ_{it}) is obtained by multiplying the best estimate of the number of users (U_b_{it}) by 1.5: [$U\_bADJ_{it} = U\_b_{it} \cdot 1.5$].

The adjusted low estimate of the number of users is simply equal to the low estimate of the UNODC when available, and the original best estimate when it is not: [$U\_l_{it} \exists \Rightarrow U\_lADJ_{it} = U\_l_{it}$; $U\_l_{it} \nexists \Rightarrow U\_lADJ_{it} = U\_b_{it}$].

The adjusted best estimate of the number of users (U_hADJ_{it}) is obtained by selecting the highest among the double of the best estimate (U_b_{it}·2) and the high original estimate (U_h_{it}): [$U\_b_{it} \cdot 2 \geq U\_h_{it} \Rightarrow U\_hADJ_{it} = U\_b_{it} \cdot 2 ; U\_b_{it} \cdot 2 \leq U\_h_{it} \Rightarrow U_{hADJ_{it}} = U_{b_{it}} \cdot 2$].

a.i.iii. Regional adjustment

The study used regional estimates on the level of consumption per user in order to correct national estimates of the level of consumption per user. UNODC provides an estimate of consumption in grams per user, per year, per macro area in reference to 2008 (2010c). Since the original estimate of the volume of consumption refers to countries within the European Union (Pudney et al. 2006; Kilmer and Pacula 2009), the regional parameter (cpr) is constructed by calculating the ratio between the estimate of the annual consumption per user (CPUu) in Europe (EU/EFTA) and in the other regions (CPUr): [$cp_r = CPU_u / CPU_r$]. The macro regions used by the UNODC are (2010c): Africa; Asia; East and South-East Europe; North America; Oceania South America, Central America, Caribbean.

The specific annual consumption per user of country *i* (CPU_i) is obtained by adjusting the general consumption per user (CPU, equal to CPU_u): [$CPU_i = CPU_u \cdot cp_{ri}$]. The study includes countries in the macro regions according to the definition of regions adopted by the UN (2015b).

a.i.iv. Purity adjustment

Ideally, the *Delta ARQ* database of the UNODC (2014a) provides six estimates of the level of cocaine purity per country per year (i.e., minimum pur_m_{it}, typical pur_t_{it}, and maximum pur_M_{it} at street (st) and at wholesale (wh) level). UNODC's data on purity are incomplete for some countries in certain years. The current study imputes missing data according to the simplest possible interpolation criteria already presented with respect to prevalence data: [$pur_{it} = \overline{pur_{it-1}; pur_{it+1}}$].

To transform estimates of raw cocaine consumption (C_raw_{it}) into estimates of the consumption of pure cocaine (C_{it}), raw volumes (C_raw_{it}) are multiplied by the estimated purity levels at retail: [$C_{it} = C\_raw_{it} \cdot pur\_rt_{it}$]. Best estimate ($C\_braw_{it}$) is obtained by multiplying the estimate of the typical purity level (pur_Tst_{it}): [$C_{it} = C\_braw_{it} \cdot pur\_trt_{it}$]; low estimate ($C\_lraw_{it}$) is obtained using the estimate of the maximum purity level ($pur\_M\_st_{it}$): [$C_{it} = C\_lraw_{it} \cdot pur\_Mrt_{it}$]; high estimate ($C\_hraw_{it}$) is obtained using the estimate of the minimum purity level ($pur\_m\_st_{it}$): [$C_{it} = C\_hraw_{it} \cdot pur\_m\_st_{it}$].

a.ii Calculating purity-adjusted seizures

The study divides seizure cases into three categories depending on the volume of the registered seizure. If the seizure has a volume smaller than 1.0 kg it is assumed to concern retail low-level

trafficking; if the seizure has a volume between 1.0 kg and 10 kg then it is considered to concern intermediate distribution; seizure of loads of more than 10 kg are assumed to concern high-level trafficking. The relative relevance of seizures occurring at each level is estimated by calculating the ratio between the volume of seizure of that specific level and the total of seizures identified in seizure cases.

