Essays on Social Conflict

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Ad Andrea, Anna e Carlo

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Introduction

Crime and violence are common aspects of the lives of citizens in many countries of the world. In addition to the direct effect on victims, crime causes extensive costs, creates a climate of fear and insecurity for all citizens and reduces economic growth, representing a significant challenge to development. Concern over these effects has made the topics of criminality and violence a major preoccupation of academics, policy-makers, and development practitioners.

This PhD thesis, entitled *Essays on Social Conflict,* has two main objectives. First, it aims to deepen our understanding of the main determinants of criminality in both developing and developed regions. Second, it seeks to inform the design of evidence-based policies to prevent and reduce crime among population segments and areas where criminality is severe.

This dissertation consists of three essays. Chapter 1 investigates the causality and robustness of the link between inequality and crimes from an empirical cross-country perspective, with an emphasis on income inequality, individual's inequality perceptions and redistributive preferences as being important determinants of criminal behavior in a country. Panel data techniques are used to assess the link between inequality and property crimes. The data cover 27 European countries over the period of 1993-2008. Fixed effect models are estimated to investigate the possibility of a causal relationship between inequality, tolerance of inequality, and crimes. The main result of the paper is that there is strong evidence of significant effects of inequality (with a quadratic decelerating crime-inequality relation) and tolerance of economic inequality on crimes and to the control for country characteristics as well as country fixed effects to account for time-invariant unobservable variables. A strong point of the analysis is the use of the instrumental variable technique to address the endogeneity of people's beliefs about inequality. To the extent that concentrated income disadvantage is a key determinant of crime at the macro-level, this analysis suggests that those policies that are designed to reduce inequality are likely to have a significant impact on crime prevention and reduction.

Chapter 2 discusses the complex link between ethnicity and homicide. Specifically, this chapter examines empirically the impact of a specific cultural dimension of ethnicity, represented by ethno-linguistic differences, and its influence on national homicide rates. The empirical specification is informed by a theoretical model of social conflict developed by Esteban and Ray (2011) that does not have a peaceful output and in which conflcit is influenced by three distributional indices of diversity: ethnic fractionalization, ethnic polarization, and a Greenberg-Gini index constructed across ethnic groups. The analysis tests the effect of these distributional measures on homicide rates across 70 countries, for the period of 1995-2007, suggesting that some ethnic structures are more conducive to homicide than others. In particular, the paper finds that ethno-linguistic fractionalization is highly significant across a number of specifications and robustness checks, and that disputes over private goods are also an important determinant of homicide rates, especially across countries in Latin and North America. By implementing the idea that intentional homicide is linked to three distinct dimensions of ethnic division, this paper provides a completely alternative view of the analysis of the determinants of homicide, contributing therefore to the existing analysis of the determinants of violent crimes and their relationship to ethnic cleavages.

Chapter 3 is devoted to the analysis of the impact of drug cartels and drug-related homicide on crimes and perceptions of insecurity in Mexico. This analysis, conducted with Professor Gutierrez-Romero, contributes to the current debates on the socioeconomic impact of drug cartels by recognizing the level to which crime, security perceptions, and actions taken to avoid being victims of crime have changed in areas where drug cartels operate with and without turf conflict that leads to drug-related homicides. This analysis uses the difference-in-difference estimator, combined with instrumental variables, to address the potential endogeneity of where cartels chose to operate peacefully or not. It was found that individuals living in areas that experienced drug-related homicides take more measures toward increasing their security, devote more resources to security than those living in areas not affected by drug-related homicides yet these areas also are more likely to experience particular crimes, such as theft and extortion. On the other hand, crimes and perceptions of the lack of safety do not change in areas where cartels operate without committing drug-related homicides and respondents living in these areas allocate fewer resources to security than those free of cartels and drug-related homicides.

Inequality, Tolerance of Inequality and Property Crimes in Europe

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Abstract

This paper uses panel data techniques to examine the relationship between inequality and property crimes, in particular domestic burglary and vehicle theft, on a national level. It analyzes cross-national preferences toward more equal income distribution from the World Values Survey to determine the factors that shape crime rates. The data cover 27 European countries over the period 1993-2008. Fixed effect models are estimated to investigate the possibility of a causal relationship between inequality, tolerance of inequality and crimes. The results reveal strong evidence of the significant effects of inequality and tolerance of economic inequality on crimes, for both domestic burglary and vehicle theft.

1 Introduction

The number of crimes recorded by the police in several European countries has consistently declined since 2002, but during the years 2006-2009 this tendency presented signs of slowing down (Eurostat, 2011). At the end of 2009, the police recorded more crimes in few Member States, in particular domestic burglary and drug trafficking, leading to an increasing relevance of this topic in the public agenda. Despite the political and social importance of crime and the long tradition in the economic analysis of criminal activities, there is no significant quantitative research on the economic determinants of crimes, especially in Europe. Much of what is known is based on analyses of data for the United States (Levitt, 2004; Levitt and Myles, 2007), whereas for Europe, the existing literature on crime typically focuses on a single country (Fasani et al. 2013; Drago et al., 2009, Buonanno et al., 2009; Draca et al., 2010).

It is commonly assumed that income inequality and crimes (especially violent property crimes) are positively correlated (Burdett et. al, 1999; Kelly, 2000; Fajnzylber et al., 2002; Burdett and Mortensen, 1998; Imrohoroglu et al., 2000, 2001). Economic models in the tradition of Becker (1968) suggest that, as income distribution becomes more unequal, the gap between the costs and benefits derived from crime increases and thus the incentive to engage in criminal activities becomes higher. However, while most cross-sectional studies conclude that inequality leads to crime (Demombynes and Ozler, 2005), panel data studies find no significant relationship between income inequality and crime, or just find negative as positive effects (Freeman, 1996; Doyle, Ahmed and Horn, 1999; Kelly, 2000). In the majority of cases, it's not easy to make a direct comparison of crime types among countries, since important differences in systems of criminal justice and in methods of reporting crimes exist among countries. Another possible reason for which the empirical literature does not produce robust results lies in the assumption of a linear relationship between economic conditions and crimes. Although most of the empirical analysis implicitly assumes a linear relationship between these two variables, only few recent studies attempt to analyze potential nonlinearities.[1]

The purpose of this paper is to investigate the causality and robustness of the link between inequality and crimes from an empirical cross-country perspective and with an emphasis on income inequality and an individual's inequality perceptions and redistributive preferences as two important determinants of the criminal behavior in a country. Two income distributions with the same level of economic inequality can have different degrees of tolerance of it. What is "acceptable" in one society could be perceived as intolerable in another, and this, because different societies can have contrasting ideas about which is the appropriate level of inequality. If people in two societies with similar distribution of income experience income inequality in very different ways, the consequences of income inequality could also be very different in these societies. Tolerance of

[1] The existing research on the question of whether the effect of disadvantage on violent crime is linear, accelerating , or decelerating at very high levels of deprivation has produced inconsistent findings (Hannok and Knapp, 2003).

inequality thus may reflect the level of social unrest and, in this analysis, it is expected to explain crime rates as done by the Gini index which does not reflect unequal psychological aspects.

The contribution of this paper is three-fold. First, it contributes to fill the existing gap in the empirical economic literature on crimes with a cross-country analysis of the socioeconomic determinants of property crimes in Europe. This analysis focuses mainly on property crimes. It concerns itself with those crimes from which the perpetrator may obtain income by the stealing or the destruction of property, as during domestic burglary and vehicle theft. Following the previous empirical literature (Neumayer, 2005; Buonanno et al., 2011), this analysis concentrates on the most important socioeconomic variables used as controls for domestic burglary and motor vehicle theft (henceforth MVT). These include income inequality, unemployment rates, the percentage of young males in a population and the public and private health expenditure. Second, using the Gini index as the measure of inequality in income distributions, this paper finds a quadratic decelerating crime-inequality relation. It therefore gives support to a small body of the literature that suggests additional deprivation has few consequences in terms of increasing crimes. Since the relationship between inequality and crime is supposed to operate through an individual's assessment of the equity of a specific distribution of economic resources, the third contribution of this analysis is in the use of individuals' inequality perceptions and in their empirical association with the level of criminality within countries. By considering what people think about the distribution of goods in society and especially what they think a just distribution would look like (Mason and Kluegel, 2000; Miller, 1992; Wegener, 1999)[2], this paper contributes in extending the analysis of individual choice in the decision to commit crimes with the inclusion of a class of attitudes and preferences. In contrast with the empirical research about the effects of inequality in incomes, research about the tolerance of inequality is mainly theoretical, focused on the field of political psychology and on the determinations of opinions, saying little about whether citizens' views are possible causes of crimes. Preferences and beliefs are derived by using the answers to a specific question, related to economic inequality attitudes, from the World Value Survey.

Results support the hypothesis that income inequality is highly significant in the explanation of property crimes, in the European context over the period 1993-2008. The relationship between income inequality, burglary, and MVT appear nonlinear and decelerating. Although highly unequal countries have significantly more property crime than areas that are more equal, the deceleration effect may be related to the lack of attractive targets for theft in very highly unequal (and lower income) countries. Moreover, individual perceptions and beliefs about income distribution (at an aggregate national level) play a chief role in the decision to commit crimes. More importantly, the Gini index and the economic attitudes toward income distributions are both independently significant. The strength of this paper is also in the use of the instrumental variable technique to deal with the potential endogeneity of people's beliefs about inequality.

[2] According to Habermas (1973:132), one of the central problems in the social sciences is "the distribution of the social product in an unequal but legitimate form."

Furthermore, the main results of this analysis extend to the use of different types of crimes, including homicide (a personal crime with a variety of motivations), robberies, drug-related offenses, and to the control for country characteristics as well as country fixed effects to account for time-invariant unobservable variables.

The remainder of this paper is organized as follows: Section 2 provides a review of the main contributions of the theoretical and empirical literature on the determinants of crimes; Section 3 describes the data used in the empirical analysis; Section 4 presents the empirical results and Section 5 concludes with policy implications.

2 On the Determinants of Crimes: Theory and Hypotheses

Fleisher (1963, 1966), among the first to explore the role of income on the decision to commit crimes by individuals, argued that the theoretical reason for assuming that low income increases the propensity to engage in criminal activities is that the cost of getting caught is quite low, since low-income individuals view their potential lifetime earnings from legal activities to be low, they may assume to lose little by gaining criminals records; moreover, "if earnings from legal activity are low, the opportunity cost of time actually spent in delinquent activity, or in a jail, is also low" (Fleisher, 1966). Another important factor in determining criminal activity is the income of potential victim. Potential victims are expected to experience more crime, especially property crime, if they have a higher level of income. So that, following Fisher (1966) "(average) income has two conceptual influences on delinquency which operate in opposite directions, although they are not equal in strength". Few years later, Becker (1968) presented the first model of criminal rational choice, representing the beginning of crime analysis from a control policies perspective in the context of economic models (Buonanno, 2003).[3] The rational choice perspective tries to explain how the offender makes crime choices, motivated by a particular reason and within a specific setting, which offers the chance to satisfy that specific reason. Specifically, Becker proposed a model where an individual decides whether to commit a crime by comparing the expected profits of the crime with the opportunities in the legal market. Ehrlich (1973) expands this perspective by considering the effect of income distribution on crimes and he argues that benefits from property crime depend on the opportunities provided by potential victims of crime and the mean legitimate opportunities available to potential offenders may be approximated by "the mean income level of those below the states median (income)" (Ehrlich, 1973). In this sense, for a median income, income inequality can be considered as a measure of the difference between benefits from legal and

[3]Becker (1993) also emphasizes that while "in the 1950s and 1960s, intellectual discussions of crime were dominated by the belief that criminal behavior was caused by mental illness and social oppressions, and that criminals were helpless victims," the economic way of looking at human behavior "implies that some individuals become criminals because of the financial and other rewards from crime compared to legal work, taking account of the likelihood of apprehension and conviction, and the severity of punishment." (Buonanno, 2003)

illegal activities.[4]

The most recent economic empirical literature assumes that income inequality and crime are positively correlated (Kelly, 2000; Fajnzylber et al., 2002b; Imrohoroglu et al., 2000, 2001). Blau and Blau (1982) show that income inequality is a main determinant of crime in the context of American cities and it is even more important than poverty, race, and culture propensity toward violence in the explanation of crimes. Chiu and Madden (1998) examine the relationship between the number of burglaries and the distribution of income, showing that the number of burglaries increases as the income distribution becomes more unequal. Fajnzylber et al. (FLL) (1998, 2002a,b) provide strong and robust evidence that income inequality causes high rates of homicide, robbery and violent theft, after controlling for country-specific fixed effects. In contrast to the latter findings, Neumayer (2005) provides evidence that the link between income inequality and violent property crime might be spurious and suggests that inequality is not a main determinant of crimes, unless either country-specific effects are not controlled for. Broadly speaking, income inequality may have an effect on society in two principle ways: one economic and one psychological (Buonanno, 2003). It is possible that, in the case of the rich, an increase in inequality will not encourage them to engage in criminal activities. However, for the poorest segments of population, an increase in inequality may induce crime because such an increase implies a larger difference between poor and rich incomes, reflecting a larger gap between the income from criminal and legal activities (Buonanno, 2003). An increase in inequality may also induce crime by dropping individual ethical and moral thresholds associated with breaking laws, through the "envy-effect" (FLL, 2002b; Buonanno, 2003). According to the "anomie/strain theory" (Merton, 1938) and the "relative deprivation theory" (Blau and Blau, 1982)[5], which are leading sociological paradigms on crime, when confronted with the relative success of others around them, individuals feel anger, resentment and frustration at their situation. The feeling of unfairness leads disadvantaged people to look for satisfaction and compensation by any means (FLL, 2002). Some individuals respond by resorting to property crime to face their grievances, and other people could develop a deep anger and resentment which can be expressed in violent ways. As a consequence, the greater the inequality, the higher this strain and the greater the incentive for low-income individuals to engage in crimes. The aim of this analysis is to examine whether income inequality, domestic burglary and MVT are linked. Given the review of the theoretical and empirical literature on income inequality and crimes, the first hypothesis to test in this analysis is that societies that are more unequal tend to suffer higher levels of crime.

[4] Ehrlich (1973) finds that higher family incomes are associated with higher rates of murder, rape, assault and domestic burglary. In addition, a measure of income inequality is associated with higher crime rates.

[5] Blau and Blau (1982:126) argued that "aggressive acts of violence seem to result not so much from lack of advantages as from being taken advantage of, not from absolute but from relative deprivation".

H_1: As income inequality increases, crimes are expected to rise

The second potential explanation that this analysis considers for property crimes is the tolerance of income inequality held by the general population in a country, a factor that has received almost no consideration in the existing studies of crimes, especially in Europe. Beliefs and perceptions fundamentally affect human behavior, but our understanding of the consequences of people's preferences is very limited. In theory, the relationship between inequality and crime operate through a person's evaluation of the equity of a specific distribution of economic resources. An individual's assessment is partially shaped by the sociocultural environment, but there is not a clear relationship between aggregate (national statistic) measures and individual psychological factors.[6] "Culture of inequality" refers to the legitimization or the acceptance of social and economic inequality by the citizenry (Crutchfield and Pettinicchio, 2009). Acceptance of inequality means that the general population has a societal norm for inequality, leading to the tolerance of it. According to this thesis, it is the norms, values, and beliefs about inequality which are held by the general population that allow societies to accept having others live in disfavorable economic conditions. When inequality becomes accepted by the general public, "responsibility" is placed on individuals for the failure to find a job, for poor health conditions, criminal involvement, and the lack of educational attainment. The market is seen as a system that provides fair rewards, and opportunities in life are in general available and unrestrained by the characteristics of individuals. Thus, resulting differences in income are considered as fair because individual effort, merit, abilities, and performance meet with proper rewards. Conforming to this political ideology (Hunt, 2004), wealth is perceived as a product of one's effort and talents' while poverty is induced by the lack of the above. As a consequence, where there is a culture of inequality, significant numbers of people do not sustain government efforts in alleviating poverty and inequality and they opt, for instance, for more punitive legal practices, with a tendency to defend the limiting of welfare benefits (Lewis, 2003).

The analysis of beliefs and opinions about inequality takes into account what people think about the distribution of goods in a society and particularly what they think a just distribution would look like (Mason and Kluegel, 2000; Miller, 1992; Wegener, 1999). In contrast with the empirical research about the socioeconomic consequences of inequality in incomes, research about the tolerance of inequality is mainly theoretical and focuses on the determinations of opinions, saying very little about whether citizens' views are possible causes of crimes.[7] The second hypothesis of this analysis predicts a positive relation between the general population's acceptance of income inequality and crimes within nations. With the aim of extending the analysis of individual choice in the decision to commit a crime, this paper makes the effort to incorporate in the analysis a class of individual preferences and to analyze the relationship between these

[6] This is called the *Ecological fallacy.*

[7] Empirical studies relating inequality and justice commonly point at two potentially conflicting principles of social justice: principle related and reward related. See Wegener (1999) for a full explanation of this theory.

psychological factors and the aggregate national statistics on crimes. What is remarkable about this analysis is the independent estimation of the significance of the Gini index and the economic attitudes toward income distribution. Two income distributions with the same level of income inequality can have different ideas about the "appropriate" level of inequality. If people in two societies with similar distribution of income experience income inequality in a very different way, the consequences of income inequality will also be very different in these two societies. An extensive culture of inequality among citizens, if it is not coupled with legal labor market opportunities or appropriate socioeconomic supports, thus may reflect the level of social division, and it is expected to explain crimes. The second hypothesis of this analysis predicts that crimes increase when individual's tolerance for inequality also increases.

H_2: As individual's tolerance for income inequality increases, crimes are expected to rise

The economic literature suggests that criminal activities are mostly motivated by benefits to illegal activities and individuals with better opportunities in the legal labor market are less likely to commit crimes (Altindag, 2012). According to Becker (1968) and Ehrlich (1973), labor market opportunities may affect a rational individual's decision to engage in crime: if legal income opportunities are less rewarding than expected benefits from crime, individuals will opt for engaging in crimes. Specifically, unemployment may lead to an increase in crime because the expected returns from legal work decrease when the probability of being unemployed is higher and because, given "a downward sloping labor demand curve, more unemployment is related with a lower wages" (Buonanno et al., 2010).

However, the empirical relationship between crime and unemployment is not clear, since the existing research in this area has produced inconsistent findings (Gould, Weinberg, and Mustard, 2002).[8] Many studies have focused their attention on unemployment, however they ignore important components of the labor market, such as wages or employment opportunities (Buonanno et al., 2003).[9] Furthermore, it is commonly assumed that most criminals are unemployed, while, many people who decide to engage in criminal activities have a job (Imrohoroglu, Merlo, and Rupert, 2001; Buonanno, 2002).[10]

Following recent empirical studies, increasing unemployment determines increase in property crimes (Raphael and Winter-Ebmer, 2001; Lin, 2008; Foufere, Kramarz, and Pouget, 2009).

[8]See Masciandaro (1999) for a review of the models addressing the issue of the relationships between unemployment and crime.

[9]Witt et. al (1998) suggest that sustained falls in the relative wages of unskilled men and increases in male unemployment in England and Wales are incentives for crimes.

[10]Imrohoroglu, Merlo and Rupert (2001) predict that 79 percent of the people engaging in criminal activities are employed and the 21 percent are unemployed. These results are consistent with the U.S. 1980 data (Buonanno, 2003).

Other studies (Arvanites and Defina, 2006; Rosenfeld and Fornango, 2007) don't find a significant effect of unemployment on crime trends (Imrohoroglu, Merlo and Rupert 2004). The third hypothesis in this analysis tests a positive effect of unemployment rates on property crimes.

H_3: Unemployment rates have a positive effect on crimes

Young individuals (and especially young males), are statistically more inclined to engage in criminal activities than the rest of the population (Grogger, 1998). This relationship appears to be strong and justified because wage, which is expected to rise with age during the early part of one's career, represents the opportunity cost of engaging in crimes (Buonanno, 2003). According to the analysis of Levitt and Lochner (2001), 18-year-olds are five times more likely to be arrested for property crimes in the US than 35-year-olds.[11]

Tremblay, Clermont, and Cusson (1994) found that the percentage of 15- to 19-year-old males in the population is positively associated with "temporary" MVT rates.[12] Offenders of all types are generally male, but professional auto thieves tend to be older (Tremblay et al. 2001). Since permanent MVT requires skills, planning and social connections (Shane 2010; Tremblay, Talon, and Hurley 2001), it calls for the involvement of older and more experienced offenders (Mullins and Cherbonneau 2011). In Herzog's (2002) study, vehicles stolen by younger offenders were more likely to be recovered, indicating that theft for temporary use was relatively more common among young people. Given the results of the empirical literature on the age structure of population and crimes, the fourth hypothesis in this analysis tests whether young males are more prone to be offenders, with an expected positive effect of this variable on crimes.

H_4: Young males are more prone to be offenders.

Empirical analyses that examine the relationship between crimes and social welfare spending is largely missing from the economics literature, at least for the European countries.[13]

[11] Levitt (2004) indicates that people over 65 have per-capita arrest rates approximately 2% the level of a 15- to 19-years-olds.

[12] Following Felson and Clarke (1998) and Maxfield (2004), MVT could be categorized into two different types. Some MVTs are committed for "temporary" and nonprofit-oriented personal needs, including joyriding and short-term transportation. Others are committed for "permanent" aims, such as resale and export (Copes and Tewksbury 2011; Felson and Clarke 1998) and much of them are connected to criminal organizations. These differences suggest that temporary and permanent MVT may have different potential offender pools, targets, and opportunity structures.

[13] Much of what is know is based on analyses of data for developing countries, many of which have recently executed programs, interventions and policies based on conditional behavior that are aimed at vulnerable segments of the population, such as the Conditional Cash Transfers (CCT) Programmes for several Latin American countries.

Literature that model this issue suggest that expenditures on welfare programmes have a negative effect on crime rates (Benoit and Osborne, 1995; Zhang, 1997; Imrohoroglu, Merlo, and Rupert, 2000), since welfare spending reduces incentives to commit a crime by raising the opportunity costs of the potential criminal.[14] Benoit and Osborne (1995) develop a model to analyze spending on social assistance in the economic model of crime. For the US economy, Zhang (1997) shows that criminal behavior is reduced when policies aimed at redistribution, specifically public housing assistance, are emphasized. Empirical evidence of a negative effect of welfare programmes on crimes is provided by Pratt and Godsey (2002) and for homicides by Savage, Bennett, and Danner (2008), and Worrall (2009). Pratt and Godsey (2002) use a panel data of 46 nations, covering the time period of 1989-1995, to estimate the link between social support (percent of GDP spent on health care and education) and violent crime, measured by homicide rates. The percentage of people immunized for measles is used as instrumental variable. A negative and robust effect is found in their analysis.[15] Other papers on this issue have produced inconsistent and mixed results on the impact of social welfare spending on criminal behavior (Chamlin, Cochran, and Lowenkamp, 2002; Burek, 2005; Worrall, 2005).