Therefore, the share of seizures occurring at retail level (sr_i) is equal to the ratio between the sum of seizure cases whose volume is smaller than a kilogram (SCL_{il}) and the total of seizure cases (SCT_{is}): [$sr_i = \sum_{l=1}^{L}(SCL^l{}_i / \sum_{s=1}^{S}(SCT_{is})$].

In the same manner, it is possible to calculate the share of seizure cases by referring to seizures assumed to occur at distribution level (sd_i) (between 1.0 kg and 10 kg) and at high-level (sh_i) (more than 10 kg). The estimate of these parameters does not take into consideration the year that the seizure case occurred; the relative relevance of the categories varies in time only because of variations in the estimated level of purity corresponding with each group of seizures. The decision to not allocate seizures to the three categories was made to increase the robustness of cross-country differences in the estimate.

By design, the three parameters form a total: [$\mathrm{sr_i} + \mathrm{sd_i} + \mathrm{sh_i} = 1$]. Consequently, by multiplying the total seizures registered in the countries by the three parameters, it is possible to determine the volume of seizures occurring at each level of the supply chain. The necessity of this step is determined by the fact that seizure cases are a sample of total seizures, and the sum of their volumes does not correspond to the total seized volume in the country.

Therefore, for example, the volume of seizures occurring at retail level (Sr_{it}) is obtained by multiplying the relative parameter (sr_i) by the total raw volume of cocaine intercepted in country *i* in year *t* ($Sraw_{it}$): [$\mathrm{Sr_{it}} = \mathrm{Sraw_{it}} \cdot sr_i$]. Using the same procedure, it is possible to estimate the volume of seizures taking place at distribution level (Sd_{it}) and at high-level (Sh_{it}). Missing information on national estimates of total seizures of raw cocaine ($Sraw_{it}$) for a given year are imputed by linearly interpolating the closest available data: [$Sraw_{it} = \overline{Sraw_{it-1}; Sraw_{it+1}}$].

After estimating the volume of seizures occurring at each step of the supply chain (Sr_{it}, Sd_{it}, Sh_{it}), it is possible to adjust each of them for the corresponding estimated purity level ($p_{it\ l}$) and to recalculate them to obtain the total amount of purity adjusted seizures (S_{it}): [$S_i = \sum_{l=1}^{3}(Sraw_{it} \cdot sl_{i\ l} \cdot p_{it\ l})$], where *l* represents the three levels of the supply chain.

As aforesaid, the *Delta ARQ* database of the UNODC (2014a) provides six estimates of the level of cocaine purity per country per year (i.e., minimum pur_m_{it}, typical pur_t_{it}, and maximum pur_M_{it} at street (st) and at wholesale (wh) level). The estimate of typical purity at street level ($pur\_t\_st_{it}$) is used to adjust for the purity of seizures occurring at retail level. The estimate of typical purity at wholesale

level ($pur\_t\_wh_{it}$) is used to adjust for the purity of seizures occurring at a high-international level. The estimate average of typical purity at both street ($pur\_t\_st_{it}$) and wholesale ($pur\_t\_wh_{it}$) levels is used to adjust for the purity of seizures occurring at the intermediate-distribution level.

Information on seizure cases are gathered from the IDS databases of the UNODC (2014c; 2014). Data on overall national seizures and purity levels come from the *Delta ARQ* databases and various editions of the *World Drug Report* by the UNODC.

b. Sizing the cocaine flows

b.i Weighting the dyads

In order to weight the relative relevance of dyads (drw_{ijt}), the study makes use of the moving average of seizures (S_{ij}) occurring along the route connecting the two countries under analysis (j, i). With respect to year *t*, the moving average of seizures (SMA_{ijt}) is determined by the level of seizures in t (S_{ijt}), during the previous year (S_{ijt-1}), and the following year (S_{ijt+1}). Seizures in previous and subsequent years account for half of their value: [$\mathrm{SMA_{ijt}} = \overline{\mathrm{S_{ijt}}; (\mathrm{S_{ijt-1}} + \mathrm{S_{ijt-1}})/2}$].

The moving average of the volume of seizures (SMA_{ijt}) referring to year *t* and occurring along the connection between country (j) and country (i) is divided by the total volume of seizures ascribed to the importer ($\sum_{j=1}^{J} \mathrm{SMA_{ijt}}$) to estimate the parameter representing the relative weight of the dyad among the two countries (drw_{ijt}): [$\mathrm{drw_{ijt}} = \mathrm{SMA_{ijt}} / \sum_{j=1}^{J} \mathrm{SMA_{ijt}}$]. All the data used to form this estimate comes from the IDS databases of the UNODC.

b.ii Sizing the flows

Once the estimates of the imported volumes (I_{it}) and of the relative weights of the connections (drw_{it}) are known, the product of the two provides the estimate for the volume of cocaine flowing from country *j* to country *i*: [$\mathrm{F_{ijt}} = \mathrm{drw_{ijt}} \cdot \mathrm{I_{it}}$].

In turn, the amount of cocaine reaching each specific country *i* (I_{it}) is equal to the sum of the cocaine exported toward *i* from each other country *j* linked to country *i* (X_{ijt}) [$I_{it} = \sum_{j=1}^{J}(X_{ijt})$]. Where *J* is the total number of *j* countries exporting cocaine towards *i*.

c. Estimating the profits

c.i Prices

The next three subsections present the calculi for the estimate of prices. Subsection c.i.i presents the imputation of missing data in the *Delta ARQ* databases of the UNODC (2014a). Subsection c.i.ii describes the estimate of purity-adjusted prices obtained by combining the available estimates of prices and purity of cocaine at both street and wholesale levels. Subsection c.i.iii explains the estimate of the trading prices that, when used in combination with the information on volumes, finally permits for calculating cocaine trafficking gross value added.

c.i.i. Delta ARQ price estimates

The *Delta ARQ* databases of the UNODC (2014a) provides six estimates of the level of cocaine purity per country per year (i.e., minimum PR_m_{it}, typical PR_t_{it}, and maximum PR_M_{it} at street (st) and at wholesale (wh) level). UNODC's data on prices are missing for some countries, in specific years.

The study checks the meaningfulness of available prices by confronting street level prices with wholesale prices and minimum, typical, and maximum prices among them.

Missing data are imputed by linearly interpolating available estimates: [$PR_{it} = \overline{PR_{it-1}; PR_{it+1}}$].

In order to make the quantities comparable all the prices are purity-adjusted, which results in six different purity adjusted prices per country per year, that are then subsequently used in the actual estimate of the monetary value of cocaine trafficking in each country.

Table 7. Average prices after check and imputation, three estimates at street level and three estimates at wholesale level

		N. Obs.	Mean	Std. Dev.	Min	Max
Retail	Typical	3,724.00	88.76	89.88	0.65	929.00
	Minimum	3,724.00	66.48	70.36	0.20	636.00
	Maximum	3,724.00	111.15	115.43	0.65	1,200.00
Wholesale	Typical	3,724.00	52,397.03	48,312.82	500.00	559,000.00
	Minimum	3,724.00	40,795.72	41,710.52	444.44	406,000.00
	Maximum	3,724.00	64,867.38	56,818.21	555.56	559,000.00

c.i.ii. Purity-adjusted price estimates

UNODC's original estimates are combined as follows to generate the new six purity-adjusted prices:

- $padjPR\_m\_st_{it} = PR\_m\_rt_{it} / \overline{(pur\_t\_st_{it}; pur\_M\_st_{it})}$
- $padjPR\_t\_st_{it} = PR\_t\_rt_{it} / pur\_t\_st_{it}$
- $padjPR\_M\_st_{it} = PR\_M\_rt_{it} / \overline{(pur\_m\_st_{it}; pur\_t\_st_{it})}$
- $padjPR\_m\_wh_{it} = PR\_m\_wh_{it} / pur\_t\_wh_{it}; pur\_M\_wh_{it}$