The final hypothesis of this research explores whether social support efforts, on the part of public and private entities, matters for crimes. In order to test the last hypothesis, this analysis will use a classical example of social policies aimed to provide services to citizens: the expenditure on health care. The expenditure on health care is an indicator of the governments effort to guarantee that citizens are healthy and able to receive quality and appropriate health care.[16] The way to view violence and crime as a public health priority is receiving strong support from major international agencies, such as the World Health Organization, and important national public health entities. With a diversity of methods aimed at changing individual behavior and community lifestyle, reducing the social context of dangerous practices, a public health approach brings a strong importance to recognize intervention and policies aimed at preventing violent behavior, injuries and deaths. Public health is therefore a social activity with important implications for individuals and communities. Based on these considerations, the last hypothesis to test is formulated as follows:

H_5: Lower crimes can be observed when a large share of the budget is spent in health.

[14] Imrohoroglu et al. (2000) develop a general equilibrium model in order to analyze the relationship between public expenditures on social welfare and police and criminality.

[15] Savage et al., (2008) investigate the relationship between crime and social welfare spending in 25 countries. The authors found a negative and nonlinear relationship.

[16] Previous research has demonstrated the importance of this variable for promoting social development (Currie, 1998; Seitz, 1990).

3 Data and Method

The aim of this paper is to test the hypotheses specified in the previous section by assessing the impact of economic and sociodemographic variables on crimes, in the form of domestic burglary and MVT. For this purpose, the paper analyses 27 countries of the European Region over the period 1993-2008. The analysis starts by considering domestic burglary and MVT data and then it deals with the income distribution index, the tolerance of economic inequality and all the other control variables.

3.1 Property Crime Trends in Europe: Evidence From Eurostat Statistics

This analysis focuses mainly on property crimes. It concerns itself with those crimes from which the perpetrator may acquire income by the stealing or the destruction of property. This class of crimes includes domestic burglaries and MVT. According to the definition adopted in this study, domestic burglary is defined as gaining access to a dwelling by force in order to steal goods. Domestic burglary is considered one of the largest societal problems because it causes not only financial and material damage, but also because of the possible emotional harm. Alternatively, MVT covers thefts of cars, motorcycles, buses, lorries, construction and agricultural vehicles.[17] The data used in this analysis were gathered by the Statistical Office of the European Communities (Eurostat). The crime statistics in this article cover offenses recorded by the police in the EU Member States and other countries.[18]

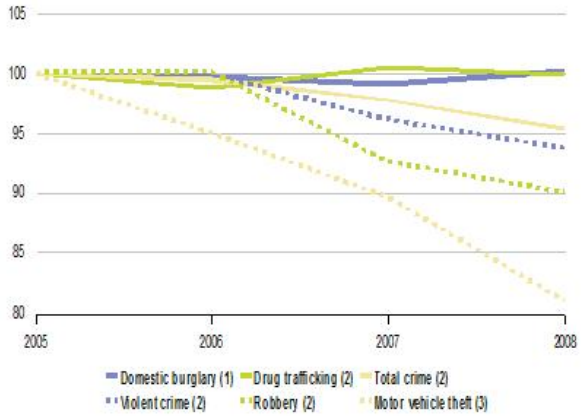
The tendency marked in police records for the years 1995-2005 suggested an increase of crimes by about half a percent per year. In many countries, a peak was reached about 2002 and since then the figures have fallen. The categories of crime which have featured increasingly in the police records are robbery, violent crime, and drug trafficking. The incidence of each of these crimes rose by 4 to 5% per year during the period 1995-2005. To the contrary, in the same years, crime which have become less common are domestic burglary and theft of motor vehicles. Police records indicate a decrease of 3% each year for domestic burglary and MTV dropped more sharply, with an annual fall of 5% over the period 1995-2005. However, according to the Eurostat data, domestic burglary (Figure 1) rose by about 3% on average in the EU in the period 2006 to 2009. In the majority of the EU States, there were rises between 5% and 10%, with sharper increases (over 20%) in Denmark, Sweden, Greece and Romania.[19]

[17] According to this data, unfortunately it is not possible to discriminate between temporary and permanent MVT.

[18] There are important differences between countries' systems of criminal justice in definitions of crimes, methods of recording and counting crimes, and the amount of reported versus unreported crime. In some cases, it could be challeging to make a direct comparisons of crime types and levels between countries; it should also be recognised that these crime statistics cannot provide a full description of the extent of crime in Europe as some crime goes unreported. Trends for specific offences moreover may reflect the attention of police activity in some areas.

[19] Falls of more than 20% are recorded in a few countries, such as Poland, Estonia, Malta and Cyprus.

Figure 1: Offenses Recorded by the Police, EU-27, 2005-2008 (2005=100)



Source: Eurostat

MVT has fallen increasingly in the most recent years, perhaps partly as a consequence of technical improvements in automobile security systems (Eurostat, 2011). The majority of the European countries recorded declines of over 10% in vehicle thefts between 2006 and 2009. However, other countries reported important increases, specifically Greece and Cyprus (over 20% for the period 2006-2009) and Romania (which has fewer cars per person than any other EU Member State).

3.2 Control Variables

The main independent variables in this study are the Gini index and the tolerance of economic inequality. The Gini coefficients are used for testing H_1 and they are obtained from SOLT (2009). The Standardized World Inequality Database Solt database (SWIID) provides the most complete set of income inequality statistics available. Used for household, the Gini index has a theoretical range from zero, which indicates that each reference unit obtains an equal share of (net) income, to one hundred, indicating that a single reference unit receives all income and all others receive nothing. In order to test H_2, as specified in section 2, this analysis uses data from the World Values Survey (henceforth, WVS), for the waves 1989-1993, 1994-1998, 1999-2004, 2005-2008. This survey collected data on a variety of economic attitudes and beliefs based on national samples and collected in face-to-face interviews with thousands of individuals across almost 100 countries. The availability of data from WVS, however, conditions the size of the sample used in the analysis.[20] Moreover, the analysis presented in this paper is restricted to those countries where a question related to tolerance of inequality was asked. The last four waves of the WVS asked people what they felt about income inequality. The responses could range from 1 (incomes should be more equal) to 10 (we need large income differences as incentives).

[20]The sample of countries has expanded from 20 countries participating in the first wave in 1981 to 97 countries being surveyed in the latest wave.

According to cross-country studies on property crimes (Becker, 1968; Ehrlich, 1973; Buonanno et al., 2011) and by the assumption of common causes for those different crime types, this study uses as a set of additional controls the unemployment rate, the percentage of males between 15 and 34 years of age in the population, and the public and private health expenditure. The unemployment rate is the total unemployment rate (percentage of total labor force). Data are from the World Bank. The data on percentage of male population between 15 and 34 years of age are from Eurostat. Per capita health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health, but does not include provision of water and sanitation. Data are in international dollars converted using 2005 purchasing power parity (PPP) rates. Data are from World Bank. Prior to turning to the empirical analysis it may be useful to investigate correlations among all the control variables. Simple correlations between the measure of tolerance, *Tol*, and income inequality, *Gini*, are positive but rather moderate, with a coefficient value of 0.14. Correlations between measures of crimes are somewhat larger for MVT and domestic burglary with a value of 0.83. Table 1 reports the correlation matrix for all the variables used in the empirical analysis.

Table 1: Correlation Matrix

	Dom	MVT	Hom	Rob	Gini	Unem	Young	Tol	Health
Dom	1.0000								
MVT	0.8334	1.0000							
Hom	0.7842	0.6205	1.0000						
Rob	0.8997	0.8361	0.8260	1.0000					
Gini	0.2711	0.1737	0.4320	0.3757	1.0000				
Unem	-0.1474	-0.1073	0.2100	0.0772	0.3499	1.0000			
Young	0.8716	0.7667	0.8728	0.8826	0.2844	0.0268	1.0000		
Tol	0.1502	0.0730	-0.0029	0.1775	0.1481	0.0830	-0.0329	1.0000	
Health	0.1492	0.3261	-0.3074	0.1068	-0.3305	-0.5504	-0.0019	0.0166	1.0000

3.3 Income Inequality and Tolerance of Inequality: Evidence From the World Value Survey

Research on the link between tolerance of income inequality and inequality has grown within the frame provided by comparative public opinion research into inequality and justice. In this context, individual preferences for inequality (what ought to be) are compared with the current distribution of goods in society (what is). In this line of research, empirical evidence shows that economic inequality is not automatically evaluated as unfair (Hadler, 2005; Osberg and Smeeding,

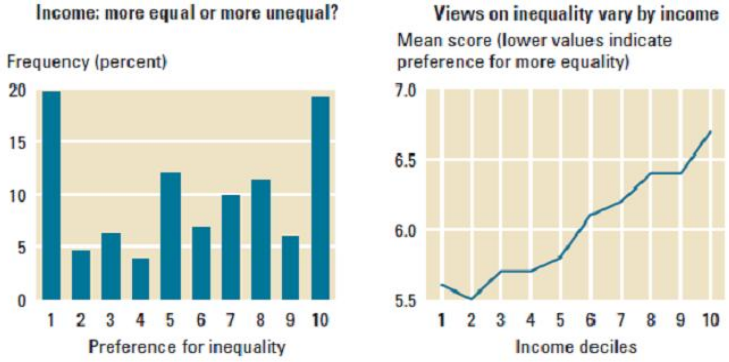
2006).[21] A recent analysis of several OECD countries was based on data from the ISSP. To construct a proxy of cross-national attitudes toward income inequality, Osberg and Smeeding (2004) asked what different professions "should earn" and what they "do earn". They found that citizens of high income countries seem on average to have analogous attitudes toward inequality, usually thinking that less well-paid professions should be remunerated more and that well-paid professions should be paid less (World Bank, 2006). These results support the view that the preferences people have over distributions are not based completely on actual incomes, but also on processes, and that differences in outcomes may be fair. People believe in a "good" inequality, needed to generate incentives for people "to study, work hard or start risky entrepreneurship projects" (Milanovic, 2001). These results appear also from the answers to a question in one wave of the WVS, which divided respondents of many countries into those who felt that income inequality is too high and those who felt it is low. By using the WVS, this analysis uses the answers to another specific question that asks representative samples of people in many countries to place their views on a scale from 1 to 10, where 1 means agreement with the statement that "Incomes should be made more equal" whereas 10 implies agreement with the statement that "We need larger income differences as incentives for individual effort", represented by score of 10. Figure 2a indicates polarization on views about inequality. The average answer is 6, suggesting no strong agreement with the two statements. Figure 2b shows a positive correlation between the score and a respondents own income. When asked about income differences "as incentives for individual effort", many people appear happy to have them and to want more of them. The results from this survey also indicate that there is heterogeneity in opinions about whether income inequality should be reduced.

All over the world, nations have developed varying attitudes towards income inequality. According to data of the WVS, within Europe, there is no agreement that income disparities should be reduced everywhere. Moreover, it appears that individuals recognize that some inequality is important to create incentives for investment and effort. In Europe, generally, people in the poorest nations are much more accepting of inequality than people in more prosperous nations.[22]

[21] Using data from the International Social Survey Program (ISSP), Osberg and Smeeding (2006) describe attitudes toward inequality in 27 countries and test the perception that Americans have a greater affinity for inequality than people in other countries. Their study omits most of the developing world.

[22] Shapiro (2002), Lambert et al. (2003), and Kelley and Evans (2009) propose several possible explanations for this pattern

Figure 2: Views on Inequality From the WVS



Source: Inglehart et al. (2004)

4 Empirical Strategy and Findings

This paper employs two approaches in order to estimate the net effect of income inequality and tolerance of inequality on property crimes in Europe. The first approach is a fixed effect specification and the second approach implements an IV strategy with two-stage least squares. The final sample includes more than 400 country-year observations for 27 European countries. The regression equations are specified by:

$$Crime_{i,t} = \beta_0 + \beta_1 Gini_{i,t} + \beta_2 Unem_{i,t} + \beta_3 Young_{i,t} + \beta_4 Health_{i,t} + \eta_i + \epsilon_{i,t} \quad (1)$$

$$Crime_{i,t} = \beta_0 + \beta_1 Tolerance_{i,t} + \beta_2 Unem_{i,t} + \beta_3 Young_{i,t} + \beta_4 Health_{i,t} + \eta_i + \epsilon_{i,t} \quad (2)$$

where $Crime_{i,t}$ is some logged measure of crime, domestic burglary, or MVT. The subscripts i and t represent a country and a time period, η is an unobserved country specific effect. In pre-testing, nonlinear effects of any explanatory variables were researched and evidence was found of such effects for the income distribution variable. All variables, therefore, enter the regression only in a linear form, with the exception of the Gini index, for which both the linear and the squared term are entered. This analysis uses weighted least-squares (WLS) regression to estimate equation (1) and equation (2). The data reveal significant heteroscedasticity remaining even after the log transformation of property crimes. This could be a product of groups of countries in the sample with small populations and very high crime levels. This analysis follows McNultys (2001) by using WLS, where the weight is defined by the mean of the population of each country.[23] Moreover, tolerance for inequality is potentially endogeneous to crimes. In consideration of this identification problem, this analysis adopts an instrumental variable strategy, described in detail in

[23] After using the log transformation for the crime variable and the weighting technique, the error variance appeared relatively homoscedastic.

the next section. Estimations have been made with STATA 12 program.

4.1 Endogeneity of Attitudes: IV regressions

The introduction of people's beliefs about income inequality could make the endogeneity prob- lem severe. The incidence of crime and violence within a nation will possibly have an impact on people's beliefs and attitudes, making them more (or less) intolerant and, thus, reverse causality cannot be discarded in this empirical analysis. One way to overcome this problem is by instrumenting the potentially endogenous regressor. When the tolerance for inequality is analyzed, this analysis considers the "cultural component" of beliefs and preferences, the parents' ethnicbackground as instrumental variables, and specifically the ethno-linguistic differences (measured by the Gini index), for the years 1968-1985. Language distances are a proxy of the cultural differences among groups living in the same country. The identification assumption is that parental language distances do not influence property crimes directly, but through correlation with people's tolerance of inequality, because what matters for crimes are not the parental cultural differences, but the way these differences are perceived by the different citizens. Given this assumption, variations in the tolerance for inequality induced by parental language distances can be considered as exogenous and employed to estimate the effect of an exogenous change in feelings and attitudes on crimes. In the two-stage least squares instrumental variable approach, the first stage is to treat tolerance of inequality as a dependent variable and to employ parental linguistic Gini index as the independent variable. In the second stage, we plug in the predicted values of tolerance for inequality for each country with crimes as the dependent variable, together with other explanatory variable that appear in the regression. This approach is intended to capture only the component of tolerance of inequality that is driven by the family ethnic background.[24] With the aim of defining distances between languages, this analysis follows Fearon and Laitin (2000b) and Esteban et al., (2012), who proposed using the information provided by language trees. Following Esteban and Mayoral (2011), "language trees are genealogical diagrams of languages related by descent of a common ancestor". The distance between two languages i and j is measured as a function of the number of common classifications in the language tree.[25]

The similarity between languages i and j , s_{ij} , is defined as the ratio of the number of common branches to the maximum possible number fifteen for the entire tree, and if two groups speak the same language, similarity s_{ij} is equal to 1. Following Fearon (2003) and Desmet et al. (2009), Esteban et al. (2012), the distance between the two languages i s defined as $K_{ij} = 1 - s^{\delta}_{ij}$, for some

[24] For literature example of cultural effects on beliefs and preferences see the experimental procedure of Hoff and Priyanka (2005).

[25] "Spanish and Basque diverge at the first branch, since they come from structurally unrelated language families. By contrast, Spanish and Catalan share their first 7 classifications as Indo-European, Italic, Romance, Italo-Western, Western, GalloIberian and Ibero-Romance languages"(Esteban and Mayoral, 2011).

parameter $\delta > 0$.[26] Data used in this analysis are an update of Fearon (2003).[27]

4.2 Results

Results on OLS and IV (2SLS) from fixed effect estimations for domestic burglary and MVT are reported in Table 2. Income inequality, measured by the Gini index, has a significant and positive effect on the incidence of crimes, whether burglary or MVT is used. By using the corresponding coefficient estimate, we can estimate the crime-reducing effect of a decline in inequality in a given country. If the Gini index falls in the sample, domestic burglaries will decrease by 17.8% (Column 1). The result on the Gini coefficient mirrors FLL's (2002b) and Kelly's (2000) findings, as it is positive and statistically significant. Following economic models in the tradition of Becker (1968), as income distribution becomes more unequal, the gap between the benefits and costs of crime increases and therefore the incentive to engage in criminal activities becomes higher. The squared term of the Gini index is negative and statically significant, suggesting that income inequality has a nonlinear effect on domestic burglaries and MVTs. An increase in income inequalities leads to an increase in violent property crimes over a range of income distribution, but at a decreasing level. Two alternative hypotheses about the relationship between economic disadvantage and violent crimes have been suggested in the literature. The first suggests that societal disadvantages intensify the negative effects of additional disadvantages and that intense disadvantage is worse than the sum of its parts (Krivo and Peterson, 1996; Lauritsen and White, 2001). The second hypothesis suggests a decelerating-nonlinear link between economic hardships and property crime. The effect of increased disadvantage on violent crime rates levels off because, at high levels of poverty and inequality, social institutions collapse and cannot be damaged further (Krivo and Peterson, 2000; McNulty, 2001) or because, although highly disadvantaged areas have more property crimes than the others, the deceleration effect may be associated to the lack of attractive targets for theft in extremely poor areas. Furthermore, the relationship between violent property crimes and income inequality is often described by a two-way causality (FLL, 2002) and a lack in the correction for the joint endogeneity of the explanatory variables lead to inconsistent estimations (FLL, 2002). In the econometric specification, the Gini coefficients are included as one year lags in order to reduce potential endogeneity problems and also to allow for time lags in the effect. This analysis also addresses the problem of joint endogeneity in a more appropriate way by employing an instrumental variable tecnique applied to models of panel data. The procedure aims to isolate the

[26] δ is a parameter that indicates how fast the distance declines as the number of shared branches rises. This paper uses values of $\delta = 0.05$, as done by Desmet et al. (2009), however others authors (Fearon, 2003; Esteban et al., 2012) compute distances using $\delta = 0.5$. The parameter δ has a useful economic interpretation because the difference between these two values selects the levels of linguistic similarity among languages. This paper focuses on lowest values of δ because this measure separates the languages that have very few branches in common.

[27] See also Alesina et al. (2003).

pure impact of income inequality on crimes by using instrumental variables which are correlated with the Gini index and which have no impact on crimes. The instruments used are the mean TC (Total Cholesterol) of the male and female population, counted in mmol per L. Such estimates (results are not shown but available upon request) are very similar to those shown in Column 1 of Table 2.[28]

Table 2 tests $H2$ by considering the tolerance or acceptance of inequality. Overall, Table 2 tests tolerance measure, yielding two model variants. The table displays the estimation results for the tolerance measure (Columns 3) and for the tolerance by groups of health expenditure (Column 4). In this case, the regression model of Column 3 is modified to reflect interactions with a dummy variable indicating the high level of (public and private) health expenditure in a country, *TolH*. The interaction of the tolerance with low levels (lower than the average of the sample) of health expenditure in a country is the reference group for the dummy variables. First, note the positive signs of the perceived-tolerance estimates (Column 3), indicating that societies with a strong culture of inequality, a high *Tol*, experience more crimes than those who have a different view. Tolerance of inequality estimates are significant at the 1% level for both types of crimes and the results are clearly in line with $H2$. The quantitative impact of these variables is considerable, with coefficients ranging between 0.69 and 0.58 for domestic burglary and MVT. In summary, our empirical results are in line with $H2$, suggesting that a general acceptance of social and economic inequality by citizenry leads to higher levels of crimes. In section 4.1 we argued that the incidence of crimes and violence within a nation will possibly have an impact on people's beliefs. Controlling for the reverse causality and for the strength of the instrument is a main aspect in this analysis, because a weak instrument may induce a bias and reduce efficiency in the estimations. In the case of tolerance of inequality as an endogenous variable (Columns 3 and 7), the appropriate test is the first-stage F test on excluded instruments. The test shows that parental ethno-linguistic difference, used as an instrument, with an F above 10 (Staiger and Stock, 1997), is a strong instrument. First-stage estimates (not reported) indicate that the average effect of parental ethno-linguistic differences is to improve the tolerance. Parents' language distances do not affect property crimes directly, but only through correlation with people's tolerance of inequality. As a consequence, what matters for crimes are not the parental cultural differences, but the way in which these differences are perceived by different individuals.

In order to test the consequences of public views and whether the perceived tolerance depends on the socioeconomic conditions of the country where the citizen lives, in Column 4 the same empirical model specification of Column 3 was tested, by including the interaction of tolerance with a health expenditure dummy variable. Column 4 of Table 2 reports the results for domestic burglary and shows, analogously to Column 3, that favorable societal attitudes toward income inequality lead to higher levels of crime. However, in line with $H5$, it can be observed for both

[28]Data of Total Cholesterol for the male and female population are provided by MRC-HPA Centre for Environment and Health. For a review of the research addressing the relation between economic factors and health see Marmot and Wilkinson (2000).

types of property crimes that tolerance of inequality associated with high levels of spending in health has a negative and statistically significant impact on property crimes. Thus, the tolerance effects on crimes are somewhat mediated through the amount of (private and public) health expenditure. This finding is in line with the theoretical prediction and it suggests that people believe in a "good" inequality, which is needed to create incentives for people (Milanovic, 2001). However, if these individual actions are not tied with opportunities or appropriate social conditions (as represented by the expenditure in welfare and health), such a situation could generate social divisions and, as a consequence, crimes. In respect to the endogeneity problem, with more than one endogenous regressor in the structural model, there will be more than one first stage regression and more than one F statistics. In this case, the appropriate test is the one developed by Stock and Yogo (2005), which is a generalization of the univariate F test on excluded instruments to the multivariate case, based on the Cragg and Donald statistics.[29] In this case, our endogenous variables are the tolerance measure and the interaction of the tolerance with the health dummy variable. Parental ethno-linguistic Gini and the immunization for measles of children ages 12-23 months[30] are used as instruments. The Stock and Yogo test reveals that the instruments for the tolerance measure and for the endogenous interaction of tolerance with the health dummy variable are relevant and strong. [31]

As formulated in $H3$, this paper examines the influence of unemployment on property crimes in Europe. As explained in the theoretical section, there is a good reason to assume that income inequality and tolerance for inequality are connected with crimes, however, it is possible that this link varies on a broader economic context. When economic circumstances are not good and many individuals live without a job, "crime is not the unreasonable behavior of a social deviant, but a natural reaction to substantial economic hardship" (Morgan and Kelly, 2010). In early 2000, less than 20 million persons were unemployed in the EU-27, slightly below 9% of the total labor force. This figure decreased to 8.5% in early 2001 before increasing back to 21 million persons by the middle of 2002. From mid-2005 there was a period of several years of declining unemployment within the EU-27, but by the first quarter of 2008, EU-27 unemployment increased quickly in the wake of the economic crisis (Eurostat, 2012). In this analysis, economic crimes appear to be related to labor market conditions as measured by unemployment.