- $padjPR\_m\_wh_{it} = PR\_t\_wh_{it}/pur\_t\_wh_{it}$
- $padjPR\_m\_wh_{it} = PR\_m\_wh_{it}/\overline{(pur\_m\_wh_{it}; pur\_t\_wh_{it})}$

PR_m_st$_{it}$, *PR_t_st*$_{it}$, and *PR_M_st*$_{it}$ indicate respectively the minimum, typical, and maximum estimate of prices at street level (st) as reported by the UNODC (2014a). *PR_m_wh*$_{it}$, *PR_t_wh*$_{it}$, and *PR_M_wh*$_{it}$ indicate respectively the minimum, typical, and maximum estimate of prices at wholesale level (wh) as reported by the UNODC (2014a). *pur_m_st*$_{it}$, *pur_t_st*$_{it}$, and *pur_M_st*$_{it}$ indicate respectively the minimum, typical, and maximum estimates of purity level at street level as reported by the UNODC (2014a). *pur_m_wh*$_{it}$, typical *pur_t_wh*$_{it}$, and maximum *pur_M_wh*$_{it}$ indicate respectively the minimum, typical, and maximum estimate of purity at wholesale level as reported by the UNODC (2014a).

padjPR_m_st$_{it}$, *padjPR_t_st*$_{it}$, and *padjPR_M_st*$_{it}$ indicate respectively the minimum, typical, and maximum estimate of purity-adjusted prices at street level as proposed by this study. *padjPR_m_wh*$_{it}$, *padjPR_t_wh*$_{it}$, and *padjPR_M_wh*$_{it}$ indicate respectively the minimum, typical, and maximum estimate of purity-adjusted prices at street level as proposed by this study.

The cross combination of minimum prices and maximum purity levels and vice versa expands the range of estimates, thus better addressing the high-level of uncertainty of UNODC's estimates. At the same time, the study exploits the average between the typical and the boundary estimates instead of the boundary estimate by themselves so as to adjust price for purity levels. This is because minimum and maximum levels are considered less reliable than estimates of typical levels (UNODC 2015d). The combined use of typical and boundary estimates mitigates the limitations of using exclusively estimates of minimum or maximum levels.

Table 8. Average purity-adjusted prices, three estimates at street level and three estimates at wholesale level

		N. Obs.	Mean	Std. Dev.	Min	Max
Retail	Typical	3,724.00	206.84	215.82	0.96	1,900.00
	Minimum	3,724.00	123.58	123.17	0.29	1,140.00
	Maximum	3,724.00	355.69	387.40	1.13	3,788.78
Wholesale	Typical	3,724.00	75,444.03	70,425.27	555.56	657,647.00
	Minimum	3,724.00	54,026.41	56,078.27	1.00	477,647.00
	Maximum	3,724.00	115,562.30	112,600.30	600.60	1,081,081.00

c.i.iii. Trading price estimates

The following paragraphs describe the calculi behind the estimates of the prices used in the study in order to estimate cocaine trafficking related gross value added.

"International price" (IP_{ijt}) (i.e., the typical price per kilogram of cocaine flowing in country *i* from country *j* in year t) is the minimum purity-adjusted wholesale price of the importing country *i* ($padjPR\_m\_ws_{it}$), if the minimum purity-adjusted wholesale price of the importing country *i* is higher than the minimum purity-adjusted wholesale price of the exporting country *j* ($padjPR\_m\_ws_{jt}$). If instead, the minimum purity-adjusted wholesale price of the importing country *i* ($padjPR\_m\_ws_{it}$) is not higher than the minimum purity-adjusted wholesale price of the importing country *j*, then the "importing price" (IP_{ijt}) is the average of the typical purity-adjusted wholesale price of the importing country *i* ($padjPR\_t\_ws_{it}$) and the minimum purity-adjusted wholesale price of the exporting country *j* ($padjPR\_m\_ws_{jt}$):

[$IP_{it} = \left[padjPR\_m\_wh_{it} \geq \ padjPR\_m\_wh_{jt}\right] \Rightarrow$
$padjPR\_m\_wh_{it}; \left(\overline{padjPR\_t\_wh_{it}; padjPR\_m\_wh_{jt}}\right)$].

"Average importing price" (AIP_{it}) (i.e., the average price per kilogram of cocaine entering into country *i* in year t) is the weighted average of the prices at import of countries *i* (IP_{ijt}), which imports cocaine from *J* countries. Specific importing prices (IP_{ijt}), referring to the transactions with country *j*, are weighted according to the size of loads flowing from that specific country (*j*) (I_{jit}): [$AIP_{it} = \sum_{j=1}^{J} \mathrm{IP}_{ijt} \cdot \mathrm{I}_{jit} / \sum_{j=1}^{J} \mathrm{I}_{jit}$].

"Average exporting price" (AXP_{it}) (i.e., the average price per kilogram of cocaine leaving country *i* in year *t*) is the weighted average of importing prices (IP_{kt}) registered by the *K* countries importing cocaine from country *i*. Specific importing prices (IP_{kit}), referring to the transactions with country *k*, are weighted according to the size of loads flowing into that specific country (*k*) (I_{kit}): [$AXP_{it} = \sum_{k=1}^{K} \mathrm{IP}_{it} \cdot \mathrm{I}_{kit} / \sum_{k=1}^{K} \mathrm{I}_{kit}$].

"Wholesale price" (WP_{it}) (i.e., the average price per kilogram of cocaine purchased by national-intermediate distributors in year t) is the average of minimum ($padjPR\_m\_wh_{it}$) and typical ($padjPR\_t\_wh_{it}$) purity-adjusted prices at wholesale level: [$WP_{it} = \overline{(padjPR\_m\_wh_{it}; padjPR\_t\_wh_{it})}$].

"Distribution price" (DP_{it}) (i.e., the typical price per kilogram of cocaine purchased by local retailers in year t) is the average of maximum purity-adjusted prices at wholesale level ($padjPR\_m\_wh_{it}$) and highest price between minimum purity-adjusted prices at street level ($padjPR\_m\_st_{it}$) and typical purity-adjusted price at wholesale level ($padjPR\_t\_wh_{it}$): [$DP_{it} = \overline{(padjPR\_M\_wh_{it}; [padjPR\_m\_st_{it} \geq \ padjPR\_t\_wh_{it}] \Rightarrow padjPR\_m\_st_{it}; padjPR\_t\_wh_{it})}$].

"Retail price" (RPit) (i.e., the typical price per kilogram of cocaine purchased by final consumers) is the average of typical ($padjPR\_t\_st_{it}$) and maximum ($padjPR\_M\_st_{it}$) purity-adjusted prices at street level: [$RP_{it} = \overline{(padjPR\_t\_st_{it}; padjPR\_M\_st_{it})}$].

c.i.iv. Dyad price check

Checking the soundness of dyads with price estimates retraces the idea behind the calculation of the "international price". The idea behind it is that drug transactions have to generate margins (Reuter 2014; Chandra and Barkell 2013; Chandra, Yu, and Bihani 2016). If the dyad identifies a non-profitable trade, then the seizure case is either a rare exception or contains an error. Therefore, if it does not exist at a trading price convenient for both then the countries in that dyad are excluded from the network.