[29]This statistic was originally proposed by Cragg and Donald (1993) to test nonidentification. Stock and Yogo presume identification and interpret a low minimum eigenvalue (equals the F statistics if there is just one endogenous regressor) to mean the instruments are weak. So the null hypothesis is that instruments are weak against the alternative that they are strong.

[30]Child immunization measures the percentage of children ages 12-23 months who received vaccinations before 12 months or at any time before the survey. A child is considered adequately immunized against measles after receiving one dose of vaccine. Data are from the World Bank.

[31]This analysis also considered as instrument for the interaction term the lag of the ethno-linguistic Gini as instrument. Unfortunately, the Stock and Yogo test reveals that this instrument for the interaction term is relevant but weak.

Increases in unemployment are associated with increases in burglary and MVT, suggesting that criminal activity is strongly motivated by the benefits from illegal activities. As pointed out by Becker (1968), Mocan, Billups and Overland (2005), Machin and Meghir (2004) and Erlich (1973), potential criminals weigh the costs and benefits of committing crime. Therefore, individuals with better opportunities in the legal labor market are less expected to commit crime. One determining factor of these opportunities is the unemployment rate. Exogeneity of unemployment in a crime regression could be questionable. Previous empirical literature provided diverse evidence on the exogeneity of the unemployment rate.[32] In this analysis, reverse causality is not alarming since a panel of countries is used in the empirical analysis and variations in crimes in a given year and country are not expected to have an impact on unemployment rate of the country in that same year. The empirical analysis controls moreover for country characteristics and for country fixed effects to account for time-invariant unobservable variables.

The results of the regressions present the proportion of young males (aged 15-34 years) in the population as an explanatory variable. The inclusion of the proportion of young males as a cause of crime consents us to check whether the link between inequality and crime is driven by this specific demographic factor.[33] By controlling for our basic crime determinants, results indicate that the share of young males in the population has a statistically significant effect on burglary and MVT. An increase of 1% in the share of males between 15 and 34 years of age leads to a 1.8% increase in domestic burglaries (Column 1). However, this effect is unclear when MVT is used as dependent variable. In Column 6, for instance, the proportion of young males appears significant but it has a negative effect on MVT. These ambiguous results could depend by the fact that our data on MVT don't allow us to distinguish between the categories of temporary and permanent MVT (Felson and Clarke 1998; Maxfield 2004). As already explained in the theoretical section, some MVTs are committed for temporary and non-profit needs. Others are committed for permanent retention aims, such as resale or export (Copes and Tewksbury 2011) and much of them are associated to organized criminal activities in Europe. These differences suggest that temporary and permanent MVT have diverse potential offender pools, targets and opportunity structures. MVT offenders of all types are usually male, but professional auto thieves tend to be older (Tremblay et al. 2001). Therefore, it is possible that dynamics in the age structure, as analyzed in this analysis, cannot capture all the dimensions of MVT and they cannot clearly explain trends in MVTs in Europe.

[32]With a panel data set, Gould, Weinberg and Mustard (2002) have shown that there is not much difference between OLS and IV estimates of the unemployment rate in a crime equation, suggesting that reverse causality is not a major issue with state level data. Lin (2008) and Raphael and Winter-Ember (2001) have found that IV estimates of the unemployment rate are larger than the OLS estimates.

[33]In 2007, the European Union counted around 96 million young people aged between 15 and 29 years, representing under a fifth of the EU population in 2007. At national level, the most "youthful" nations in the EU included Ireland, Cyprus, Slovakia, and Poland, which counted the highest proportion of young people in the total population. In Denmark, Germany, and Italy young people accounted for less than 18% of the population (Eurostat, 2009).

A greater specificity in the analysis of MVTs is convenient and suggested in further investigations.

The final hypothesis, $H5$, of this study explores whether the composition of the public and private budget on social support matters for crimes. Results show a clear negative effect of the per capita spending in health on the incentive to commit crime. Critical to understanding violence and crime as a problem in the public health approach is its focus on risk factors. Risk factors are the individual characteristics, the social and ecological factors, and all the aspects of the environment that increase the possibility of a person/group engaging in violence or becoming a victim of violence. As an example, Roth and Moore (1995) noted that the criminal justice approach is not very effective in dealing with violence among family members. Such violence is often not reported to the police and in many cases health practitioners see violence that goes unreported to criminal justice agencies. This situation has clear implications for the identification of violence and for the development of effective responses because preventing violence and crime requires attention to victims, as well perpetrators.

Table 2: IV Fixed Effects Estimates, Domestic Burglary and MVT

	1	2	3	4	5	6	7	8
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
VARIABLES	Dom	Dom	Dom	Dom	MVT	MVT	MVT	MVT
Gini	0.178**	0.392***			0.0483	0.310***		
	(0.0784)	(0.0811)			(0.112)	(0.0956)		
Gini2	-0.00384***	-0.00728***			-0.00200	-0.00609***		
	(0.00135)	(0.00138)			(0.00193)	(0.00163)		
Unem	0.0241***	0.0164***	0.0381***	-0.0199	0.0257***	0.00732	0.0372***	-0.00177
	(0.00434)	(0.00423)	(0.0122)	(0.0155)	(0.00598)	(0.00502)	(0.0120)	(0.0200)
Young	1.880***	0.725***	0.534	2.035**	2.348***	-0.613*	2.833***	3.130***
	(0.224)	(0.263)	(0.963)	(0.899)	(0.327)	(0.316)	(0.982)	(1.144)
Health		-0.000182***				-0.000406***		
		(2.01e-05)				(2.44e-05)		
Tolerance			0.698***	0.643***			0.583***	0.793**
			(0.191)	(0.238)			(0.181)	(0.313)
TH				-0.189***				-0.186***
				(0.0411)				(0.0519)
Constant	-16.93***	-3.640			-21.47***	16.80***		
	(3.385)	(3.896)			(4.957)	(4.683)		
First-stage F			16.22				20.81	
CraggDonald				6.92				6.50
Obs	467	445	166	151	448	427	160	143
Country	33	33	16	16	33	33	15	15

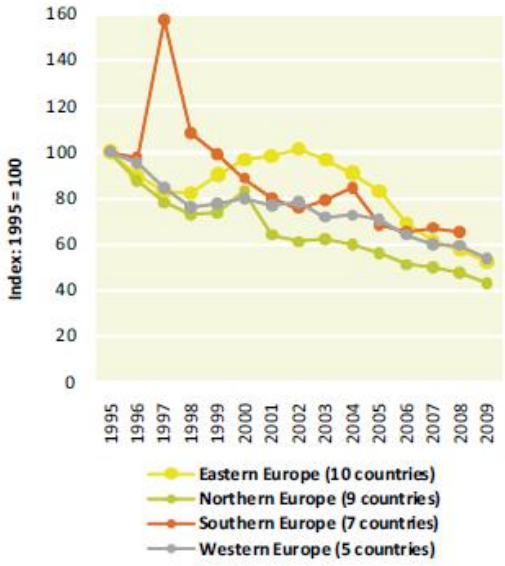
Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.3 Results on Other Forms of Crimes: Homicides, Robberies and Drug-Related Crimes

Table 4 analyses some variations to examine the robustness of the baseline in Table 3, by considering alternative measures of crimes. Our baseline uses violent property crimes, focusing mainly in those crimes from which the perpetrator acquires income by stealing or by the destruction of property. Table 4 instead employs homicides, robberies and drug-related offenses, as computed by Eurostat. The first four columns of Table 4 employ homicide data. Homicide is defined as the intentional killing of a person, including murder, manslaughter, euthanasia and infanticide. It excludes death by dangerous driving, abortion, help with suicide and attempted (uncompleted) homicide. Homicide is fairly universally reported because of its importance, and definitions differ less between countries than for some other types of crime. For this reason, homicide figures are considered the most consistent indicator of the violent crime situation in a country, since most murders come to the attention of the police. Despite some fluctuations such as those seen in Albania, which experienced rises in the homicide rate during the civil unrest, homicide rates have decreased or remained more or less stable in the majority of European countries since 1995, following the peaks of 1991-1993 (see Figures 3).

Figure 3: Sub-Regional Homicide Rates



Source: UNODC Homicide Statistics

The national figures provided by Eurostat indicate that Lithuania and Estonia have the highest homicide rates (over 8 and 5 victims respectively per 100,000 people). The other countries reporting more than 2 homicides per 100,000 people, for the period in analysis, were Finland, Bulgaria, Romania and Ireland, while the lowest rates (less than 1 per 100,000) were observed in Austria, Slovenia, Germany.

Robbery is another type of violent crime. It is defined as stealing by force or by threat of force. It includes mugging (bag-snatching) and theft with violence. Data on robberies are less consistent, since the rates of reporting these offenses vary significantly between jurisdictions.[34] While police recorded robberies have fallen by about 11% since 2006 in the EU as a whole, significant rises were reported in many different countries, such as, Greece, Cyprus, Luxembourg, Bulgaria, the Netherlands, Hungary, Sweden, and Denmark. In contrast, there were declines in Romania, Latvia, Poland, Italy, Estonia, the UK and Lithuania (Eurostat, 2012). The last category of crime included in this analysis is drug-related crime. Drug offenses include the illegal possession, cultivation, production, supplying, transportation, importing, exporting and financing of drug operations. Drug offenses have generally been increasing consistently in the EU since 2002. In 2006-2009, these offenses continued to increase, with the majority of Member States recording increases of over 10%. However, there were declines in Hungary, Germany and Austria.

Results from this analysis, summarized in Table 3, show a significant and positive effect of the Gini index on the incidence of crimes, this time including homicides, robberies and drug offenses. There is strong evidence of the link between inequality and the gap between the rich and poor in Europe. As explained before, the type of crime traditionally associated with economic inequality is property crime, but this may be simply an "opportunity" explanation, since when poor people live side by side with richer individuals, there is more opportunity. In recent years, the "deep anger" explanation has become popular, and many studies relate economic inequality with violent crimes, as in the case of homicides. The central concept in this association is relative deprivation (Blau and Blau, 1982), and it refers to a feeling of envy or jealousy about what other people own. Deprivation tends to produce feelings of anger and resentment which manifest in violent crime. Results of the Gini index are positive and statistically significant for all the categories of crimes, as shown in Table 3. The squared term of the Gini index indicates that income inequality has a nonlinear effect also on homicides, robbery, and drug-related crimes. An increase in income inequalities leads to an increase in violent crimes over a range of income distribution, but at a decreasing rate. Table 3 tests H2 by considering the tolerance or acceptance of inequality held by the population in a country. The positive signs of the perceived-tolerance estimates indicate that societies with a strong culture of inequality experience more homicides and drug offenses than those who have a different view. Tolerance of inequality estimates are significant at the 1% level and the results are clearly in line with $H2$. The quantitative impact of these variables is considerable, with coefficients of 0.56 for homicides and 0.69 for drug offenses. However, it can be observed (column 4 and 12) that tolerance of inequality associated with high levels of spending in health has a negative and statistically significant effect.

[34]In richer countries moreover a greater share of the population may have insurance and thus strong incentives for reporting victimization. In some countries reporting minor crimes is seen as a civic duty. Thus, these countries appear to have higher rates of property crime than poorer areas.

Thus, the tolerance effects on crimes are mediated through the amount of (private and public) health expenditure in a country. Results for the robberies category are somewhat ambiguous. According to Felson and Clarke (1998:14), "In general, the opportunity for crime must be evaluated for very specific categories of offense." They noted that, from the perspective of opportunity theory, robbery is not one crime but many, depending on the setting and type of victim, and that finer differentiation will often be required by the theory. In this analysis, economic crimes are related to labor market conditions as measured by unemployment. Increases in unemployment are associated with increases in robberies and drug offenses, suggesting that criminal activity is clearly motivated by the benefits from illegal activities. Results presented in Table 3 also indicate that the proportion of young males in the population has a statistically significant effect on homicides, robberies and drug offenses. For instance, an increase of 1% in the percentage of males between 15 and 34 years of age leads to a 0.72% increase in drug offenses (Column 10), suggesting that the inequality-crime link is clearly driven by the age population structure. Moreover, as predicted in H5, there is evidence of a negative effect of spending in health on the incentive to commit crime.

5 Conclusions and Policy Implications

The purpose of this paper was to empirically test the impact of income inequality on national crimes, in the European context. Using economic models in the tradition of Becker (1968) as theoretical background and following the most recent empirical contributions on the determinants of crimes (Buonanno et al., 2011), this paper links domestic burglaries and MVTs to income inequality. The Gini index, used as the measure of income concentration, has a significant and positive effect on the incidence of domestic burglaries and MVTs across 27 European countries, for the period 1993-2007. As specified by the theory, as income distribution becomes more unequal, the gap between the benefits and costs of crime increases and thus the incentive to commit crimes becomes higher. However, the squared term of the Gini index, with a negative and statically significant effect, suggests that income inequality has a nonlinear effect on domestic burglaries and MVTs. An increase in income inequalities leads to an increase in violent property crimes over a range of income distribution, but at a decreasing rate. Because the relationship between inequality and crime is believed to operate through a person's individual assessment of the equity of a particular distribution of economic resources within a country, this paper investigates the relationship between these psychological factors (aggregated at a national level) and the national statistics on crimes. The second hypothesis of this analysis predicts a positive relation between the general population's acceptance of income inequality and crimes within nations. Results strongly support the hypothesis that an extensive culture of inequality among citizens, if it is

not coupled with appropriate social conditions, may reflect the level of social unrest and, thus, can explain crimes. In particular, this result persists when instrumental variable technique is used to control for potential reverse causality between people's beliefs about income inequality and the incidence of crime and violence within a nation.

Moreover, unemployment has a significant repercussion on crimes, especially on property crimes, suggesting that criminal activities are mainly motivated by relative benefits to illegal activities. These results support previous empirical evidence on this relationship as shown by Lin (2008) and Gould, Weinberg and Mustard (2002). With the aim to analyze the impact of demographic structure on crimes, this paper finds that the proportion of young males, between 15 and 34 years old, in a country is also related to violent property crimes with a significant and positive effect. However, the ambiguous results on MVTs suggest that demographic structures, as analyzed in this analysis, may not capture all the dimensions of MVT and, therefore, they cannot clearly explain trends in MVTs in Europe. A finer specificity in the analysis of MVTs is convenient and suggested for further investigations. Finally, this analysis has shown that crimes decrease when social development improves. Health expenditure per capita, used as a proxy for social welfare, has a significant and a negative impact on national crimes. Moreover, the main results of this analysis extend to the use of different types of crimes, including homicides, robberies and drug-related offenses, and to the control for country fixed effects to account for time-invariant unobservable variables.

To the extent that concentrated disadvantage is a key motivator of crime at the macro-level, this research suggests that those policies that are aimed at alleviating inequality are likely to have a significant impact on crime reduction. These policies could come in the form of social support efforts, on the part of public or private entities, such as welfare and health care.

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Table 3: Ols and IV Fixed effects estimates: Homicide, Robberies and Drug-related crimes

	1	2	3	4	5	6	7	8	9	10	11	12
	OLS	OLS	IV	IV	OLS	OLS	IV	IV	OLS	OLS	IV	IV
VARIABLES	Hom	Hom	Hom	Hom	Rob	Rob	Rob	Rob	Drug	Drug	Drug	Drug
Gini	0.142**	0.254***			0.214***	0.255***			0.178**	0.392***		
	(0.0645)	(0.0640)			(0.0788)	(0.0806)			(0.0784)	(0.0811)		
Gini2	-0.00295***	-0.00468***			-0.00375***	-0.00456***			-0.00384***	-0.00728***		
	(0.00111)	(0.00109)			(0.00135)	(0.00137)			(0.00135)	(0.00138)		
Unem	0.00384	-0.00258	0.00619	-0.000946	0.0119***	0.0185***	0.00126	0.0267***	0.0241***	0.0164***	0.0381***	-0.0199
	(0.00337)	(0.00333)	(0.00927)	(0.0154)	(0.00405)	(0.00402)	(0.00739)	(0.00757)	(0.00434)	(0.00423)	(0.0122)	(0.0155)
Young	2.098***	1.162***	-0.0431	0.834	0.249	0.535**	1.227**	0.938**	1.880***	0.725***	0.534	2.035**
	(0.181)	(0.207)	(0.772)	(0.889)	(0.230)	(0.263)	(0.577)	(0.464)	(0.224)	(0.263)	(0.963)	(0.899)
Health		-0.000142***				5.31e-05***				-0.000182***		
		(1.59e-05)				(1.95e-05)				(2.01e-05)		
Tol			0.560***	0.788***			-0.252**	-0.0217			0.698***	0.643***
			(0.135)	(0.235)			(0.119)	(0.106)			(0.191)	(0.238)
TH				-0.0671*				0.0545***				-0.189***
				(0.0406)				(0.0192)				(0.0411)
Constant	-24.71***	-13.05***			3.674	-0.948			-16.93***	-3.640		
	(2.757)	(3.079)			(3.514)	(3.911)			(3.385)	(3.896)		
First-stage F			22.78				18.76				16.22	
Cragg-Donald				6.98				8.04				6.98
Obs	458	436	167	151	448	432	156	145	467	445	166	151
Country	34	34	16	16	34	34	16	16	33	33	16	16

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Ethno-Linguistic Heterogeneity and Homicides: A Cross National Inquiry

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Abstract

This paper examines empirically the impact of ethno-linguistic differences on the incidence of homicide rates. The empirical specification is informed by a theoretical model of social conflict developed by Esteban and Ray (2011) in which conflict is influenced by three distributional indices of diversity: ethnic fractionalization, ethnic polarization and a Greenberg-Gini index constructed across ethnic groups. The analysis tests the effect of these distributional measures on homicide rates across 70 countries, for the period 1995-2007, and suggests that certain ethnic structures are more conducive to homicide than others. In particular, the paper finds that ethno-linguistic fractionalization is highly significant across a number of specifications and robustness checks, suggesting that disputes over private goods are an important feature of homicide rates exactly as specified by the theory and especially across countries in Latin America and North America.

1 Introduction

Violent crime is an increasingly common aspect of life in many countries of the world, particularly in urban areas. In addition to the direct effect on victims, crimes inflict significant costs, produce a climate of fear and insecurity for all citizens, and reduce economic growth, presenting a major challenge to development. For this reason, the question of whether ethnic diversity affects homicide rates is of great importance due to the current political need to understand what promotes violence and in order to design and implement strategies aimed at encouraging development while ensuring human security.

The economic literature offers a wide range of explanations for the ethnicity/violent crime relationship. Merton's (1938) "strain and anomie thesis" and Shaw and McKay's (1942) "social disorganization" perspective make this relationship a central component of their theories. According to the strain theory, the structure of the society may hinder the opportunity for (poor) individuals to reach success through socially acceptable means. Individuals develop alternative values and strain, often fighting against societal norms and models, to achieve success through illegitimate means (Agnew, 2009). Among the various specific strains that are most conducive to crime, discrimination based on characteristics such as race/ethnicity and religion play a chief role (Agnew, 2006). The available research on ethnicity and crime is rather limited. Data that enable cross-national comparisons with respect to this issue are particularly difficult to locate. Many national statistics simply break down their aggregate crime statistics by immigration status or race, and general crime rates are examined without accounting for the contribution of different ethnic groups to the overall rates.[1] Comparative studies are even more difficult because of the lack of uniformity in the definition of ethnic groups. "Ethnicity" is a difficult concept to measure because it involves different concepts such as language, country of origin, religion, ancestry, beliefs and behavior related to every day living. Ethnicity encompasses a way of life and connotes shared cultural traits and a shared group history. However, even if some ethnic groups share linguistic or religious traits, others may share a common group history but not a common language or religion.

The purpose of this analysis is to assess whether ethnic diversity influences intentional homicides. Due to its severity, homicide is one of the most carefully recorded crimes, and it is considered among the most representative and comparable crime indicators. In some circumstances, homicide is also a reasonable proxy for violent crime given the "invisible" nature of much of violent crime in terms of the failure to record it. To measure homicide, I use the data provided by United Nations Office on Drugs and Crime (UNODC), for the years 1995-2007 and for 70 countries. UNODC homicide statistics provide users with the most complete reference for the greatest number of countries and the longest time series data on homicide that is available.

[1] The expanding crime-economic literature includes the effect of immigration on the relationship between ethnicity cleavages and crimes. However, the immigration-ethnicity/race-crime research picture remains incomplete and yields contradictory results (Wortley, 2009).

Literature on higher civil social unrest has lately considered ethnic divisions as a main explanatory factor. However, there has been a controversy about how to define and measure the notion of "ethnic division." Fearon (2003) uses the index of fractionalization, Montalvo and Reynal-Querol (2005) use a variant of the polarization index, and Esteban and Ray (1994) claim that polarization is related to social conflict. More recently, Esteban and Ray (2011) (henceforth, ER) show that social conflict could be linked to a linear combination of three distributional measures that capture different dimensions of ethnic population structures: polarization, fractionalization, and a Greenberg-Gini index of intergroup differences. In the ER model every distributional measure plays a different role in the explanation of social conflict. They obtain the result that the impact of polarization increases with high intensity conflict and when there are public goods at stake (for instance, conquering power in the case of a civil war), while the impact of fractionalization increases with the private component of social conflict and for conflict of lower intensity, such as violent crime; the Gini index becomes relatively important in explaining conflict if group cohesion is low. This analysis asserts the idea that intentional homicides are linked to the above-mentioned distributional measures and, with an expected effect of ethnic fractionalization on the incidence of national homicide rates, it provides an alternative view and analysis of the determinants of national violence. The analysis is accomplished by using a specific cultural dimension of ethnicity, the linguistic differences across groups, following Fearon (2003), Desmet et al. (2012), and Esteban et al. (2012).[2] The model generates testable hypotheses about the relationship between ethnic diversity and homicide.

To the best of my knowledge, this analysis represents the first empirical effort to apply the theoretical social conflict model developed by Esteban and Ray (2011) to homicide and thus contributes to the existing body of work on the determinants of homicide and its relationship to ethnic cleavages.[3]

The main conclusion of this paper is that ethnic fractionalization has a significant and positive effect on the incidence of homicide (clearly economically motivated) for the presence of opposing positions and interests among ethnic groups. Results also confirm the theory that polarization is not related to low-intensity conflict. The results extend to the use of different regional dummies and samples of countries, to the inclusion of overall and regional time trends across a number of different estimation models. These findings are important because they suggest that certain ethnic population structures could be more conducive to homicide than others.

The structure of the paper is as follows: Section 2 reviews existing theory linking ethnicity and

[2]This paper does not take into account concepts that divide people into groups on the basis of physical characteristics which result from genetic ancestry (race, skin, eye and hair color or facial type), which is the most common approach in the analysis of criminality.

[3]See Esteban et al. (2012) for the first empirical test of the ER model on the impact of ethnic divisions on internal armed conflict/internationalized internal armed conflict. They use as indicator of the incidence of conflict the number of battle-related deaths and the Bank's index of political instability.

homicide. Section 3 describes the data used in the empirical analysis; Section 4 presents the empirical results; and Section 5 presents a conclusion.