The dyad identified by seizure cases is included in the network if the minimum purity-adjusted wholesale price of the importing country *i* ($padjPR\_m\_ws_{it}$) is higher than the minimum purity-adjusted wholesale price of the exporting country *j* ($padjPR\_m\_ws_{jt}$): [DY_{ijt} ∃ if $padjPR\_m\_wh_{it} \geq padjPR\_m\_wh$].

c.i.v. Calculating the gross value added at high/international level

Revenues for high-level traffickers from county *i* in year *t* emerge from the trade of cocaine with other countries connected in the trafficking network (HR_int_{it}) and from the sale of cocaine to national distributors (HR_nat_{it}). High-level trafficking costs ($HCOS_{it}$) concern the purchases of cocaine on the international market. The difference between the sum of the two forms of revenues (HR_int_{it}, HR_nat_{it}) and costs ($HCOS_{it}$) provides the gross value added at high-international level (HGP_{it}): [$HGP_{it} = (HR\_int_{it} + HR\_nat_{it}) - HCOS_{it}$].

Calculating the revenues from international cocaine trafficking

In any given country *i*, revenues from international trafficking (HR_int_{it}) are two thirds of the total value of exports of cocaine (XV_{it}) plus one third of the total value of the imports (IV_{it}): [$HR\_int_{it} = XV_{it} \cdot \frac{2}{3} + IV_{it} \cdot \frac{1}{3}$].

Value of imports (IV_{it}) is obtained by multiplying imported volumes (I_{it}) times the "average importing price" (AIP_{it}): [$IV_{it} = I_{it} \cdot AIP_{it}$].

Value of the exports (XV_{it}) is the product of exported volumes (X_{it}) and the "average exporting price" (AXP_{it}): [$XV_{it} = X_{it} \cdot AXP_{it}$].

Calculating the revenues from inputting cocaine in the national market

Revenues from drug sales to intermediate distributors (HR_nat_{it}) are the product of "wholesale price" (WP_{it}) multiplied by the volume sold to the national distributor (N_{it}): [$HR\_int_{it} = N_{it} \cdot WP_{it}$].

In turn, the volume sold to the national distributor (N_{it}) is equal to the sum of national consumption (C_{it}), seizure at retail level (Sr_{it}), and half of seizure at national-intermediate level (Sn_{it}): [$N_{it} = C_{it} + Sr_{it} + Sn_{it} \cdot \frac{1}{2}$].

Calculating the costs of high-level international traffickers

High-level costs ($HCOS_{it}$) emerge from the purchase of cocaine on the international market. Traffickers acquire a volume of cocaine corresponding to the imports (I_{it}) and, on average, they pay the "average importing price" (AIP_{it}): [$HCOS_{it} = I_{it} \cdot AIP_{it}$].

In producing countries, the costs are the farm-gate prices of cocaine ($FGVA_{it}$).

c.i.vi. Calculating the gross value added at distribution level

The difference between the value of the sale to retailers (DR_{it}) and the cost of purchasing products from high-level international traffickers ($DCOS_{it}$) determines the gross value added at the intermediate-distribution level (DGP_{it}): [$DGP_{it} = DR_{it} - DCOS_{it}$].

Calculating the revenues from cocaine distribution to retailers

The volume of cocaine that intermediate actors sell to local retailers (V_{it}) is equivalent to the sum of the volume consumed (C_{it}) and seizures taking place at retail level (Sr_{it}). Revenues at distribution level (DR_{it}) are equal to the sum of these volumes multiplied by the "distribution price" (DP_{it}) that retailers pay to procure the cocaine from distributors: [$DR_{it} = V_{it} \cdot DP_{it}$].

Calculating the costs of national distributors

The costs for distributors are equal to the volumes of cocaine they purchase from high-level traffickers (N_{it}) multiplied by the "wholesale price" (WP_{it}): [$HR\_int_{it} = N_{it} \cdot WP_{it}$].

In turn, the volume purchased by distributors (N_{it}) is assumed to be equal to the sum of internal consumption (C_{it}), seizures at the retail level (Sr_{it}), and half of seizures at distribution level (Sn_{it}): [$N_{it} = C_{it} + Sr_{it} + Sn_{it} \cdot \frac{1}{2}$].

c.i.vii. Calculating the gross value added at retail level

Gross value added at retail ($RGVA_{it}$) is obtained by subtracting the cost of purchasing cocaine at the intermediate level ($RCOS_{it}$) from the revenues at retail (RR_{it}): [$RGVA_{it} = RR_{it} - RCOS_{it}$].

Calculating the revenues from cocaine sell to final consumers

Total consumption (C_{it}) multiplied by the price at retail (RP_{it}) provides the revenues at retail (RR_{it}): [$RR_{it} = C_{it} \cdot RP_{it}$].

Calculating the costs for retailers

The distribution price (DP_{it}), multiplied by the purchased quantities from intermediate actors (V_{it}), provides the costs sustained by retailers ($RCOS_{it}$): [$RCOS_{it} = V_{it} \cdot DP_{it}$].

c.i.viii. Calculating the overall national gross value added

The overall national gross value added (GVA_{it}) is the sum total of its three components: [$GVA_{it} = \mathrm{HGVA}_{it} + \mathrm{DGVA}_{it} + RGP_{it}$].

Annex II: econometric evidences

Table A. 1 Wald test of joint significance, time dummies of Model 1

(1) y1999 = 0
(2) y2000 = 0
(3) y2001 = 0
(4) y2002 = 0
(5) y2003 = 0
(6) y2004 = 0
(7) y2005 = 0
(8) y2006 = 0
(9) y2007 = 0
(10) y2008 = 0
(11) y2009 = 0
(12) y2010 = 0
(13) y2011 = 0
(14) y2012 = 0
(15) y2013 = 0
Constraint 15 dropped
F(14, 62) = 6.61
Prob > F = 0.0000

Table A. 2 Effect of Controls of corruption, rule of law, and probity & rule of law on homicide rates, years 1999-2013 unbalanced panel of 63 countries

	(1)	(1.i)	(1.ii)	(1.iii)
	Synthetic index	**Rule of law indicator**	**CPI**	**Rule of law indicator and CPI**
FGAV |%|	0.3266**	0.2304*	0.3182**	0.1795+
	(0.0979)	(0.0898)	(0.1043)	(0.0959)
Cocaine consumption	0.0000	0.0000+	0.0000	0.0000+
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Infant mortality rate	0.0910***	0.0639**	0.0949***	0.0959***
	(0.0150)	(0.0193)	(0.0149)	(0.0196)
Urban population (%)	0.0030	-0.0010	-0.0005	0.0047
	(0.0053)	(0.0059)	(0.0061)	(0.0054)
Probity & Rule of Law	0.0115			
	(0.0118)			
Rule of law		0.1982		0.4250*
		(0.2009)		(0.1895)
Corruption control			0.0865	-0.0686
			(0.0731)	(0.0630)
Police rate	-0.0002	-0.0008	-0.0001	0.0000
	(0.0007)	(0.0008)	(0.0006)	(0.0006)
ln hom. rate t-1	0.1574*	0.1796*	0.1034	0.1294+
	(0.0769)	(0.0763)	(0.0805)	(0.0753)
15-34 male (%)	14.5871***	16.4360***	15.1440***	14.9691***
	(2.9159)	(2.4114)	(3.1664)	(2.7403)
Seizure rate	0.5242**	0.4176*	0.6821***	0.4135**
	(0.1715)	(0.1672)	(0.1878)	(0.1291)
Traff. share of GAV	0.5590	0.9371*	0.6138*	0.8482**

	(0.3458)	(0.3741)	(0.3062)	(0.2627)
Alcohol consumption	0.0618**	0.0453+	0.0572*	0.0499**
	(0.0218)	(0.0249)	(0.0251)	(0.0179)
Political violence	0.3982***	0.2241*	0.3962***	0.2752**
	(0.1085)	(0.0934)	(0.1108)	(0.0869)
Year controls	Yes	Yes	Yes	Yes
N	608	618	608	608
N. of countries	63	63	63	63
N. of instruments	57	57	57	61
F	39.85	46.61	47.44	2346.14