2 On the Link Between Ethnic Differences and Social Conflict

This section discusses prior research on the relationship between population ethnic heterogeneity and homicide rates. The first part introduces empirical research findings, and the second section discusses theoretical backgrounds.

2.1 Literature Review

Empirics of ethnicity and homicide

Much of the research regarding the relationship among population heterogeneity, violence, and homicide, has been based on black population size and its association with violence in the United States (Chon, 2011). Blau and Blau (1982) report that a proportion of the black population in U.S. cities is positively correlated with violent crime rates and homicide. However, black population size alone does not have an effect on the level of violence, whereas the percentage of the black population in interaction with income inequality is positively related to the homicide rate. Braithwaite (1979) and Messner and Golden (1985) find no association between racial inequality and homicide rates, suggesting that relatively heterogeneous societies are not necessarily homicide-prone. Therefore, there is a lack of consistent results on the connection between ethnic heterogeneity and homicide rates.

Other studies extended population heterogeneity issues to a cross-national focus. Some studies suggest a significant and a positive relationship between ethnic heterogeneity and homicide rates in a country (Hoskin, 2001; Altheimer, 2007, 2008; Cole and Gramajo, 2009). Hoskin (2001) suggests the presence of a positive association between ethnic diversity and homicide in his analyses of 36 nations. Stamatel (2009) reports that ethnic heterogeneity is positively associated with homicide rates in East-Central European countries. However, other studies didn't find a significant relationship between ethnic diversity and homicide rates (Hansmann and Quigley, 1982; Messner, 1989).

Few studies used linguistic and religious heterogeneity as well as ethnic heterogeneity (Cole and Gramajo, 2009; Hansmann and Quigley, 1982; Neapolitan, 1997). The study of Cole and Gramajo (2009) found no significant relationship between religious diversity and homicide rates even though they found that ethno-linguistic diversity tended to increase the homicide rate. Very recently, progress has been made in measuring linguistic diversity as a measure of ethnic divisions.

In particular, based on work by Laitin (2000) and Fearon (2003), Desmet et al. (2012), and Esteban et al. (2012) bring to bear evidence that linguistic distances are predictors of conflict. In particular, Desmet et al. (2012) report that only when linguistic fractionalization is measured on the basis of language groups that have divided a long time ago is such an index a significant predictor of social conflict.

Theoretical background

Previous cross-national analysis of population heterogeneity and its impact on homicide rates have used four main theoretical frames. They are Sellin's (1938) "cultural conflict theory", Merton's (1938) "strain theory", Shaw and McKay's (1942) "social disorganization theory" and Blau and Blaus (1982) "ethnic economic inequality theory". Following Sellin (1938), conflicts of norms exist among different cultural groups in a society, which leads to violence. The cultural conflict theory assumes that an individual is in antagonism to other ethnic groups because different ethnic groups contend for limited resources such as education and employment (Hansmann and Quigley, 1982), and an individual acts in order to preserve or maximize the interest of their cultural group. Following Sellin (1938), the probability of cultural conflict increases when a society becomes more diverse. Population diversity moreover may provoke political conflicts among various ethnic groups to gain political power, since in a fragmented society it might be difficult to agree on the amount and kind of public goods the government should provide (Easterly and Levine, 1997; Alesina et al., 2003; Carment et al., 2009; Cole and Gramajo, 2009; Unnever and Cullen, 2010; Esteban and Ray, 2011).

According to Merton's (1938) "strain theory", the way in which society is structured may limit the possibility for poor people to achieve success through socially acceptable and legitimate means. Individuals could develop alternative values and rebell against societal norms and models to achieve success. When strain is seen as high in magnitude, unjust, and associated with low social control, strain is more likely to produce strong negative emotions and, therefore, crimes (Agnew, 2009; Froggio and Agnew, 2007). Among the various specific strains that should be most crime-prone, discrimination based on characteristics such as race/ethnicity and religion plays a chief role (Agnew, 2006).

Following Shaw and McKay (1942), population heterogeneity encourages social disorganization because exposure to other ethnic cultures may deteriorate the ability to reinforce cultural values to the members of the ethnic group (Hansmann and Quigley, 1982). Ethnic diversity, moreover, limits the communication capability among different ethnic groups (Gartner, 1990; Graif and Sampson, 2009). The weakened social connections and values among the individuals of an ethnic group obstruct effective social control. Research links the weakened social control with a high level of crime (Avison and Loring, 1986; Hansmann and Quigley, 1982).

There has been widespread empirical support for the hypothesis that income inequality leads to higher homicide rates (Kelly, 2000; Wilkinson and Pickett, 2005). Blau and Blau (1982) see race as "inborn inequality" and show that intensified economic inequality among minority ethnic groups brings social conflicts and criminal violence and that the explanatory power of racial inequality for the homicide rate is stronger than that of economic inequality. Ethnic minority groups are expcted to experience desperation and frustration because of their economic conditions. The frustration and resentment from relative deprivation could lead to aggression (Blau and Blau, 1982; Carment et al., 2009). Moreover, members of minorities often aim their aggression at an easily available target, generally composed by members of their own ethnic group (Balkwell, 1990). Xie and McDowall (2010) show that racial and economic inequality forces American black people to live in crime-prone areas.

Thus, black people are a target of violent crimes perpetrated by other black people who are also living in disadvantaged economic conditions.

2.2 Dimensions of Heterogeneity and Indices

"It is unclear how to integrate linguistic and "ethnic" differences with other dimensions that make the latter politically and economically salient" (Alesina and La Ferrara, 2005). Easterly and Levine (1997) use data from the Soviet Atlas Narodov Mira, a compilation of ethnolinguistic groups present in 1960 and based on historical linguistic origin. A limitation of this data is that linguistic heterogeneity does not necessarily correspond with ethnic heterogeneity, as is the case for most Latin American countries that are less homogeneous in terms of race than in terms of languages. Moreover, Atlas data consider a number of groups that are listed as separate linguistic categories, but whose distinction has no political or economic relevance. Many groups are aggregated into a single category while they are distinct political actors, even enemies, at the national level (Posner, 2004).[5] Alesina et al. (2003) and Fearon (2003) have compiled different measures of ethnic diversity which attempt to explicate the fact that the difference among groups manifests in different ways in different places or countries. However, Alesina et al. (2003) do not take a position on whether ethnicity, language, or religion is the main dimension. They accept the classification proposed by the Encyclopedia Britannica that identifies ethnic groups as well as language groups that are defined by other characteristics, such as skin color. Fearon (2003) instead constructs a list of ethnic groups which "depends on what people in the country identify as the most socially relevant ethnic groupings".

[5] An example of this is the case of the Tutsis and the Hutus in Rwanda, which are aggregated into a single category "Banyrwanda." Posner (2004) proposes a classification based on "politically relevant ethnic groups" (PREG), defined as groups that can influence economic policy decisions either directly or indirectly.

This method has the advantage of being closer to what the theory would want (Alesina and La Ferrara, 2005; Desmet et. al, 2009; Spolaote and Wacziatg, 2009; Esteban et al., 2012), and this is the approach followed in this paper. In cross-national research of social and political violence and economic growth, analysts most often use ethnic fractionalization as an index of ethnic diversity (Easterly and Levine, 1997; Collier and Hoeffer, 2004; Fearon and Laitin, 2003; Miguel et al., 2004). The Fractionalization index ranges from 0 (ethnic homogeneity) to 100 (extreme ethnic heterogeneity) and is defined as the probability that two randomly selected individuals in a country will belong to two different ethnic groups. Ethnic divisions are typically captured by the fractionalization index, $F = \sum_{i=1}^{m} n_i(1 - n_i)$, where n_i is the population share of group i and m is the number of groups.[6] Ethnic heterogeneity measures are common throughout cross-national homicide research, but as of yet they fail to be consistently supported (LaFree, 1999).[7]

In order to consider the notion of social effective antagonism, alienation, and identification, this analysis follows Esteban and Ray (1994), who introduce a measure of polarization to capture the possibility that social conflict is determined by inter-group distances y within-group cohesion. They introduce the polarization measure, $P = \sum_{i=1}^{m} \sum_{j=1}^{m} {n_i}^2 n_j \, d_{ij}$, with d_{ij} as a measure of inter-group distances. Fajnzylber et al. (2002b) provide evidence of the empirical relationship between income polarization (calculated following Esteban and Ray (1994) and violent crimes, such as homicides and robberies. For the authors, the social tension that leads to violence and crime would be produced by the economic heterogeneity of internal and strong groups.[8]

Finally, the Gini index is given by $G = \sum_{i=1}^{m} \sum_{j=1}^{m} n_i n_j d_{ij}$. Proposed by Greenberg (1956), the Gini index computes the population weighted total distances between all groups and can be considered as the expected distance between two randomly selected persons. Gini is essentially a generalization of the fractionalization index, whereby distances between different groups are taken into account. Naturally, the Gini index does not satisfy the requirements of a diversity index mentioned previously, and the maximal diversity need not be attained when all groups are of the same size.

Because every society contains numerous groups (church groups, political parties, women's organizations, student's organizations, etc.), the Gini index, fractionalization, and polarization mea-

[6] It satisfies the fundamental requirements of diversity (Shannon, 1949): *(i)* for a given number of groups, the index reaches its maximum when all groups are of the same size and *(ii)* if all groups are of equal size, then the society with a larger number of groups possesses a higher index of diversity.

[7] Fajnzylber et al. (2002) use a measure of ethno linguistic fractionalization employed by Mauro (1995) and Easterly and Levine (1997) in their cross-country growth studies of violent crime.

[8] Following Esteban and Ray (2004), an individual of group i feels identified with other individuals in the same group, for example, those who speak the same language. The degree of identification depends on the size of the group, n_i, and is given by the value n_i^{α}. In Esteban and Ray (1994) α is a positive number (α is in the range of 1 to 1.6), implying that the sense of identification is stronger in a larger group. The alienation felt by an individual of group i toward an individual of group j is increasing in the distance d_{ij}. The sense of identification toward their own group may affect an individual's alienation toward another group. This interaction between alienation and identification yields antagonism.

sures may be employed over ethnicity but also over every kind of group distribution.

2.3 A model of Social Conflict

The economic literature on ethnic conflict is very extensive; there is a rich tradition of theoretical models of social conflict; however, few of these models are clearly designed to capture conflict among ethnicities (Grossman, 1991, 1999; Hirshleifer, 1995; Azam, 2001; Esteban and Ray, 1994, 1999; Gershenson and Grossman, 2000; Grossman and Mendoza, 2003). Esteban and Ray (2011) have proposed a model where, as in Horowtiz (1985), conflict is determined both by instrumentalist and primordialist reasons.[9] The central focus of the ER model is on the role of within and between group income differences and on group cohesion. The authors assume that ethnic relations are intrinsically conflictual (the model does not feature a peaceful outcome) and the composition of the groups is fixed and immutable. They investigate the relation between the incidence of conflict and various measures of heterogeneity used in the empirical literature.

With the aim of assessing whether ethnic divisions influence national homicide rates, this analysis will empirically test the model by Esteban and Ray (2011). The ER model assumes that society is composed of individuals placed in m ethnic groups involved in a conflict for two categories of prizes: one is public (cultural supremacy, ideology, political power, and/or the control of an economic sector) and the other is private (and therefore excludable), such as the revenue from natural resources.[10] N_i is the number of individuals in group i, and N the total number of individuals, so that $\sum_{i=1}^{m} N_i = N$. These groups are assumed to contest a budget with per capita value normalized to unity. It is assumed that a proportion λ of this budget is available to create society-wide public goods. One of the groups will get to control the mix of public goods, but it is assumed that λ is given.[11] The residual proportion, $1 - \lambda$, can be privately divided, and once again the winning group can seize these resources. All individuals derive equal payoff from their consumption of the private good, but differ in preference over the public goods available. The authors define u_{ij} to be public goods payoff to a member of group i if a single unit per capita of the optimal mix for group j is produced. The per capita payoff to group i is $\lambda * u_{ij} + (1 - \lambda)(\frac{N}{N_i})$ for the case in which i wins the conflict and $\lambda * u_{ij}$ in case some other

[9] Theories of ethnic conflict rely on some combination of two categories of motives: instrumentalist or rationalist and primordialist or consummatory. Instrumentalist views stress the fact that participants in conflict hope to gain material benefit from the conflict (jobs, wealth, and power). Primordialist views focus on the instinctive dimension of conflict, which they interpret as an explosion of antagonism (Caselli and Coleman, 2011). The contribution of this analysis is in the instrumentalist tradition.

[10] Privateness has two properties: first the prize is divided among the winning group, so group size matters and second, the identity of the winner is irrelevant to the losers.

[11] Note that $\lambda = \pi/(\pi + u)$ measures the relative publicness of the prize.

group j wins.[12] In the model, $u_{ii} > u_{ij}$ for all i, j in which i is different from j. These payoff differences define a notion of distance or alienation across groups that is $\delta_{ij} = u_{ii} - u_{ij}$. ER discuss these effects in detail.

The main result of the ER model links equilibrium conflict to a linear combination of a particular inequality measure (the Gini coefficient), the Herfindahl-Hirschman fractionalization index, and the specific polarization measure by Esteban and Ray (1994). The equilibrium per capita conflict σ is a linear function of these distributional measures, and it is approximated by the following formula:

$$\sigma \simeq \omega_1 + \omega_2 G + \alpha[\lambda * P + (1 - \lambda)F] \tag{1}$$

where $\omega_1 = (1 - \lambda)(1 - \alpha)(m - 1)/N$ and $\omega_2 = \lambda(1 - \alpha)/N$.[13] σ is a measure of the intensity of conflict determined by the ratio of the income-equivalent cost of the per capita level of resourses employed in a conflict (time, effort, and risk) to the value of the potential benefits from conflict. Equation (1) tells us that the effect of each distributional measure is influenced by the relative publicness of conflict payoffs, as well as the extent of group cohesion. Given $\lambda = \pi/(\pi + u)$ as a measure of the relative publicness of the prize, the impact of P is enhanced by λ, and that of F by $1 - \lambda$. The weights in the linear combination related to each of these three indices correspond to the relative importance of public and private goods in the conflict prize (what the group is fighting for), on the level of intra-group cohesion and on overall population. What groups are fighting for defines how alienated groups will feel about each other. The cohesiveness of a group determines the level of within-group identification. Moreover, the effect of polarization increases with conflict over public goods and the impact of fractionalization growth with the private component of social conflict, while the Gini index becomes relatively relevant in the explanation of conflict if group cohesion is low.[14]

Prior cross-national research of ethnic polarization shows that it increases the risk of wider civil conflict (Reynal-Querol, 2002; Gardeazabal, 2011), whereas ethnic fractionalization increases the risk only for lower levels of violence, such as violent crimes including homicides and robberies (Fajnzylber, Lederman and Loayza, 2002b; Hegre and Sambanis, 2006). More diversity (fractionalization) may increase the coordination problems among groups and, therefore, for a given level of polarization, the probability of high-intensity conflict, such as civil wars, may be smaller, while the likelihood of lower-intensity social conflict, for which is not required relevant coordination activity among the members of groups, may increase (Collier and Hoeffler, 2004;

[12] The parameter λ can also be interpreted as an indicator of the importance of the public good payoff relative to the monetary payoff used as numeraire.

[13] α represents the weights of the aggregate of all payoffs for other group members.

[14] See also Esteban and Ray (1994) and Duclos, Ray, and Esteban (2004).

Esteban et al., 2012).[15]

In addition, the coefficients of the existing ethnic structure of the population can be directly linked to exogenous parameters; this is because, as pointed out by previous studies (Alesina et al., 2003; Hegre and Sambanis, 2006; Esteban et al., 2012) ethnic composition, based on language diversity, displays an important time persistence and, thus, the exogeneity assumption could be reasonable at the 20-30 year horizon. Ethnic distribution measures are time invariant (in the short term) and act much like a country-specific effect. The dataset used in this analysis includes a relative short period, 1995-2007, which further justifies the exogeneity assumption.[16]

Implications for estimation

This paper uses a research design that applies the ER theoretical model of conflict, by using the model as a guide to conduct a systematic analysis of the occurrence (or absence) of homicide, considered a proxy of the (low) level of national violence. This paper analyzes 70 countries to explore the fit of the ER model in a cross-sectional context to determine if the empirical measures used in the ER model are actually able to explain other theoretically significant variables, such as homicide. Even if the ER model predicts cases of civil war (and the analysis by Esteban et al. (2012) empirically predicts cases of the onset and incidence of civil war perfectly), it would still not be able to tell us much about other forms of violence within a nation. Instead, this analysis helps to identify the causal mechanisms through which the independent variables in the ER model also influence the risk of homicide, leading to a deeper understanding of national violence and suggesting possible revisions and extensions of the ER model. Following the presentation (in the previous section) of the core elements of the ER model and all main empirical results, this section now turns to the research design employed in this analysis. For the available data, the empirical exercise suggests testable hypotheses about the relationship of ethnic population structure and internal violence, in the form of homicide, that the ER model has not explicitly considered. These hypotheses could be incorporated in the model by adding new measures of internal social conflict for all countries and by performing new empirical tests of an expanded model.

[15] For example, Korea and Sri Lanka have the same level of (religious) polarization (0.72). However Sri Lanka, which suffered a civil war, has a degree of religious fractionalization of 0.49, while Korea, with a much higher level (0.79) did not experience a civil war (Montalvo and Reynal-Querol, 2005).

[16] As argumented in Esteban and Mayoral (2011), the consideration of different dimension of ethnicity, like religion, may be more problematic for the analysis of social conflict. In some repressive regimes, non-official religions might be prosecuted and this may create a correlation between religions and conflict.

The goal of the empirical exercise is to take equation (1) to the homicide data. We consider the different distributional measures P, F, G/N, which are the baseline specification, as predictors of homicides. What is remarkable about this analysis is the assessment of the simultaneous effect of the three ethnic distributional measures on homicide rates, as specified by the background theory. A regression of homicide on ethnic fractionalization (which does not allow for different distances between languages) will yield a positive coefficient, when controlling for polarization and for the Gini index. Highly fractionalized societies might be more prone to violence for the presence of opposing positions and interests, however, the intensity of such conflict will be "moderate," such as for the case of homicide and crime. In principle, a high number of different groups should make coordination activities (required by groups of rebels in a situation of war) more difficult and, therefore, civil wars will be less probable since it will be difficult to maintain cohesion among groups. Therefore, fractionalization represents an incitement to victimization whereas a society's degree of polarization may be the cause of rebellions and civil wars. For this reason, the impact of fractionalization is expected to increase with the low levels of violence (and with the private component of social conflict). This would be an important finding, since it would mean that the ethnic fractionalization theory is supported even when the other main distributional measures are included in the model, suggesting that certain ethnic structures are more conducive to homicides than others.

H_1: Ethnic fractionalization is positively associated with the risk of homicide.

If the attention is on the importance of including distances among groups, polarization will not have a significant impact on national homicide rates. Though related to inequality, polarization measures emphasize the separation between large, internally homogeneous ethnic groups. Polarization increases with respect to both the ethnic differences between groups and the degree of identification within each group, where identification depends positively on the size of the group and negatively on its internal dispersion. For instance, the presence of a common viewpoint and intragroup similarity tend to increase polarization, as does the introduction of a rival "outgroup". When there is a feud, persons with the same viewpoint unite and share information. When individuals with the same views spend all their time together, their viewpoints could become stronger and more extreme. The result is that groups often make more extreme decisions than would the average individual in the group. Possible consequences of highly polarized societies, in terms of social cohesion, could be rare events but with a very severe intensity, as in the case of civil war, international conflicts, or terrorist attacks.[17] A regression of homicides on ethnic polarization will not yield any significant result, when controlling for fractionalization and the Gini index, whereas the fractionalization-homicide association will remain. It is not uncommon for countries to experience opposing movements in measures of fractionalization and polarization.

[17] In order to comprehend the "severity" or magnitude of civil war, following the definition used by the Peace Research Institute of Oslo (PRIO), a civil war could be defined as a battle in which (at least) between 25 and 999 battle-related deaths occurred in the year of the conflict.

The failure to control for ethnic polarization is questionable theoretically, as there are reasons to believe that polarization is associated with homicide rates. Given the review of cross-national theoretical and empirical literature on the ethnic structure of population and homicide, the second hypothesis to test is that ethnic polarization is not associated with higher levels of homicide, when fractionalization and Gini are included in the same models.

H_2: Ethnic polarization is not associated with the risk of homicide.

Finally the Greenberg-Gini differences index, which is essentially a generalization of the fractionalization index whereby distances between different groups are taken into account, becomes relatively relevant in the explanation of social conflict if group cohesion is low. The third hypothesis to test is, therefore, that the ethnic Gini index is associated with higher levels of homicide, when fractionalization and polarization are included in the same models.

H_3: Ethnic Greenberg-Gini index is positively associated with the risk of homicide, only if group cohesion is low.

This study uses per capita GDP measure as a relevant determining factor of the incidence of homicide. According to cross-country studies on homicide, it is reasonable to think that the presence of homicide is less probable if there is a high development level, captured by per capita gross domestic product. From a theoretical perspective, income is the most important variable in the model of violence and crime. If findings confirm this hypothesis, they could indicate that a significant fraction of homicides results from economically motivated crimes that become violent and lethal, suggesting that the private component of violence is an important aspect of the analysis. The expectation is also that the fractionalization-homicide association will remain.

H_4: Per capita GDP is negatively associated with the risk of homicide.

Increases in urban population size facilitate social interaction, including homicide, by reducing the physical distances among members of a community. According to the literature, demographic factors can contribute to the intensity of violent criminal activity. Specifically, a high level of urbanization can promote the development of social interactions between criminals and would-be criminals, decreasing therefore the costs of committing crimes and leading to a higher incidence of them. The last hypothesis to test is the following:

H_5: Urban population is positively associated with the risk of homicide.

3 Empirical Implementation on Homicide Rates

The aim of this analysis is to test the ER model by assessing the impact of ethno-linguistic heterogeneity among populations on homicide rates. For this purpose, 70 countries are looked at

over the period 1995-2007. The analysis starts by considering homicide rates and then it deals with the distributional measures of fractionalization, polarization and Gini as described in Section 3.3.

3.1 Homicide Data

This study is concerned with "intentional homicide." It is concerned only with those acts in which the perpetrator intended to provoke death by his or her acts. This ignores deaths associated with conflicts or deaths produced when the perpetrator was irresponsible, as well as killings that are considered justifiable for the penal law. According to the definition adopted in this study, intentional homicide is thus "unlawful death purposefully inflected on a person by another person." Data are provided by United Nations Office on Drugs and Crime (UNODC). Section 7.1 of the Appendix contains descriptions on the sources and quality of homicide data used in this analysis and presents a picture of global geographical differences in homicide rates for the year 2010 (Figure 3 of Appendix).