Note: the table reports the results of system GMM of Blundell and Bond (1998) regressions of economic indicators of the cocaine market and structural variables on homicides in a series of 63 countries in the period 1999-2013. The dependent variable is the log of the homicide rate in each year; the main explanatory variable is the fluctuation of the gross value added related to cocaine trafficking in each country (i.e., FGVA |%|). Year dummies are included in all regressions. The four models replicate the analyses proposed in model (1) (see Table 4) and focus on the specific roles of Probity/Corruption control (CPI), Rule of law, and on their interaction. Model (1) is the model proposed in Table 4. Model (1.i) utilizes an indicator of the Rule of Law as a unique measure of the quality, transparency, and effectiveness of public institutions. Model (1.ii) has CPI, an indicator of the control of corruption, as the regressor. Model (1.iii) combines both CPI and the rule of law without combining them..

Figure A 1. Correlation between Probity (CPI), Rule of law indicator, and their synthetic indicator

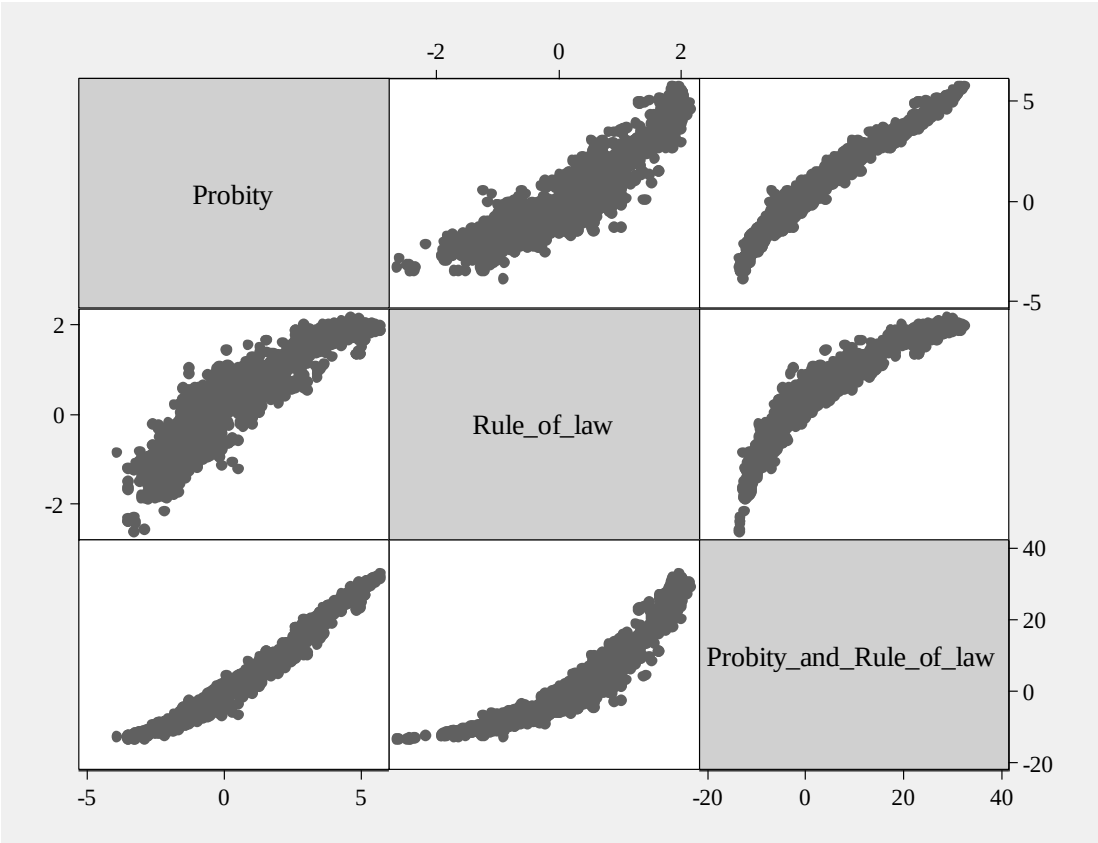


Figure A 2. Distribution of residuals, models (1) to (5)