According to recent available data, globally, the total number of homicides in 2010 was 468,000 (UNODC, 2011).[18] The analysis of global tendencies in homicide rates is limited by the shortage of time-series data in many countries, especially in Africa. Moreover, in subregions with high homicide rates, such as the Caribbean and East, Central, and West Africa, there are relevant disparities between data from criminal justice and public health sources. Available data indicate that the homicide rate decreased in many countries of the world, especially in Europe, Norther America, and Asia, from 1995 to 2007 (Figure 1). Although the United States has a relatively high homicide rate compared to other countries with similar socio-economic conditions, U.S. crime rates in general have been declining since the mid 1990s, resulting in a stable descending trend of the Norther American homicide rate. Homicide rates have fluctuated in South America but have returned to a level similar to those of 1995.[19] While there was a steady downward trend in homicide rates in Central America during the years 1995-2005, the subregion has experienced an important increase in homicide since 2005. The Caribbean subregion has also experienced a steady increase over the past decade.[20] The homicide rate in Asia shows a constant downward trend from 1995 to 2009, although in the Western Asia subregion, the homicide rate stabilized during most of the first

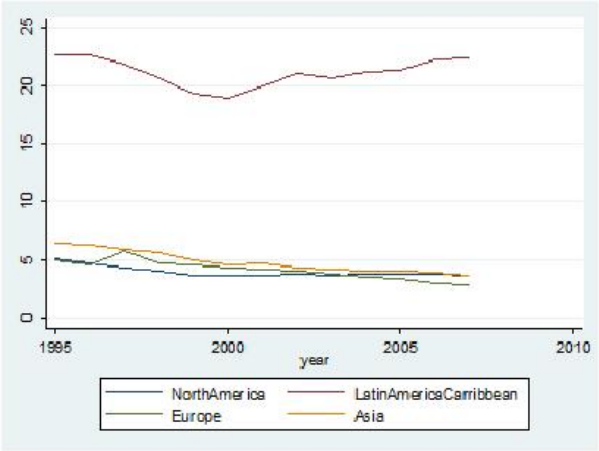
[18] Of that number, 36 percent were estimated to have occurred in Africa, 31 percent i n the Americas, 27 percent i n Asia, 5 percent in Europe and 1 percent in Oceania. Some 40 percent of countries have homicide rates under 3 per 100,000 people, while in 17 percent of countries it is greater than 20 per 100,000, reaching 50 per 100,000 in some countries and as high as 80 per 100,000 in others (UNODC, 2011).

[19] One important exception is represented by the case of Colombia, which, although it still has one of the world's highest homicide rates, has seen a massive drop in its homicide rate from 72 to 33 per 100,000 people.

[20] Drug trafficking is an important driver of homicide rates in Central America and one of the main factors behind growing violence levels in the subregion (World Bank Crime and Violence in Central America: A Development Challenge (2011).

decade of the 21st century. It should be noted that complete time-series data do not cover a number of Asian countries, such as Bangladesh, China and Indonesia and homicide trends are imprecise in post-conflict countries, such as Afghanistan and Iraq, for which no time-series data are accesible. In Europe, despite some important fluctuations such as those verified in Albania, homicide rates have decreased or remained more or less stable in the majority of European countries since 1995, following the peaks of 1991-1993. Most Western and Northern European countries have been among those with the lowest homicide rates in the world. Violent crimes and drug offences have increased in many European countries in the same period.

Figure 1: Homicide Rates by Country



Source: UNODC Homicide Statistics

3.2 Distributional Indices and Control Variables

The main independent variables in this study are the Gini, fractionalization, and polarization indices. For the other explanatory variables, the economic literature uses a variety of controls, depending on the specific hypothesis being tested. According to cross-country studies on homicides (Fajnzylber et al., 2002b; Kelly, 2000), this study uses, as set of controls, per capita GDP and the urban population rate as important determining factors of the incidence of homicide. GDP per capita, in constant 2000 U.S. dollars, is the gross domestic product divided by midyear population, as measured by the World Development Indicators (World Bank).[21]

[21] 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.

Urban population refers to people living in urban areas as defined by national statistical offices. It is measured using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects. It is reasonable to think that the presence of homicide is less probable if development is high, captured by per capita gross domestic product. From a theoretical perspective, income is maybe the most relevant variable in the models of social violence and crimes (Fearon and Laitin, 2003).[22] Big cities represent a possible risk area for violent crimes, like homicides. Increases in urban population size encourage social interaction, including homicide, by reducing the physical distances among community members. While urban settings can provide protective elements such as better policing and faster access to medical facilities, in many countries, homicide rates in cities with more than 500 inhabitants per square kilometer are higher than in the rest of the country. This can be a consequence of social (inequality, segregation, poverty) and criminological (more targets, drug markets, and anonymity) factors (UN, 2011).

3.3 Distributional Measures: Ethnic Groups and Distances

This study adopts the Fearon (2003) ethnic group classification and uses an update of the data by Fearon (2010), which presents a list of ethnic groups in 160 countries that made up at least 1 percent of the country population in the early 1990s. In order to define "ethnicity", Fearon employs the concept of "radial categories" used by linguistic and cognitive scientists (Lakoff, 1987). The concept of radial categories is based on the idea that the prototypical ethnic group has a list of characteristics such being conscious of group membership and viewing it as psychologically important; sharing some common distinguishing cultural features (language, religion, and customs); having a homeland, or at least remembers one; and having a shared and collectively represented history as a group.

In order to compute inter-group distances, we use the linguistic distance between two groups, as already made by previous analysis.[23] The different languages spoken in a country can be ordered in a language tree catching the genealogy of languages, classified in accordance with their

[22]Fearon and Laitin (2003) use per capita income as a proxy for the financial, administrative, political capability and the degree of penetration of the central government. Collier and Hoeffer (2004) think of the growth of income per capita as a proxy for new income opportunities.

[23]Greenberg (1956), Laitin (2000), Fearon (2003), Desmet et al. (2009, 2010) and, Esteban et al. (2012).

family structure.[24] The ethnolinguistic distance can be approximated by the lack of nearness on the language tree. The similarity between two languages i and j, s_{ij}, is represented by the ratio of the number of common branches to the maximum possible number (fifteen) for the entire tree. If two groups have the same language, s_{ij} is equal to 1. Following Fearon (2003) and Desmet et al. (2009), the distance between the two languages is defined as $K_{ij} = 1 - s^{\delta}_{ij}$, for some parameter $\delta > 0$. δ is a parameter that determines the speed with which the distance declines as the number of shared branches rises. This analysis uses values of δ of 0.05, as used by Desmet et al. (2009); however, other authors (Fearon, 2003 and Esteban et al., 2012) measure distances using $\delta = 0.5$. This paper focuses on the lowest values of δ because this measure will essentially separate the languages that have very few common branches.

3.4 Descriptive Statistics

This section describes the three linguistic diversity indices used in the empirical analysis and the other economic and demographic variables, which are the gross domestic product per capita and the urban population. GDP per capita is recalculated into U.S. dollars by considering purchasing power. Urban population is the percentage of people who live in cities as opposed to rural areas. Table 1 reports the average values and the standard deviation of the three different indices, Gini, fractionalization and polarization, GDP, and urban population.

With respect to the ethno-linguistic heterogeneity measures, Latin American and Caribbean countries tend to become more diverse when controlling for distance (the region has a high ethnic polarization) while African countries become less diverse when taking into account distances.[25] With the fractionalization index, 15 out of the 20 most diverse countries are African. In contrast, by considering the Gini index only 3 out of the 20 most diverse countries are still African.

The picture for Europe is mixed. Some countries become more diverse when controlling for

[24] For instance, the Spanish and Catalan branches share their first 7 nodes: Indo-European, Italic, Romance, Italo-Western, Western, Gallo-Iberian, and Ibero-Romance languages. In contrast, Spanish and Basque diverge at the first branch, since they come from structurally unrelated language families and because Basque is an isolated language with no links to other languages (Esteban et al., 2012).

[25] Although many languages are spoken in African countries, they tend to be quite similar. The most extreme example is Togo in which there are 40 languages spoken in that country, almost all of which belong to the Niger-Congo/Atlantic-Congo/Volta-Congo classification. Similar examples appear in other African countries, such as Ghana, Benin, and Ivory Coast.

distances.[26] Table 2 of the Appendix shows the differences in population size between different EU member states and the official state language. Table 3 of the Appendix shows the correlation of the fractionalization, polarization, and Gini index.

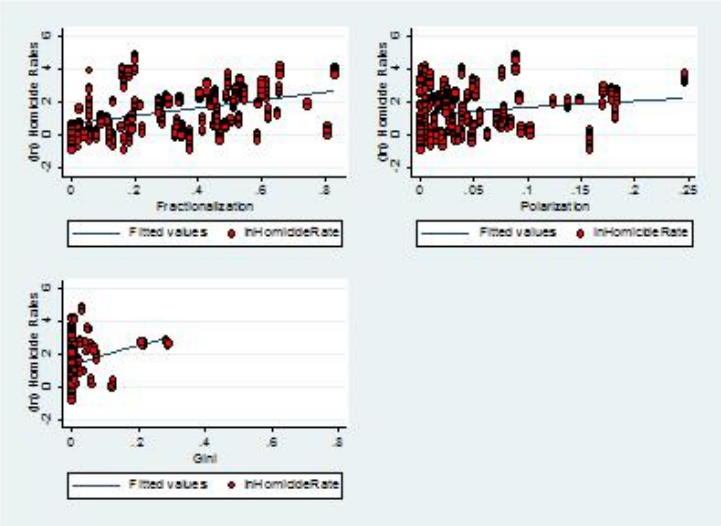
Table 1: Summary Statistics (1995-2007)

Variable	Mean	Africa	LAC	Asia	Europe	Std.Dev.
Fract.	0.4155	0.5869	0.4167	0.3764	0.2360	0.2375
Pola.	0.0463	0.0280	0.0613	0.0695	0.0333	0.0543
Gini	0.0441	0.0193	0.0200	0.0406	0.0203	0.0815
GDP	8.2724	7.1382	8.1123	7.3111	8.9878	1.4054
Urban Pop.	4.0463	3.8875	4.0138	3.8156	4.1982	0.4191

Now that the measures of ethnic heterogeneity have been described, it is important to indicate the empirical relationship between those indices and homicide rates, by showing scatter plots that capture the effects of polarization, fractionalization and the Gini index on homicides. Panel A shows how fractionalization is related to homicide (in logs); Panel B relates polarization to homicide and Panel C relates the Gini index to homicide (Figure 2). Fractionalization is positively related to homicide. However, some countries experience high homicides even if they are characterized by low levels of Fractionalization. Honduras and El Salvador, for instance, have experienced very high homicide rates in the period 1995-2007 but have low polarization and fractionalization. At the same time, some nations such as Hungary, Czech Republic, Poland, and Slovenia experienced culture and political conflicts among different ethnic groups (Carment et al., 2009); however, their ethnic diversity did not automatically lead to ethnic inequality. In other words, even though some societies exhibit a high level of heterogeneity, they enjoy equality among various ethnic groups (Balkwell, 1990). It is interesting to describe the situation of countries that have a high degree of polarization but a low degree of fractionalization. The ethnic composition of the population of Guatemala, for instance, is 55 percent Ladino (Mestizo), 42 percent Maya (Amerindian), and 3 percent other small groups. This implies a very high degree of polarization (0.96) and a lower level of fractionalization (0.52). It is not uncommon for countries to experience opposing movements in measures of fractionalization and polarization. Population heterogeneity, or fractionalization, may not be the same event as population polarization.

[26] This is the case of Bulgaria, a country with a large Turkish minority. In Estonia, the majority speaks a non-Indo-European language, but the minority is Russian-speaking (Desmet et al., 2009).

Figure 2: Homicide Rates, Fractionalization, Polarization and Gini



Source: UNODC Homicide Statistics

4 Regression Results

This section presents the estimation of the ER model for the incidence of homicides, measured in logs, as a function of polarization, fractionalization, and the Gini index of ethno-linguistic heterogeneity. With a pooled OLS estimator with time-region fixed effects, this analysis tests the following model:

$$Homicide_{it} = \alpha + \beta_1 Fractionalization_{it} + \beta_2 Polarization_{it} + \beta_3 Gini_{it} + \beta_4 X_{it} + \epsilon_{it} \qquad (2)$$

where (ethnic) fractionalization, polarization, and Gini are the relevant distributional variables in the model and $X_{i,t}$ is the set of controls, which include GDP per capita and urbanization. The sample includes 70 countries for the period 1995-2007. The empirical analysis computes robust standard errors adjusting for clustering at the country level applied to models of panel data, indicating that the observations are clustered into countries and they may be correlated within countries, but would be independent between nations. This methodology allows to control for heteroscedasticity, for the presence of unobserved country-specific effects, such as systematic measurement errors in crime statistics, and for the effect of unobserved variables that vary little over time and can thus be considered as country-specific effects but vary significantly from one country to the next. Regarding the endogeneity of the explanatory variables, this analysis restricts ethnic distributional measures to be completely exogenous, given the predetermined and time-invariant nature of ethno-linguistic divisions.

Table 4 reports the coefficients of the regression results. As predicted in $H1$, and by excluding the results of Column 4 in Table 4, in all cases the ethnic fractionalization index has a statistically significant effect on the incidence of homicides. The analysis presented in Column 4 allows to test whether the interacted indices of ethnic fractionalization with every regional dummy (Latin America and the Caribbean, Europe, Africa, Asia, and North America) are significant. In this case, the regional dummy-regression model of Column 3 is modified to reflect interactions. Oceania is the reference group for the regional dummies. In this analysis, only the interacted fractionalization index with the Latin American and North American regional dummy is positive and significant (in respect to Oceania) and it does not appear to have any impact on the other regions, suggesting that the assessment of ethnic diversity on homicide is driven by the data of two specific regions, Latin America and North America. These results don't represent a surprise. Even if homicide rates have fluctuated in Latin America areas, most of the countries have experienced a steady increase over the past decade. This is particularly a concern in Latin America because homicide rates in some countries are extremely high. Many countries are important outliers in terms of their homicide rates; within the region, for example, Jamaica and El Salvador exhibit the highest levels of youth homicide. The U.S. homicide rate, which has declined substantially since 1995 from a rate of 8.1 to 5.6 per 100,000 thousand people in 2007, is still among the highest in the industrialized world. There were 14,748 homicides in the United States in 2010 and 666,160 murders from 1960 to 1996 (UNODOC, 2011). Large disparities in homicide rates in the United States have been reported among different racial/ethnic groups (Bernard et al., 2007) and the minority racial/ethnic population in the United States is disproportionately affected by homicide.[27]

The link between the ethno-linguistic heterogeneity of a population, as measured by the fractionalization index, and violence could be interpreted by concepts such as discrimination, exclusion, poverty, and racial integration. Latin America is the most unequal region in the world. This inequality is a result, among other factors, of inequality in access to opportunities, some of which are determined at birth by race and ethnicity (Paes de Barros et al., 2009). Indigenous people and African descendants, for instance, continue to be substantially more likely to live in poverty than the overall population in many countries in the region. In Panama, for example, 80 percent of indigenous people are poor, while among the non-indigenous population, only 25 percent are poor. In Brazil, there is still a significant gap between the poverty rates for black people and white people at 18.3 percent and 8.4 percent, respectively (IDB, 2011).

Another remarkable result of this analysis is the lack of significant results for the African region, which has very high rates of homicide. Some countries in the sample, Nigeria and South Africa for instance, have homicide rates that exceed the threshold of one thousand combat-related deaths during a year that is the standard criterion for the definition of a civil war.

[27] During 1999-2002, the homicide rate for black people was estimated to be 17.8 per 100,000 people, a rate 10 times that of whites (1.8 per 100,000) and higher than the rates reported for American Indians/Alaska Natives (6.0 per 100,000), Asian/Pacific Islanders (2.9 per 100,000), and Hispanics (8.0 per 100,000)(Bernard et al., 2007).

However, the difference between homicide and civil war does not depend only on the number of deaths, but what is clearly different is the organization of killing: the perpetrators of homicide are usually individuals or small groups, whereas rebellion needs a cohesive group of at least several hundred killers (Collier and Hoeffler, 2004). There are several possible explanations for the lack of significant results from the homicide regressions for the African region. This could depend on the lack of representative data for the whole African Region, which includes only four countries, that are Nigeria, South Africa, Morocco and Egypt, and also on the quality of crime data because homicide trends are unclear in post-conflict countries.[28] Africa not only has the highest ethnic diversity, but also the highest incidence of civil war. "Ethnic conflicts in Nigeria and Africa, for instance, in general arise as a result of scarcity of political resources, multi-culturalism, religion, militarization of ethnicity, among others (Osinubi and Osinubi, 2006)".[29] Asecond possible reason is that the homicide rate probably surges in the early post-conflict years as a result of the war, and this, beyond other reasons, for a huge stock of guns possessed by the civilian population and for the psychological effect of a reduced inhibitions about settling people through violence. The increase in violence in South Africa, for instance, may also be related to the ending of civil wars in bordering countries (Collier and Hoeffler, 2004). In the short period analyzed in this study, homicides in Africa are probably unrelated to economic inequality and ethno-linguistic differences, as captured by the ethnic fractionalization index, normally the main determinants of low levels of social unrest, such as homicide. Results confirm the theory that certain ethnic population structures are more conducive to violence than others. Fractionalization represents an incitement to victimization whereas a society's degree of ethnic polarization may be the cause of rebellions and civil wars, such as high levels of violence in Africa, which are phenomena not considered in this analysis.

Column 1 of Table 4 contains the basic specification with the fractionalization, polarization and Gini indices. Column 2 uses the natural log of per capita gross domestic product (GDP) in constant dollars (lngdp) and adds (log) urban population. The analysis checks whether the assessment of ethnic diversity on homicide is driven by a specific region which might be considered more or less violent, in terms of homicides. With this aim, Column 3 introduces regional dummies variables indicating groups of countries according to geographical location (Latin America and Caribbean, Europe, Africa, Asia, and North America), which are thought to capture specific characteristics of the regions such as cultural, sociological, and historical factors. The elimination from the sample of countries belonging to Africa, Asia, and Europe, as shown in Columns 5-7, does not affect the statistical significance of ethnic fractionalization; however, in these cases, the final

[28] It is likely that during a civil war police records are incomplete, if only because part of the country is likely to be beyond official control (Collier and Hoeffler, 2004).

[29] The problem of land resources-territorial inhabitation as a factor in ethnic conflicts in Nigeria has become exacerbated since the 1990s when oil companies in the Niger Delta and other oil producing states, identified oil exploration activities (Tokunbo Simbowale Osinubi and Oladipupo Sunday Osinubi, 2006).

sample is smaller. In all cases, and with the inclusion of Latin American and North American regions in the analysis, the ethnic fractionalization index has a statistically significant effect on the incidence of homicide. Column 8 controls for different regional time trends and it confirms that the effect of ethnic fractionalization on homicides is robust also to the introduction of time trends.[30]

These results are consistent with ER (2011) and also with Sellin's (1938) culture conflict theory and Shaw and McKay's (1942) social disorganization theory. As specified by the background theory, highly fractionalized societies might be more prone to violence for the presence of opposing positions and interests, however the intensity of such conflict will be moderate, such as for the case of homicides, whereas in highly polarized societies, the occurrence of social conflict should be rare but its intensity very severe, such as for civil war in Africa (Esteban et al., 2012). Based on Table 4, in all specifications (in which the effect of Latin American and North American countries is present), the effect of ethnic fractionalization (which does not allow for different distances between languages) is robust, both in terms of magnitude and statistical significance (with the inclusion of Regional Dummy, in Column 3, ethnic fractionalization is significant only at the 10 percent level). Using the results in Column 2, for instance, a 1 percent point increase in the level of fractionalization is associated with a 2.3 percent increase in the homicide rates. As pointed out by Collier (2001), Montalvo-Querol (2005), and Esteban et al., (2012), ethnic diversity and fractionalization among a community could be an obstacle to coordination, which is required by groups of rebels in a situation of high-intensity social conflict. Therefore, fractionalization represents an incitement to victimization, whereas a society's degree of polarization may be the cause of rebellions and civil wars (Gardeazabal, 2011). If the focus is on the importance of including distances, neither polarization nor the Gini index have a significant impact on national homicide rates. These results provide, respectively, support for $H2$ and $H3$.

The presence of homicides is less likely if there is a high development level, captured by per capita gross domestic product (GDP) in constant dollars. From a theoretical perspective, income is maybe the most important variable in the models of social violence and crimes.[31] The negative impact of GDP on homicide rates suggests that the occurence of violent crime could be countercyclical and that stagnant economic activity leads to more intense violent criminal activity. The fact that this result holds for different specifications may indicate that an important fraction of homicides results from economically motivated crimes that become violent and lethal. The estimated coefficients for the GDP are always statistically significant at the 1 percent level (only in Column 7 is the significance lower). For homicides, the estimated coefficient implies that a 1 percentage point increase in the GDP is associated with a 48 percent decline in the homicide rate

[30] To this effect, regional dummies interacted with a time trend are introduced in the analysis.

[31] Fearon and Laitin (2003) used per capita income as a proxy for the financial, administrative, political capability, and the degree of penetration of the central government. Collier and Hoeffer (2004) think of the growth of income per capita as a proxy for new income opportunities.

in the short run (Column 2). Thus, economic activity, using GDP as a proxy, has a larger impact on homicides, as predicted by $H4$.

According to the literature (Cole and Gramajo, 2009) and to $H5$, demographic factors can contribute to the intensity of violent criminal activity. Specifically, a large degree of urbanization can encourage the development of social interactions between criminals and would-be criminals, thus decreasing the costs of committing crimes and leading to a higher incidence of them.[32] After controlling for basic economic conditions and for the level of ethnic population heterogeneity, a higher degree of urbanization is associated with higher homicide rates, which confirms the view that this type of violent crimes is more an urban phenomenon in this analysis. Big cities represent a possible risk area for homicides.

Table 5 analyzes variations of the model in order to examine the robustness of the baseline in Table 4. Column 1 considers the case in which the fractionalization variable interacts with the regional dummies in determining homicide. Column 2 introduces a measure of (net) income inequality, the Gini index, as provided by the Standardized World Income Inequality Database (SWIID).[33] This is a very important hypothesis to test because, as our background theory supports, the impact of fractionalization increases with the private and economic component of social conflict. Even if the ER model has not explicitly considered income disparity indices (such as the Gini index for income distributions), this analysis uses the Gini index in order to check if homicide rates, across countries and over time, are driven by income differences.[34] Note that in the econometric specification, the Gini coefficient control variables are included as one year lags in order to minimize potential endogeneity problems, since the association between income inequality and homicide could suffer from reverse "causation" but also to allow for time lags in the effect.[35] Table 5 (Column 4) considers the case in which the Gini index interacts with the regional dummies for Latin America and the Caribbean, Europe, Africa, Asia, and North America in determining homicides, with Oceania as the reference group for the regional dummies. Undertaking a comparative analysis across countries with the consideration of the interactions between economic inequality and regional dummies allows us to isolate previously unremarked consistencies and to better recognize the nature of intergroup disparity. The effect of economic inequality correlated with regional dummies on homicides is present in the Latin American and North America regions, in respect to Oceania, and it does not look similar across the other regions

[32] See Glaeser, Sacerdote, and Scheinkman (1996); Glaeser and Sacerdote (1999a).

[33] See http://www.siu.edu/fsolt.

[34] It is commonly assumed that income inequality and crimes (especially violent crimes) are positively correlated (Burdett et al., 1999; Imrohoroglu et al., 2000, 2001; Fajnzylber et al., 2002; Burdett and Mortensen, 1998; Grogger, 1998.

[35] The analysis also deals with the endogeneity problem more appropriately using an instrumental variable approach. The technique aims to isolate the pure impact of income inequality on homicides by using instrumental variables which are correlated with the Gini index and which have no impact on homicides. The instrument used is the distance of a country from the equator (referred to as latitude). Such estimates (results are not shown but available upon request) are very similar to those shown in Column 2 of Table 5.

in the analysis. There are not significant results for Europe, with similar ethnic fractionaliza- tion indices to those of the reference group, Asia and Africa. These results suggest that the assessment of economic diversity on homicides is driven by data of two regions, once again, Latin America and North America. Even if over the last decade, Latin America and the Caribbean has made progress in reducing inequality and in improving social outcomes, Latin America is still the most unequal region in the world (IDB, 2011). As mentioned above, much of the inequality in the region is associated with the inequality of opportunities and an important proportion of the inequality in incomes that is observed is determined by characteristics such as race or place of birth. Income inequality has serious social costs for Latin America and the Caribbean, and it seems to increase homicides in the region. By considering the OECD countries, the latest trends in the 2000s showed an increasing gap between rich and poor, especially for the United States (Daly and Valletta, 2006; Schwartz, 2010). The resulting inequality for the United States inevitably impacts economic performance as a whole and also raises political challenges because it breeds social resentment and generates social instability (OECD, 2011).

Even if income inequality and ethnic heterogeneity are two different phenomena, much of the economic inequality that is observed could be determined by ethnic inequality; and it is possible that ethnic heterogeneity intensifies income inequality among dissimilar ethnic groups. By the inclusion of the Gini index by regions, these findings support the conclusion that private and economic components of homicides are generally present in the regressions and that disputes over private goods could be an important feature of homicide rates, especially for countries in Latin American and North American regions. What matters for homicide are also the economic differences between groups coexisting in the same country.

4.1 Robustness Checks

Table 6 summarizes alternative estimation models. The empirical section includes a panel of countries; a robustness check is now performed by running the regressions in a cross section. Column 2 presents estimates obtained in a cross-sectional regression just for the year 1995, Columns 3-4 present the results for a cross-sectional analysis respectively for the years 1995 and 1998, in which the homicide rates are expressed as the average over the period 1995-2007. Column 5 presents the results of regressions by using random effects. Once again, the results are robust to the use of different specification models. The homicide regressions indicate that per capita GDP, the degree of ethnic divisions, as measured by the fractionalization index, and the degree of urbanization, are significant determinants of national homicide rates.

5 Discussions and Conclusions

The purpose of this analysis was to test the impact of three different dimensions of population heterogeneity on national homicide rates. Using Esteban and Ray (2011) as a theoretical back-

-ground, this paper links homicide rates to a linear combination of ethnic polarization, ethnic fractionalization and the Greenberg-Gini index of inter-group differences. Ethnic linguistic fractionalization has a significant and positive effect on the incidence of homicides across 70 countries, for the period 1995-2007, and across a number of different specifications. As specified by the theory, highly fractionalized societies might be more prone to violence, but the intensity of such conflict will be moderate, expressed as violent crimes and homicides, while in highly polarized societies, the occurrence of social conflict should be rare, but its intensity very severe, as in the case of civil war (Esteban et al., 2012). The results of this analysis suggest that certain ethnic structures are more conducive to homicides than others. In particular, the degree of ethnic fractionalization of the population increases the likelihood of homicides for the presence of opposing positions and interests. These findings also suggest that private and economic components of homicides are generally present in the regressions and that disputes over private goods are an important feature of homicide rates as specified by the theory of Esteban and Ray (2011). What matters for homicides are also the economic differences between groups coexisting in the same country. The outcomes of the present regression analyses are also consistent both with Sellin's (1938) cultural conflict theory and Shaw and McKay's (1942) social disorganization theory by confirming that ethnic inequality is one of the most robust predictors of homicide rates in cross-national research. The results extend to the use of different regional dummies and samples of countries, to the inclusion of overall or regional time trends and across a number of different estimation models. However, investigations reveal that the assessment of ethnic diversity and economic inequality on homicides is driven by data of two specific regions, namely Latin America and North America.

Homicides decrease when economic development improves. GDP per capita, the proxy for economic development, has a significant and negative impact on national homicide rates. The result is consistent with many previous cross-national studies (Avison and Loring, 1986; Hansmann and Quigley, 1982; Neapolitan, 1994). The degree of urbanization in a country is also related to homicide rates with a significant effect. Urbanization has a significant repercussion on homicide rates. These results have failed to support a group of researchers' proposition that advanced urbanization is related to low homicide rates (Eisner, 2001; Whitt, 2010), however, they support Cole and Gramajo's (2009) results, according to whom, urbanization may be associated with a high rate of homicide and that it may be due to the fact that poor economic conditions are common problems in a city and they lead to intense competitions for limited resources.

By putting forward the idea that intentional homicides are linked to three distinct dimensions of ethnic division, this analysis provides a completely alternative view of the determinants of homicides, contributing therefore to the existing analysis of the determinants of violent crimes and their relationship with ethnic cleavages. What is remarkable about these results is the analysis of the simultaneous effect of three ethnic distributional measures on homicide rates as they appear

in the theoretical model of Esteban and Ray (2011). One of the important implications of the current study for future cross-studies is that population heterogeneity has an aggravating, positevely correlated influence on homicide rates. Given the results of this research, it is apparent that a harmonious relationship among different ethnic and economic groups is an important component in the reduction of homicides.

6 References

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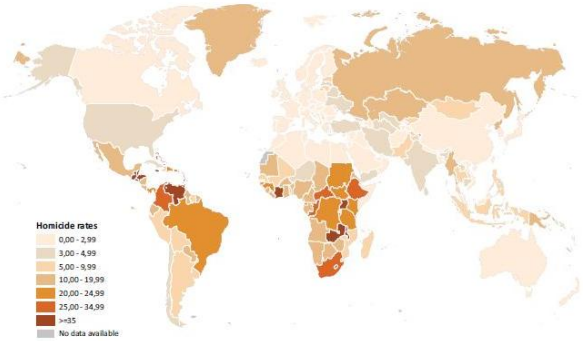
7 Appendix

7.1 Homicides: data sources and data quality

The analysis presented in this study are based on the dataset UNODC Homicide Statistics 2011, which was created by collecting data on intentional homicide at national and international level from two sources: criminal justice and public health records. These two sources have different perspectives: the main goal of the former is to detect whether and how a crime was committed; that of the latter is to classify the factors that caused the death of an individual. Criminal justice officers tend to use all available information from the crime scene (witness testimony, the surrounding context of a violent death). In contrast, public health system classification requires that certifying physicians, from the medical evidence before them, correctly judge if another person inflicted the injury and whether the culprit intended to kill the victim. Homicide tends to be recorded effectively by criminal justice institutions and thus police homicide data are relatively accurate in comparison to that of other crime types, for which the "dark figure" (number of unreported crimes) tends to be higher.

UNODC Homicide Statistics 2011 include criminal justice data for 177, representing 86 per cent of the 207 countries. These data were provided to UNODC by Member States through established reporting procedures, or were made publicly available by institutions such as na- tional police forces, ministries of justice or the interior, or by national statistical offices. Many of those countries where criminal justice homicide data are not reported at international level are in Africa or the Pacific islands. When criminal justice data were unavailable, public health data on homicide levels were used as the preferred country source.

Figure 3: Homicide rates by country (2010 or latest available year)



Source: UNODC Homicide Statistics

Table 2: EU member states: population by size and official state language

Country	Population (in millions)	Official language(s)
Germany	82,5	German
France	60,9	French
United Kingdom	60,4	English
Italy	58,8	Italian
Spain	43,8	Spanish
Poland	38,1	Polish
Romania	21,6	Romanian
The Netherlands	16,3	Dutch
Greece	11,1	Greek
Portugal	10,6	Portuguese
Belgium	10,5	Dutch, French, German
Czech Republic	10,3	Czech
Hungary	10,1	Hungarian
Sweden	9,0	Swedish
Austria	8,3	German
Bulgaria	7,7	Bulgarian
Denmark	5,4	Danish
Slovakia	5,4	Slovak
Finland	5,3	Finnish, Swedish
Ireland	4,2	Irish, English
Lithuania	3,4	Lithuanian
Latvia	2,3	Latvian
Slovenia	2,0	Slovenian
Estonia	1,3	Estonian
Cyprus	0,8	Greek, Turkish
Luxembourg	0,5	Luxemburgish, French,German
Malta	0,4	Maltese, English

Source: Extra and Gorter (2008)

Table 3: Correlation Matrix

	Fra	Pola	Gini	Gini(Solt)
Fract.	1.0000			
Pola.	0.2746	1.0000		
Gini	0.1778	0.4636	1.0000	
Ineq.	0.4700	0.1784	0.0072	1.0000

Table 4: Homicide rates: Regional and Time effect

VARIABLES	1	2	3	4	5	6	7	8
Fractio.	3.348***	2.364***	1.374*		2.338***	2.280**	2.959***	1.383*
	(0.763)	(0.786)	(0.760)	(1.410)	(0.749)	(0.879)	(1.088)	(0.768)
Fra*L.America				3.424***				
				(0.563)				
Fra*Africa				0.768				
				(2.057)				
Fra*Asia				0.201				
				(0.738)				
Fra*Europe				1.076				
				(0.795)				
Fra*N.America				2.730**				
				(1.241)				
Polari.	-0.403	-2.475	-1.361	-1.661	-1.898	-2.583	-2.555	-1.016
	(2.981)	(3.372)	(2.459)	(2.687)	(3.042)	(3.511)	(3.590)	(2.418)
Gini	1.124	2.087	1.541	2.070	0.723	2.524	-0.259	1.445
	(2.122)	(2.315)	(2.715)	(2.879)	(2.139)	(2.689)	(3.594)	(2.577)
lngdp		-0.480***	-0.481***	-0.522***	-0.546***	-0.572***	-0.278*	-0.470***
		(0.116)	(0.0790)	(0.0937)	(0.110)	(0.148)	(0.152)	(0.0774)
lnUrbanPop		0.781*	0.410*	0.656***	0.679*	0.646	0.639	0.370*
		(0.431)	(0.207)	(0.232)	(0.403)	(0.472)	(0.381)	(0.203)
Constant	0.436**	1.658	3.451***	2.601**	2.709*	3.158	0.517	3.317***
	(0.204)	(1.601)	(1.271)	(1.224)	(1.523)	(2.460)	(1.716)	(1.065)
Reg/Time Dummy	none	none	Reg.Dum.	Reg.Dum	no Afr.	no Asia	No Eur.	TimeTrend
Observations	335	323	323	323	310	268	178	323
Countries	69	66	66	66	63	53	38	66
R-squared	0.326	0.470	0.671	0.612	0.547	0.489	0.308	0.673

Robust standard errors in parentheses, clustered by country

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Homicide rates: two way interactions, fractionalization and income inequality

VARIABLES	1	2	3	4
Fractio.		1.518*		1.319
		(0.764)		(0.843)
Polari.	-1.661	-2.387	-1.825	-0.853
	(2.687)	(2.755)	(2.477)	(2.531)
Gini	2.070	2.949	1.704	1.630
	(2.879)	(2.108)	(2.335)	(2.492)
lngdp	-0.522***	-0.306**	-0.370**	-0.472***
	(0.0937)	(0.145)	(0.151)	(0.0976)
lnUrbanPop	0.656***	0.618	0.508*	0.466**
	(0.232)	(0.379)	(0.263)	(0.228)
Fra*L.America	3.424***		2.544***	
	(0.563)		(0.750)	
Fra*Africa	0.768		0.111	
	(2.057)		(1.862)	
Fra*Asia	0.201		0.347	
	(0.738)		(0.785)	
Fra*Europe	1.076		1.753	
	(0.795)		(1.132)	
Fra*N.America	2.730**		2.429***	
	(1.241)		(0.903)	
Ineq.		2.093***	1.560*	
		(0.566)	(0.817)	
Ineq*L.America				0.410***
				(0.106)
Ineq*Africa				-0.119
				(0.318)
Ineq*Asia				0.00383
				(0.111)
Ineq*Europe				0.139
				(0.107)
Ineq*N.America				0.313*
				(0.172)
Constant	2.601**	-6.445**	-3.613	2.434
	(1.224)	(2.694)	(3.574)	(1.475)
Observations	323	235	235	235
R-squared	0.612	0.573	0.634	0.674

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Homicide rates: different specifications

VARIABLES	1	2	3	4	5
Fractio.	2.364***	1.648*	1.663*	1.623*	1.600**
	(0.786)	(0.935)	(0.837)	(0.835)	(0.691)
Polari.	-2.475	-1.469	-0.996	-1.171	-3.220
	(3.372)	(3.129)	(3.426)	(3.452)	(3.668)
Gini	2.087	1.868	2.169	2.489	3.865
	(2.315)	(2.558)	(2.167)	(2.122)	(4.217)
Lngdp	-0.480***	-0.460***	-0.365***	-0.386***	-0.729***
	(0.116)	(0.111)	(0.115)	(0.120)	(0.0971)
Urban pop	0.781*	0.173	0.293	0.361	1.671***
	(0.431)	(0.331)	(0.424)	(0.461)	(0.356)
Constant	1.658	4.251**	2.659*	2.596	0.284
	(1.601)	(1.605)	(1.496)	(1.566)	(1.251)
Observations	323	58	73	73	323
Countries	66	58	73	73	66
R-squared	0.470	0.393	0.294	0.302	-

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Estimating the impact of Mexican drug cartels on crime

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Abstract

We estimate the impact of drug cartels and drug-related homicides on crime and security perceptions in Mexico. For this purpose, we combine surveys on crime victimization with indicators of where drug cartels operate with and without drug-related homicides. Using the difference-in-difference estimator, we find that people living in areas that experienced drug-related homicides are more likely to take extra precautions to guard their security, yet these areas also more likely to experience some crimes, particularly thefts and extortions. In contrast, these crimes and perceptions of unsafety do not change in areas where cartels operate without leading to drug-related homicides.

Keywords: Crime, difference-in-difference, instrumental variables, Mexico

JEL Classifications: K49, O170, R59, C26

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1. Introduction

As the new millennium approached, Mexican drug cartels started suddenly fighting for territory, leading to the death of 63,000 people between 2006 and 2012 (SNSP, 2011; Molzahn et al., 2013). In parallel to this unprecedented wave of drug-related homicides, crime in Mexico also rose, directly affecting about 14 percent of households.[1] Not surprisingly, the majority of the Mexican population (77%) identifies drug-cartel violence and crime as the country's most important problems.[2]

This paper contributes to the existing debates on the socio-economic impact of drug cartels by identifying to what extent crime and perceptions of unsafety have changed in areas where drug cartels operate with and without turf conflict leading to drug-related homicides. The literature has so far found consistent evidence that poverty, unemployment rates and migration outflows have increased in areas that have experienced drug-related homicides (Dell, 2011; BenYishay and Pearlman, 2013; Robles et al., 2013; Gutiérrez-Romero and Oviedo, 2014; Ríos, 2014b). These previous studies argue that the violent environment, along with the increase of thefts and extortions of local populations, could potentially be driving these results. However, up to date there is no evidence of the extent to which these crimes increased as a direct result of drug cartels operating in certain areas, or as a result of cartels battling for turf, which potentially could have induced these cartels to tax local populations to fund their ongoing conflict. Our aim in this paper is to bridge this gap. We also contribute to the literature by assessing to what extent people living in areas where drug cartels operate (with and without drug-related homicides) changed their perceptions of unsafety and took action to prevent being victims of crime.

To answer our research questions we use the nationally representative crime victimization survey *Encuesta Nacional Sobre Inseguridad* (ENSI) conducted in 2005 and 2010. This survey provides information about respondents' perceptions on unsafety and the crimes they have experienced, including those that were not officially reported. To identify where drug cartels have operated with and without drug-related homicides at municipality level we use the data collected by

[1] Own estimates using the national survey on unsafety (ENSI) 2010.

[2] http://www.pewglobal.org/2011/08/31/crime-and-drug cartels-top-concerns-in-mexico

Gutiérrez-Romero and Oviedo (2014), who monitored official records, media reports and specialized blogs from 2000 until 2010. We also use the official statistics on drug-related homicides which give account of the location and number of people who died as a direct result of the confrontation among cartels (90%) and those with the state authority, available only from December 2006 until September 2011 (SNSP, 2011).

We use the difference-in-difference estimator in order to build the counterfactual of what would have happened to the crime rates and perceptions of unsafety had the cartels and their associated homicides not existed. We estimate separately two types of impacts.

First, to assess the impact of drug cartels operating 'peacefully' we focus only on areas that have not had drug-related homicides at any point during the period 2000-2010. Among these areas free-of drug-related homicides we estimate the change in outcomes in municipalities before they had any cartels operating (2000-2005) and after cartels settled in these areas (in 2006 or afterwards). That change in outcomes is compared to the one experienced in areas that did not have cartels or drug-related homicides over the same periods.

Second, we separately estimate the impact of drug-related homicides. For this purpose, we estimate the change in outcomes in municipalities before they had any drug-related homicides (2000-2005) and after they experienced drug-related homicides in these areas for the first time (in 2006 or afterwards). That change in outcomes is compared to the one experienced in areas that did not have drug-related homicides at any point over the same periods.

The presence of drug cartels and their related homicides is by no means randomly allocated. Thus, a simple comparison in outcomes between respondents living in municipalities where cartels operate and those used as control group are likely to over- or under- estimate the impact of drug cartels and their associated violence. To address the potential endogeneity of where cartels chose to operate peacefully and not we combine the difference-in-difference estimator with instrumental variables. We use as instrumental variable whether the municipality shared the same ruling party as its corresponding state government. This kind of political decentralization has been shown in previous research to be strongly correlated with the probability of municipalities experiencing drug cartels and drug-related homicides, and has also been used as an instrument to deal with the endogeneity of drug-related

activities in Mexico (Ríos, 2012; Gutiérrez-Romero and Oviedo, 2014; Ríos, 2014a). We also interact the variable decentralization with a dummy variable denoting the period during which both the Mexican and the Colombian governments changed their strategy to combat drug cartels (in 2006 and afterwards). These policies, called 'war on drugs', are also regarded as key contributors to the Mexican drug-related casualties (Dell, 2011; Guerrero-Gutiérrez, 2011a; Castillo et al., 2012; Lessing, 2012; Osorio, 2012; Robles et al., 2013).

Our results reveal a contrasting picture as to where crime, and perceptions of unsafety, change. On the one hand, people living in areas where cartels are battling for turf (with evidence of drug-related homicides) feel more unsafe and take additional precautions to guard their security. Despite these extra precautions, these areas are still more likely to experience certain types of crimes, particularly thefts and extortions. On the other hand, these crimes and the perceptions of unsafety do not change in areas where cartels operate without drug-related homicides. Thus, our findings deepen the understanding as to when cartels' drug-trafficking activities lead to other crimes and some of the consequences on the local population.

The paper continues as follows. Section 2 describes the reasons behind the conflict among Mexican cartels, its potential links to crime, and presents a sequential game illustrating this link. Section 3 presents the data used. Section 4 shows the impact of drug cartels and drug-related homicides on crime and perceptions of unsafety. Section 5 concludes.

2. Crime and war on drugs

It is well known that drug cartels had operated in Mexico for several decades without leading to major scale of violence. The peaceful coexistence among cartels was kept thanks to an unwritten pact criminal organizations had with some members of the 70-year ruling party, the Institutional Revolutionary Party (PRI) (Astorga and Shirk, 2011). In exchange for bribes, these agreements allowed cartels to operate in certain areas, known as *plazas*, as long as cartels kept a low profile, meaning that no violence, crime or drug-selling were targeted towards the local population (Campbell, 2009; Guerrero-Gutiérrez, 2011a). The strong hegemony that the PRI had across all spheres of government, allowed the party to effectively punish cartels that violated these agreements with arrests

or killing of their leaders, without ever leading to a violent retaliation from cartels (Ríos, 2012). Why then, did the drug-related violence surge and spread across the country in recent years?

In 2000 the PRI lost for the first time the presidential election to the National Action Party (PAN), as well as several other local and state elections. As the hegemony of the PRI weakened, cartels suddenly started fighting for territory. It is estimated that 6,680 people got killed, mostly cartel members, between 2000 and 2005 (Ríos and Shrik, 2011). An even higher wave of drug-related homicides followed soon after the controversial victory of Felipe Calderón (backed by PAN) in the presidential elections of 2006. Calderón won amid allegations of rigging. So, in order to regain credibility, some argue, Calderón launched a new strategy against drug cartels (Ravelo, 2012). Calderón's administration soon after taking office dispatched the army to combat cartels in their strongholds and arrested more drug cartel leaders than ever before (Guerrero-Gutiérrez, 2011a). Dell (2011) using regression discontinuity finds that PAN Mayors were more likely to request enforcement assistance against cartels from the federal government than Mayors from other parties, thereby increasing crackdowns against cartels. These crackdowns although temporarily beheaded criminal organizations, divided them into smaller factions leading to violent confrontations among each other.[3]

In parallel to Calderón's policies, Colombia also intensified indictments of drug shipments and destruction of drug processing labs, which induced cartels to shift their operations towards Mexico (Castillo et al., 2012). These cartels positioned themselves particularly in areas well connected and in close proximity to the north-border or pacific coast where they could transport drug-shipments which fuelled even more violence as they disputed *plazas* where other cartels already operated.

The 'war on drugs' policies implemented, in both Colombia and Mexico, triggered unprecedented levels of violence thanks to another change in Mexican politics. Singe the beginning of the new millennium, more local areas for the first time had a different ruling party than their respective state and federal governments. This political decentralization, meant that the informal agreements that drug cartels had with some politicians and local police were more difficult to coordinate and honor as PAN and new parties lacked the connections or ability to enforce previously established agreements

[3] While in 2005 there were six major drug cartels, by 2010, there were 16 (Guerrero-Gutiérrez, 2011a).

with cartels (Snyder and Duran-Martinez 2009; Ríos, 2012; Ríos 2014a). So cartels started fighting among themselves to retain the control over their *plazas*.

In sum, drug cartels in Mexico have operated under two types of regimes, each reaching very different results. Under what we define as the 'hegemonic' regime, the one that prevailed under the 70-year ruling PRI, cartels reached agreements with some members of the local and state authority leading to a peaceful coexistence of cartels in exchange for bribes and as long as cartels followed set rules of conduct. Under the more recently implemented 'decentralized' regime, there could be coordination failures within the local and state-authority. Thus, previous agreements between some members of the authority allowing cartels to operate in an area are more difficult to reach and honor. The fragility of these agreements has led to cartels fighting for turf and ignoring any previously established rules of conduct.

Under both types of regime, the main profits from drug cartels are likely to be derived from drug-trafficking, otherwise they would switch activity altogether. Nonetheless, cartels might have different incentives to combine their core activity of drug-trafficking with other criminal activities depending upon the rewards and penalties they might face.

In the hegemonic regime, the corrupt institutions that allow the operation of these cartels might increase the perception of unsafety, especially if the presence of these cartels leads to more crime. Crime could for instance increase if drugs become more readily available in these areas. The international evidence however, shows a mixed correlation between drug availability, drug dependency and crime. Whilst studies looking at the prevalence of drug-consumption among prisoners have found a positive correlation, this does not necessarily prove there is a causal relationship between drug use and crime (OID, 2012). Other studies looking at the drug-consumption among the general population have not found a consistent positive correlation between drugs and crime.[4] However,

[4] For instance, Washington D.C. has a murder rate that is five times higher than the one in New York City, and also higher rates of forcible rape, robbery, aggravated assault, burglary and motor vehicle theft (MPDC, 2011; FBI, 2013). Nonetheless, these two cities have the same prevalence of crack users, and heroin use is actually lower in Washington D.C. than in New York City (Stevens and Bewley-Taylor, 2009: 4).

studies specifically conducted for areas dedicated to drug-production -as is the case now in Mexico- show that there might be a stronger link between drug production and criminality. For instance, Mejia and Restrepo (2013) find that in Colombia cocaine production activities explain 36% of homicide rates, 66% of forced displacement rates and 43% of the attacks by illegal armed groups. Hence it is uncertain, whether, and if so to what extent, crime could increase in areas where cartels maintain the monopoly of a *plaza* to traffic drugs relatively freely.

Previous research has shown that the probability of dealing cocaine within Mexico actually increases when municipal and state governments are ruled by different political parties (Ríos, 2014b). Thus, we would expect that if indeed drug availability increases crime, it will do so even more under the decentralized case. There are other reasons why cartels' drug-trafficking activities could lead to more crime under the 'decentralized' regime. Although cartels might still bribe some members of the authority to be given *plazas*, these might not be tenable in the long-run due to the coordination failures. For instance, a cartel might get protection from some members of the local authority but not from the state authority. Since the monopoly of the plaza is no longer guaranteed other cartels might intend to take over, triggering a turf war among cartels, and perhaps with the authority in retaliation for not allowing them to operate freely.[5] Mexican cartels as a result, have resorted to hiring militias, usually deserters of the police or army, local gangs and former prisoners. Since the hiring of these armed groups and fighting is not a cheap strategy, the increase of criminality in some areas could be the result of cartels extorting civilians to fund cartels' ongoing battles.

Under the decentralized regime, as the probability of cartels being chased and arrested increases, so does the temporary beheading of these groups. When a criminal organization loses its leader, its ability to control all the members working directly or indirectly for the cartel might also be weakened. Thus, the specialized "cells" hired to provide protection to the cartel may become free to pursue their own criminal objectives, disobeying any internal rules of conduct the cartel might have established to avoid attracting unwanted attention from the authority.

[5] For instance, Castillo et al. (2012) find that there are more drug-related homicides in Mexican municipalities that have two or more cartels.

The so called legitimization-habituation hypothesis in the criminology literature can also explain why crime could have increased as a result of drug cartels experiencing conflict. This hypothesis suggests that the violence generated by high density conflict devaluates human life, legitimizing violence (Archer and Gartner, 1984). This is one of the reasons why crime rates increase in countries after suffering violent conflicts and terrorist acts (Archer and Gartner, 1984; Landau and Pfeffermann, 1988). Anthropological studies in Mexico have shown that the increasing presence of drug traffickers in some areas has contributed towards the habituation of the narco-culture (Trabajo de campo en tiempos violentos, 2011). Profits from drug-trafficking are flaunted as a source of pride and status. As illegal activities become a way of life in the areas affected by drug-trafficking, the value that people place in earning a living from legitimate sources could be reduced, incentivizing some towards committing other types of crimes.

2.1 A simple sequential game

We summarize our theoretical discussion on the impact of drug cartels and drug-related homicides on crime using a sequential game.

Assume we have two types of players, a local authority a_r and organized drug cartels, o_r which can be operating under two types of regimes $r \{1,2\}$. In the first of these regimes, the local authority is decentralized, meaning that it does not share the same ruling party as a higher up state government. In the second type of regime, a coordinated regime, the local authority shares the same ruling party as the state government.

In the first stage of the game, nature decides the regime r of the local authority and that becomes common knowledge to all players. In the second stage of the game, cartels will bribe the local authority some positive amount, β, in exchange for permission to operate in the area trafficking drugs, which render cartels an income of $\tau > 0$, discounting the bribe given.[6]

[6] According to official estimates, about 60 per cent of the Mexican police force is under cartels' payroll, costing cartels more than a billion dollars annually to bribe just the local police (Keefe, 2012; Salinas de Gortari, 2012).

Since drug-trafficking is officially illegal, the authority will grant the permission to the cartels to operate in exchange for the bribe β, under the condition that the cartel commits no crimes, which could render cartels an extra source of revenue ε, where $\varepsilon<\tau$.

Under the coordinated regime, the local authority has the prerogative to seize drugs from time to time in order to keep the impression of abiding by the rule of law to the general population. The authority pays for this signal of law abiding a cost $c>0$. In case the cartel disobeys the rules of conduct, and commits crime in the areas which we assume there is perfect information on such violations, the cartel will be charged a penalty of $\pi>0$, which can be imposed by either arresting the cartel's leader or expropriating its property.

Under the decentralized regime, the local authority also needs to keep the impression of abiding by the rule of law to the population and will also pay for these signals a positive cost d, where $c \leq d$.

If the authority is decentralized it can no longer guarantee that the cartel's activities will not be found out by the state authority, so cartels face the risk of paying a penalty π with a probability, p, regardless of whether they follow the rules of conduct of the local authority or not.

Given the coordination failures in the decentralized regime, the local authority cannot guarantee the protection of the cartel from potential rival cartels wanting to operate in the area. Hence, cartels working under the decentralized regime will have to invest an amount v, to secure themselves from potential challengers.

In Figure 1 we illustrate the potential payoffs to the authority and cartels under the two types of regimes. The dominant strategy in the coordinated regime will be that cartels follow the rules of conduct and do not commit crimes if the penalty is high enough, $\varepsilon<\pi$. In the decentralized regime the dominant strategy will be for cartels to combine their drug activities with committing other crimes, since that extra income from extorting the population, ε, can cover their expenses on hiring services to protect themselves from potential transgressions v and in case they have to pay a penalty π.

In this game we have depicted the actions that cartels might take under different regimes. Citizens as a result might also change their behavior, taking more security precautions in areas where

crime is increasing, which as a result might reduce or level crime rates. Proponents of the cohesion hypothesis argue that external threats may increase social cohesion within society, thereby leading to a reduction of other internal conflicts like crime (Simmel, 1955; Coser, 1956). External threats might induce people to contribute more towards the group's welfare, such as by investing more time, effort and sharing resources (Bornstein, 2003). In the case of Mexico some vigilante groups have emerged in areas most affected by drug-related homicides. However, some of these vigilante groups have resorted to arming themselves and have themselves become organized criminal groups. That is the case with the *La Familia* movement in Michoacán, which started as a vigilante group and later on became a fierce drug cartel.

3. Victimization survey and drug cartels activity data

To estimate the impact of drug cartels and their associated homicides on crime we use the nationally representative crime victimization survey *Encuesta Nacional Sobre Inseguridad* (ENSI) conducted in 2005 and 2010 by the *Instituto Ciudadano de Estudios sobre la Inseguridad* (ICESI) and the National Institute of Statistics and Geography (INEGI). The ENSI in each of these years drew a new, but still comparable and nationally representative sample of the adult population aged 18 or older across the 32 Mexican States. Specifically, 57,398 people were interviewed in 2005 and other 60,461 in 2010.

Respondent's characteristics remained similar over time, in terms of their age, gender and occupation (Table A.1 in appendix). The percentage of respondents that stated a member of their household had been a victim of crime increased from 10.3% in 2005 to nearly 14% in 2010 (Table A.1).

The survey identifies who had been a victim of crimes by asking "*Over last year, were you victim of a crime*?" Those who answered positively, were then asked the following open-ended question: "*Which crime(s) was that?",* followed by "*In which state and municipality did this crime occur?*" The survey segments the responses on crime victimization in 12 categories: car theft, theft of car accessories, house burglary, mugging, kidnapping, lesions, sexual crime, fraud, extortion, other kind of thefts and other kinds of crimes. Table A.2 shows the frequency with which each of the major crimes was reported. Car theft, theft of car's accessories, mugging, extortions, fraud and other thefts

all increased from 2005 to 2010. Among the major crimes analyzed, only house burglary, lesions and sexual crimes dropped across the country. It is worth noting that only 41 kidnappings were reported in 2005 and also in 2010. This small number contrasts with the official statistics available at state level, which suggest kidnappings significantly increased across the country for the period of our analysis (Saldierna, 2010). The reason for this apparent contradiction might be due to the fact that the ENSI survey asks respondents themselves whether they were the victims of kidnapping. Given the low rate of kidnapping liberations, a very different statistic would have been obtained if instead respondents had been asked if a family member was kidnapped.

The survey also asks respondents about their perceptions on unsafety and actions taken to guard against crimes. Table A.3 shows that the percentage of respondents that believes crime in their municipality increased went up from 41% in 2005 to 55% in 2010. The percentage of respondents that do not trust the local police increased from an already high figure of 77% in 2005 to 90% in 2010.

3.1 Drug cartels activity data

To identify the impact of cartels and their associated homicides on crime and perceptions we combine the ENSI survey data with indicators on which municipalities have experienced drug cartels and drug-related homicides.

There are no official statistics on where drug cartels operate. Thus, we use the data collected by Gutiérrez-Romero and Oviedo (2014). These authors identified where cartels operated at municipality level by monitoring police reports, national and international media and specialized blogs during 2000-2010. [7]

To identify which municipalities have experienced drug-related homicides we use two data sources. Given that there are no official statistics on drug-related homicides for the period 2000-2005 we also use the data above collected by Gutiérrez-Romero and Oviedo (2014). For the period 2006-

[7] Coscia and Ríos (2012) have estimated the location as where drug-cartels operate at municipality level using an automated online search algorithm. To the best of our knowledge, these authors have not made public their database.

2010 we use the official data on the number of casualties attributed directly to the drug-related conflict among cartels and the state-authority provided at municipality level and on a daily basis (SNSP, 2011). Gutiérrez-Romero and Oviedo (2014) find that for the period during which there are official statistics, 63 municipalities experienced drug-related homicides attributed to confrontations among cartels or with the state authority in the media but were not recorded in the official statistics. From these 63 municipalities only 19 were sampled in the ENSI survey. We eliminate these 19 areas with conflicting information from our analysis to minimize a potential contamination of our control groups, as well as in order to keep a consistent definition of treatment for the post-treatment period (2006-2010).

3.2 Selection of treatment and control groups

We focus on estimating the impact of drug cartels operating in municipalities for the first time in 2006 or afterwards, and separately the impact in municipalities experiencing drug-related homicides for the first time in 2006 or afterwards.

A caveat of our chosen periods of focus is that we exclude from our analysis areas that have experienced drug cartels or drug-related violence previous to 2006. Nonetheless, we gain in precision by being able to separately estimate the impact of cartels and their violence for a period in which many drug cartels spread their activities and killings to new areas across the country.

The ENSI in 2005 and 2010 sampled 1,029 out of the 2,456 municipalities in the country. From these sampled municipalities we exclude all respondents interviewed in 195 municipalities for having experienced drug-related homicides during 2000-2005, and another 19 municipalities for having experienced drug-related homicides during 2006-2010 according to the media, but not in the official statistics. In Figure 2 we show in a map the municipalities (202) we exclude from our analysis, and those (827) that remained in our analysis (shown in black in the map).

We further split the municipalities surveyed in ENSI into two types of treatments, each with its respective control group. In table A.1 we show the number of respondents in each of the municipalities used as treatment and control groups.

Impact of drug-related homicides: treatment and control groups

Figure 3 shows the treatment and control groups used to measure the impact of drug-related homicides. The figure shows the 507 treated municipalities which experienced *for the first time* at least one drug-related homicide during 2006-2010, according to official records (and that at no point during 2000-2005 experienced drug-related homicides). The control group, shown in the darkest color, is composed by the 39 sampled municipalities that did not experience any drug-related homicides at any point during 2000-2010.

In Figure 3 we also show the treated municipalities that are in the top 10 decile according to their drug-related homicides rate per 100,000 inhabitants over 2006-2010. These areas have a considerably higher drug-related homicide rate (227.8 killings per 100,000 inhabitants) than the rest of the treated municipalities (25.5 killings per 100,000 inhabitants).

Impact of drug cartels: treatment and control groups

Figure 4 shows the treatment and control groups used to measure the impact of drug cartels. In the lighter color we show the 43 treated municipalities that experienced *for the first time* drug cartels operating in their areas during the period 2006-2010, but that at no point during 2000-2010 experienced drug-related homicides. Only one of these treated municipalities has two cartels operating simultaneously in the area. The rest (42) of these treated municipalities have only one cartel operating. Also in Figure 3, in black color, we show the location of the 271 municipalities used as a control group, which did not experience drug cartels or drug-related homicides during 2000-2010.

4. Impact of drug cartels and drug-related homicides

In this section we estimate the impact of drug cartels and separately the impact of drug-related homicides on crime and perceptions of unsafety. To take into account observed and unobserved characteristics that might affect the change in our outcome variables we combine the difference-in-difference estimator with instrumental-variables, *Z,* and a panel fixed effects regression at municipality level, as shown in equation (1). Across all the regression specifications in this section we use the

sampling weights provided by the ENSI survey to take into account the representation of the respondent in the sample.

$$E(Y_{ijt} | Z_{ijt}) = \alpha + \delta X_{ijt} + \rho M_{ij} + \lambda Treated_{ijt} * Post_{it} + \phi Post_{it} + \psi_{ijt} \quad (1)$$

where Y_{ijt} represents the outcome variable of interest, such as crime, of survey respondent i at time t in municipality j. X is a vector of the respondent's characteristics. M is a vector of time varying characteristics of the area. *Post* is a dummy variable on whether the observation is for the post-treatment period (2006 or after) or not. ψ_{ijt} represents the error term. The difference-in-difference effect λ is the coefficient of the interaction between *Post* and the dummy variable *Treated,* which indicates whether the person was affected in a municipality treated by drug-related cartels (or drug-related homicides). Since the location where drug cartels operate might be endogenously determined with crime levels, we control for that potential endogeneity using instrumental variables.

As instrumental variable *Z,* we use the interaction between the variable *Post* and the dummy variable *Decentralized*, which indicates whether the municipality's local government had the same ruling party as its corresponding state government in 2005. As mentioned before, we use this instrument as the literature suggests that municipalities that were decentralized right before 2006 were more likely to have experienced drug-related homicides soon after. Since we are using instrumental variables, the difference-in-difference effect is estimating the local average effect of the treatment (LATE) on outcomes for those whose treatment has been changed by the instrument *Z.*

The respondent's characteristics we control for (gender, age, whether has high school or higher level of education attainment, whether is an entrepreneur and size of household) are those that the international literature has found to be related to the probability of experiencing crime (Fajnzylber et al., 1998).[8] In particular, we control whether the respondent is an entrepreneur as this group has allegedly been particularly targeted by cartels for extortion and kidnapping (Ravelo, 2012). The area characteristics we control for are: the Gini coefficient of the municipality and lagged for the years

[8] The ENSI for the year 2010 does not provide information on household's income, so we control for the education level of the respondent.

2000 and 2005, and the unemployment rate at state level and lagged for the years of 2002 and 2006. We control for unemployment rates since the literature has found it strongly correlated with crime rates (Landau, 1998; Agnew, 1999). These theories argue that since employment constitutes the main legitimate mean for obtaining income, difficulty in gaining employment can increase frustration and the chances of resorting to crime. Although unemployment might induce crime, as crime increases, firms and entrepreneurs might be forced to move out to other areas thereby inducing more unemployment in the original location. In order to avoid a potential endogeneity between unemployment and crime rates, we use lagged information for unemployment rates. We also control for the inequality level at municipality level following the theories on strain and anomie, which suggest that the frustration of unsuccessful individuals increases when faced with the relative success of others around them. Thus, the higher the inequality, the more strain and the greater the inducement for low-status individuals to commit crime (Barkan, 2006). Since inequality might also be endogenously influenced by crime rates, we also use lagged information for the Gini coefficient (Fajnzylber et al., 2002).

4.1 Change in crime

To determine whether the crime occurred in a municipality treated by cartels (or drug-related homicides) we use the stated municipality of where the crime occurred, and not the respondent's current area of residency. [9] Thus, in our regressions estimating the impact on crime we use the characteristics of the municipalities where the crimes occurred and not the characteristics of the areas where the respondent is currently living. We discard any reports where the respondent did not state in

[9] The survey asked about the crimes that occurred in the year prior to the interview, that is 2004 and 2009. Thus, we identify the treatment areas by drug-related homicides as those areas that experienced at least one drug-related homicide between 2006-2009, which broadly coincide with those treated by drug-related homicides during 2006-2010. (72 municipalities experienced drug-related homicides for the first time in 2010). There are no differences in the sampled ENSI municipalities that we identified as treated by drug-cartels but free of drug-related homicides in 2006-2009 or 2006-2010.

which municipality the crime occurred. Table A.2 (in appendix) shows respondents stated the municipality of where crimes occurred for the great majority of cases across all types of crimes analyzed.

Tables A.4 to A.7 in the Appendix present the first-stage least squares instrumental variables (IV) regressions, and the validity test of our instruments, which show that the instruments are robust. We discuss these results in depth in sub-section 4.4.

Table 1, Panel A, shows the results of the IV-second-stage least squares panel-fixed effects regressions, which measure separately the impact of drug cartels and drug-related homicides on crime. Column (2) shows that the theft of car accessories increased by 16 percentage points in municipalities that had at least one drug-related homicide relative to their control group. Extortions also increased (by 4.7 percentage points) as well as other thefts (by 6 percentage points) in municipalities treated by drug-related homicides, relative to the control group.

We also find a reduction in the percentage of respondents experiencing other kinds of crimes in the municipalities treated by drug-related homicides. The percentage of respondents that experienced house burglary declined (by 16 percentage points), as well as the percentage of those that experienced kidnappings (2.2 percentage points), sexual crimes (4.2 percentage points), fraud (3.6 percentage points) and other types of crimes (12 percentage points).

This mixed evidence might be due to various factors. For example, when cartels operate in these areas they might focus on certain crimes (car accessories, extortions and other thefts) and reduce their efforts on other types of crimes. But there are other possibilities too. We have very few observations on reported kidnappings and sexual offenses in the survey, which might be due the hesitation of the respondent to reveal if they had suffered this kind of crimes and as mentioned earlier, due to the fact that the reported kidnappings refer to the instances where the respondent was affected directly, and not a family member, which obscures their real prevalence. The mixed evidence could also be related to the degree of variance in the number of drug-related homicides each treated municipality has experienced. It is possible that the more violent areas are experiencing other kinds of change in crime rates. To assess if there is any differences in the types of crime across municipalities we divide further our treated groups.

Panel B shows the impact of drug related violence but on those municipalities in the top 10 decile of drug-related homicides during 2006-2009. Among these areas we observe a different pattern of impact on crime. For instance, house burglary increased by 54.3 percentage points, and also other thefts increased by 40.4 percentage points relative to their control group. The increase of these crimes in the areas with most drug-related homicides is consistent with international literature that a high-level of conflict is associated with property theft (Landau, 2003). As discussed earlier, the reason for the positive correlation we find could be driven by drug cartels taxing their residents to fund their ongoing turf conflicts.

In the areas worst affected by drug-related homicides, we also observe a reduction in mugging (column 4). The change in the behavior of respondents, shown in the next sub-section, which take more precautions for instance to reduce the risk of being victims of crime might also explain the observed reduction in muggings.

In Table 1, Panel D, we also show the impact on crime of drug-cartels but whenever they operate free of drug-related homicides. We find no statistically significant impact across 10 out of the 12 types of crime analyzed. Crimes categorized as "other thefts" decreased (by 7 percentage points), in contrast to what occurred in the areas with drug-related homicides. Column (12) shows that "other crimes" increased; nonetheless these crimes are in relative terms of lesser frequency than the other 11 types of crimes analyzed. Thus, this evidence supports our hypothesis that when cartels have a peaceful (i.e. with no homicides) monopoly of a *plaza*, cartels are more likely to concentrate their efforts on drug-trafficking, and less on committing other crimes such as thefts and extortions.

Since the incidence of some crimes increased but declined for others, we analyze next the probability of experiencing crime of any type. We find no change in this probability across any of the areas treated by drug-related homicides or drug-cartels, relatively to their control group (column 13).

4.2 Change in perceptions and actions

We estimate next the impact of drug cartels and drug-related homicides on respondent's perception of unsafety. [10] In contrast to the previous sub-section, in our regressions here we use the characteristics of the municipalities where the respondent was residing at the time of the interview. Tables A.8 in the Appendix present the IV-first-stage least squares regressions which show that the instruments are robust. We discuss these results in depth in sub-section 4.4.

Table 2, shows the results of the IV-second-stage least squares panel-fixed effects regressions. We find that the percentage of respondents that believe crimes increased in their municipalities and those who feel unsafe in their municipalities increased in areas that experienced drug-related homicides, relative to their control group (Panel A, column 1 and 2). In contrast, we find no change in these perceptions of respondents living in areas that experienced drug cartels free of drug-related homicides relative to their control group (Panel B, column 1 and 2).

We find no difference in the change of the expressed mistrust for local police among respondents living in areas experiencing drug cartels or drug-related homicides relative to their control groups (column 3). Thus, the general increase in mistrust in local police cannot be attributed to drug cartels or the drug-related homicides alone.

In Table 2, columns (4)-(7), we explore the actions that the respondents have taken "*as a result of being afraid of being victims of crime*". Among those who live in municipalities with drug-related homicides the percentage of respondents who stated no longer go out at night increased (by 40 percentage points), and so did the percentage who no longer visits friends and relatives (by 48 percentage points), and who no longer uses public transport (by 24 percentage points). Again, we find no statistically significant change in these responses among those living in areas with drug cartels but free of drug-related homicides relative to their control group.

[10] In contrast to the previous section, the survey asked respondents about their perceptions on unsafety and actions taken to prevent crime referring to the year in which the survey was conducted (2005 or 2010). Thus, in this sub-section we identify the treatment areas with drug-related homicides as those areas that experienced at least one drug-related homicide between 2006 and 2010.

In Table 3 we show evidence on the actions taken as a result of the perceived unsafety among our respondents using IV-second-stage least squares panel fixed-effects regression. The corresponding results of the IV-first-stage least squares regression are shown in Table A.9, and also discussed in sub-section 4.4.

We find that on the one hand, there was no change in the percentage of respondents that acquired an insurance policy among those living in the areas affected by drug-related homicides, relative to their control group (Table 3, Panel A, column 1). On the other hand, the percentage who acquired an insurance policy declined (by 14 percentage points) among those living in areas affected by drug cartels but free of drug-related homicides (Table 3, Panel B, column 1). These contrasting results might be due to differences in the price of the insurance premiums, information which the ENSI survey does not provide.[11] However, as we showed before, the theft of car accessories, for instance, only increased in the areas affected by drug-related homicides and not in areas with drug cartels without drug-related homicides. This suggests that if car insurance premiums increased they are more likely to have done so in areas affected by drug-related homicides.

We also find that the percentage of respondents that improved their security (by installing more locks, walls, alarms or getting a security dog) increased (by 70.5 percentage points), but only among the respondents living in municipalities affected by drug-related violence relative to their control group (Panel A, column 2). Similarly, the percentage who hired private police increased (by 33 percentage points), but only among those living in areas with drug-related homicides relative to their control group (column 3). The only similarity we find across both types of treatment areas is that the respondents increased the security for their cars, relative to their control groups (column 4).

In Table 3, column (5) we analyze the probability of respondents moving of residency after experiencing a crime. The survey asked respondents whether they experienced crimes in the year previous to the interview and the location of that crime. However, the survey did not ask where the respondents were residing in that previous year. Thus, we determined whether the respondent moved

[11] Guerrero-Gutiérrez (2011a) shows there is a positive correlation in car insurance premiums and drug-related homicide rates per 100,000 inhabitants at state level.

to a different municipality or state after experiencing house burglary by comparing the location (municipality and state) where the respondent was living at the time of the interview and the stated location of where the house burglary occurred over the previous year. We find that across all respondents, only a small percentage (0.1%) moved to another municipality or state after experiencing house burglary (Table A.3).[12] Moreover, in our difference-in-difference analysis we find no statistically significant change in the percentage that moved following a house burglary in the areas affected by drug cartels nor in the areas affected by drug-related homicides, relative to their control groups. However, it is likely that we are underestimating the probability of moving after suffering a crime for two reasons. First, we cannot identify the cases of respondents who moved residency but who did not experience house burglary in the previous year. Second, even for those who experienced burglary, we only know if they moved to a different municipality or state, but not if they relocated within the same municipality, perhaps to a safer neighborhood.

In Table 3, columns (6)-(8), we analyze other actions taken as a result of having experienced a crime. We find no difference in the percentage of respondents experiencing a crime and not reporting it officially to the authorities among the respondents living in areas with drug cartels or drug-related homicides, relatively to their control groups (column 6). Thus, the level of impunity that might deter respondents reporting crimes could be similar across the treatment and control areas.

Among those who did report the crime experienced to the authorities, the outcome of the official report (whether nothing happened with the claim, or whether stolen items were recovered) was no different among respondents living in areas with drug cartels or drug-related homicides, relative to their control (columns 7 and 8).

4.3 Simple comparison between treated and control areas in 2010

We present next further differences in security spending and respondents' assessment of the performance of authority between the treatment and their respective controls areas. We present this

[12] Estimating that percentage but only for the population who suffered a house burglary: 4.7% moved to another municipality or state over the following year in 2004, and 5.08% in 2009.

information only for the year 2010, given that these questions are available in the ENSI survey in 2010, but not in the previous survey of 2004. To assess these differences between the treated and control areas we use the equation as shown in (2). We once again use an instrumental variable specification.

$$E(Y_{ij} | Z_{ij}) = \gamma + \delta X_{ij} + \rho M_i + \mu Treated_{ij} + \psi_{ij} \quad (2)$$

where Y_{ij} represents the outcome variable of interest of respondent i in 2010 in the municipality j. X and M are the vectors of the respondent and area characteristics. Z_{ij} represents whether the municipality was decentralized in 2005. Since our outcome variables do not change over time, we only use as instrument a dummy variable indicating whether the municipality was decentralized or not in 2005. μ represents the difference in outcomes between respondents living in the treated areas (by drug cartels or drug-related homicides) and those in the control group in 2010.

Tables A.10 in the Appendix present the IV-first-stage least squares regressions, the results of which we discuss in depth in sub-section 4.4. Table 4, shows the corresponding IV-second-stage least squares regressions. In Table 4, column (1) we show the differences in security spending in 2010 between areas treated by drug-related cartels or drug-related homicides, relative to their control groups. We find no differences in spending between respondents living in areas treated by at least one drug-related homicides and their control group. However, the respondents living in the areas most affected by drug-related homicides (those in the 10th decile of drug-related homicides) spend on average 1,166 dollars more in security than the respondents living in the control group (Panel B). In contrast, the respondents living in areas where drug cartels operate but free of drug-related homicides spend 1,417 USD dollars less in security than those respondents living in their respective control group (Panel D).

It is worth noting that since we do not have information about security spending in previous years, these differences in spending observed in 2010 are not necessarily being caused by the presence of drug-related homicides or cartels in these areas, as these areas might have spent higher amounts in

security previously. Nonetheless, the differences in spending reveal the extra burden on security spending that crime and violence can impose on households.

In column (2) we show further differences among respondents living in the two types of treated areas. The respondents living in areas affected by at least one drug-related homicide are 18 percentage points more likely to believe that their participation with others in improving public security is important compared to their control group (panel A, column 2). However, we find no difference in this perception between those who are living in the top 10 decile of drug-related homicides, nor among those living in areas affected by drug cartels with no homicides and their respective control groups. Hence, as the social cohesion hypothesis suggests, drug-related homicides, as an extra pressure, may induce people to participate with others to take action against external pressures, but only in areas where such violence is occurring, and up to a certain level of violence. Beyond a certain level of conflict people might perceive that is too dangerous to participate in vigilante activities for instance.

In column (3) we examine whether the perceptions about impunity differ between respondents living in treated and control areas. It is important to examine these differences, as the theoretical and empirical literature have shown the higher the level of (perceived) impunity the higher the crime rates (Becker, 1968; Ehrlich, 1973; 1996). We find that among the respondents living in areas affected by at least one drug-related homicide, the perception that criminals are punished if they commit a crime in their municipality is 10 percentage points higher than those in their respective control group. This statistically significant difference is no longer found once we further divide the treated areas according to the level of drug-related homicides (in top 10 decile or bottom 9th decile), nor among the areas where drug cartels operate without drug-related homicides relative to their control group.

To conclude our analysis, in Table 4, column (4), we show that those living in the areas most affected by drug-related homicides, in the top 10 deciles, are 8 percentage points less likely to agree that the strategy of the federal government to tackle organized crime is working, relative to its control group. In contrast, those living in the bottom 9th decile of drug-related homicides, or where cartels operate but without drug-related homicides are more likely to agree that the federal action against organized crime is working.

4.4 Robustness checks

The validity of our identification strategy depends on two key factors: the robustness of our instrumental variable and that the municipalities used as a treatment (either for drug cartels or drug-related violence) and control group have had similar parallel trends in crimes before treatment began.

As mentioned earlier, previous research has shown the relevance of the decentralization instrument we use in explaining the probability of experiencing drug cartels and drug-related violence. To check the validity of the instrument used, in the appendix (Tables A.4-A.10) we present the first-stage regression of the IV approach for all the estimations shown in section 4. These tables also include the coefficients associated with our decentralization instrument and our treatments (municipalities experiencing drug-related homicides or drug cartels). We find that the instrument is statistically significant in 95 out of the 96 regressions presented. For instance, in Table A.5 we show the first stage results of the impact of drug-related homicides in the top 10 decile on crimes. The instrument used, *decentralization*post,* is statistically significant and positive. This suggests that areas that were decentralized were more likely to have a high-intensity level of drug-related homicides, as the literature suggests. Table A.6 also shows that areas decentralized were less likely to have drug cartels operating peacefully (without drug-related homicides), also supporting the predictions of the literature. As we discussed in Section 2, we would expect that these cartels free of drug-related homicides to be more likely to operate in coordinated regimes, not in decentralized ones.

At the bottom of each of the Tables A.4 to A.10 we present the under-identification tests, which show that the excluded instrument, decentralization, is correlated with the endogenous regressors. The F-test across all tables show that we do not have any weak instrument problem given that in all models the p value is very small. In addition, the F-test is greater than 10 in 92 out of the 96 regressions presented.

To assess the size of the bias in our IV estimates, due to a potential weak correlation between the IV used and the endogenous regressors, we present the Cragg-Donald Wald F statistic, and compare it to the Stock-Yogo weak ID test critical values. Across all our estimators the size of that bias is around 10%.

We also show the endogeneity test of the treatment variables (drug- cartels or drug-related homicides). The null hypothesis of the endogeneity test is that the treatment measure is exogenous, thus no IVs are needed. We do find evidence of endogeneity across several models, although not all, at the 10 percent confidence level.

We now move on to discuss the validity of the parallel trends between our treatment and control groups. To test these trends we would need to have information about crime rates at municipality level. Given that there are no crime rates available at this level, we test instead if the municipalities used as treatment and control groups had similar homicide rates, a close proxy for criminality in the past. In Figures 5 and 6 we show that both our treatments analyzed (drug-related homicides and drug cartels free of drug-related homicides) had parallel trends in homicides rates with respect to their control group at least in the 10 years before the treatment began. It is only after 2007 that homicide rates sharply increased in the municipalities treated by drug-related homicides, but not in the controls. Interestingly, the general homicide rates remained below the national level for the municipalities treated by cartels but that did not have drug-related homicides and its respective control group (Figure 6). Thus, this evidence suggests that the municipalities used as controls are a suitable group off which to build the counterfactual of what would have happened to the treated municipalities, in the absence of the treatment.

5. Conclusion

This paper estimated the impact of drug cartels and separately drug-related homicides on the probability of suffering a crime and on the perceptions of security. To this end we combined nationally representative surveys on crime with indicators of where drug cartels operate with and without drug-related homicides.

Our findings reveal a contrasting picture of how residents have been affected across different areas. The perception of unsafety increased among the respondents living in areas affected by drug-related homicides. These respondents also take more measures towards increasing their security, spending on average about 1,166 US dollars more in security than those living in areas not affected by drug-related homicides. This is a non-negligible amount in security expenditure for a middle-income

country, which could be contributing to the impoverishment and migration out of these violent areas. In contrast, the perceptions of unsafety do not change in areas where cartels operate without leading to drug-related homicides, and respondents living in these areas spent on average even less resources than those free of cartels and drug-related homicides.

The probability of experiencing the main types of crime analyzed remained unchanged, thefts even declined where cartels have the full monopoly of the area where they operate, without facing conflicts leading to drug-related homicides. This result could be due to cartels choosing to specialize on drug-activities, and not on committing other crimes in these areas. This effect could also be reinforced if the police are no longer chasing cartel members, but allowing them to operate freely, so the police can focus their efforts on non-drug-related crimes.[13] In contrast, certain crimes did increase where cartels battle for turf, with evidence of drug-related homicides. We cannot rule out that the spike in certain crimes in these areas is being driven by police resources being deviated towards chasing cartels, thereby congesting law-enforcement (Gaviria, 2000). However, we do not find a generalized rise in crime rates in these areas, but rather a pattern where those crimes that require more sophisticated organization increased, such as extortion and other theft. Thus, our results are more supportive of the hypothesis that when cartels face battles for turf these conflicts increase cartels' security expenses, and as a result cartels resort to taxing locals through theft and extortion to fund their ongoing conflicts.

Our results confirm the assumptions made by previous studies arguing that drug-cartels increase crime rates and perceptions of unsafety. However, our study reveals that this is the case only when drug-cartels are battling for turf and not when cartels operate without disputes leading to drug-related homicides. Thus, our findings help deepen the understanding of when cartels' drug-trafficking activities lead to other crimes and some of the consequences on the local population.

[13] For instance, in a short-lived depenalization of cannabis in Lambeth, a borough of London, Adda et al. (2014) find that the overall crime rate declined as result of the police being able to divert resources towards dealing with other non-drug related crimes.

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Figures and Tables

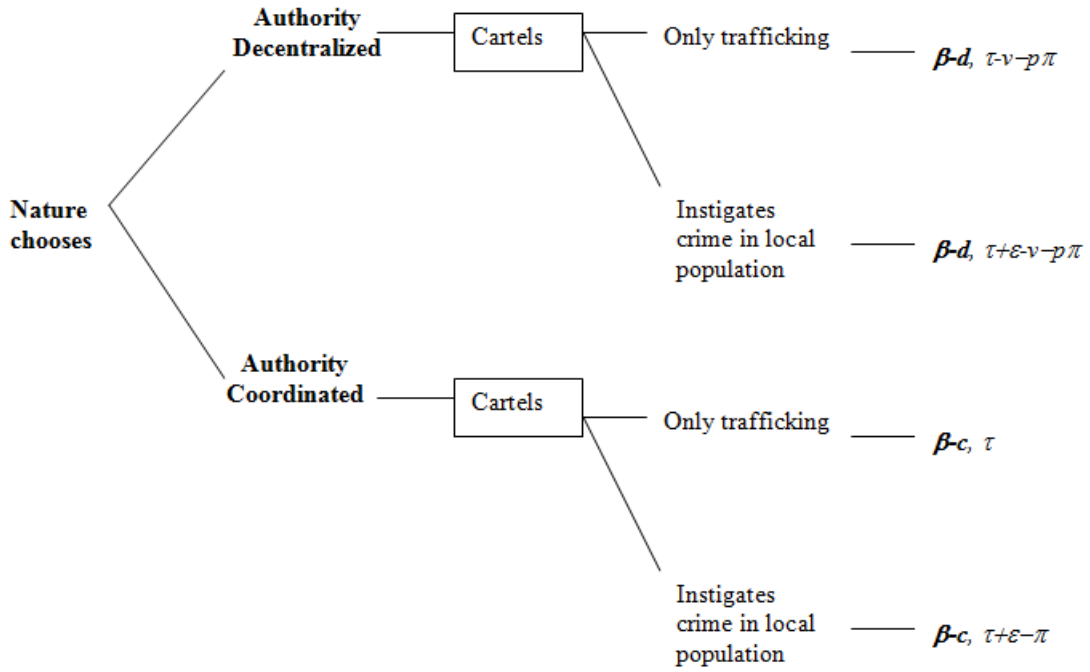

Figure 1. Sequential game between authority and cartels under decentralized and coordinated regimes

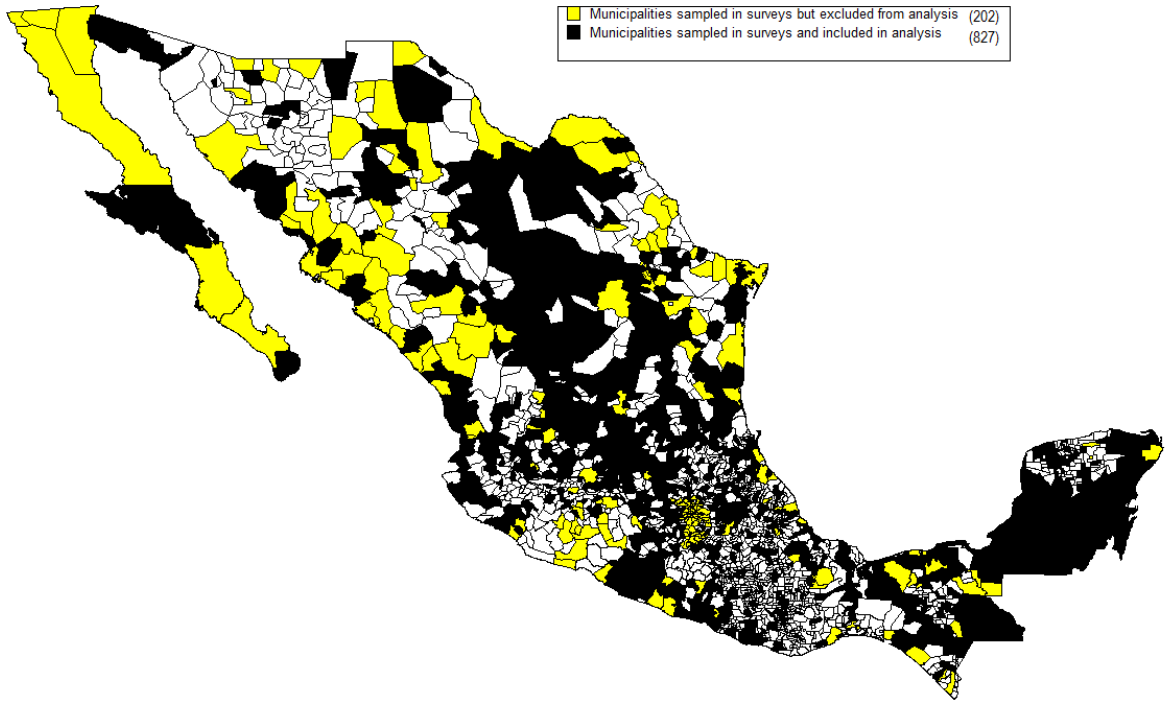

Figure 2. Municipalities excluded and included in analysis. *Source: ENSI 2005, 2010*

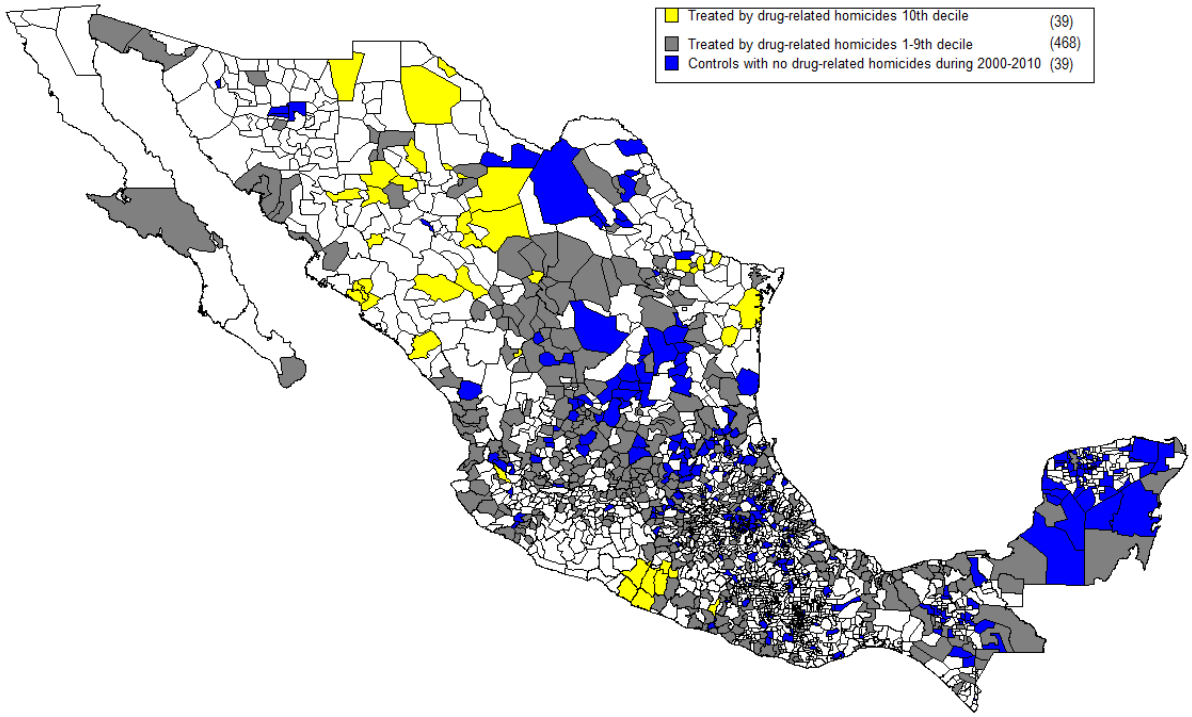

Figure 3. Municipalities used as controls and treated with drug-related homicides. *Source: ENSI 2005, 2010*

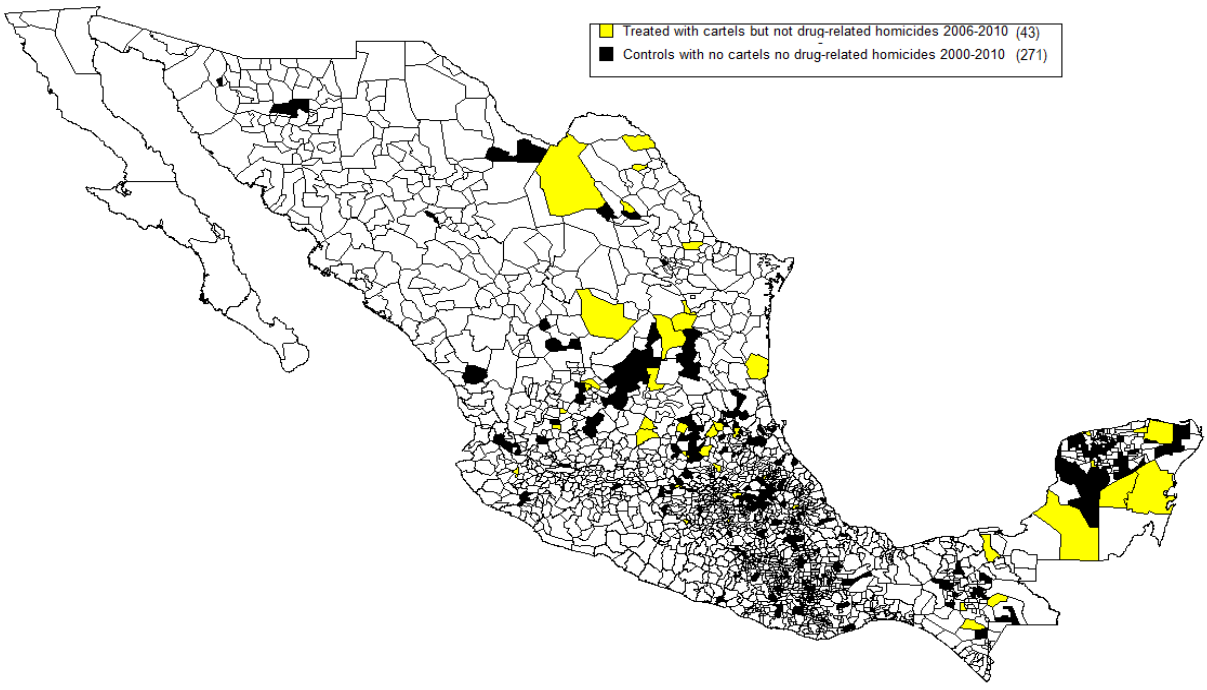

Figure 4. Municipalities used as controls and treated with cartels but not drug-related homicides. *Source: ENSI 2005, 2010, cartels operating in municipalities Gutiérrez-Romero and Oviedo (2014).*

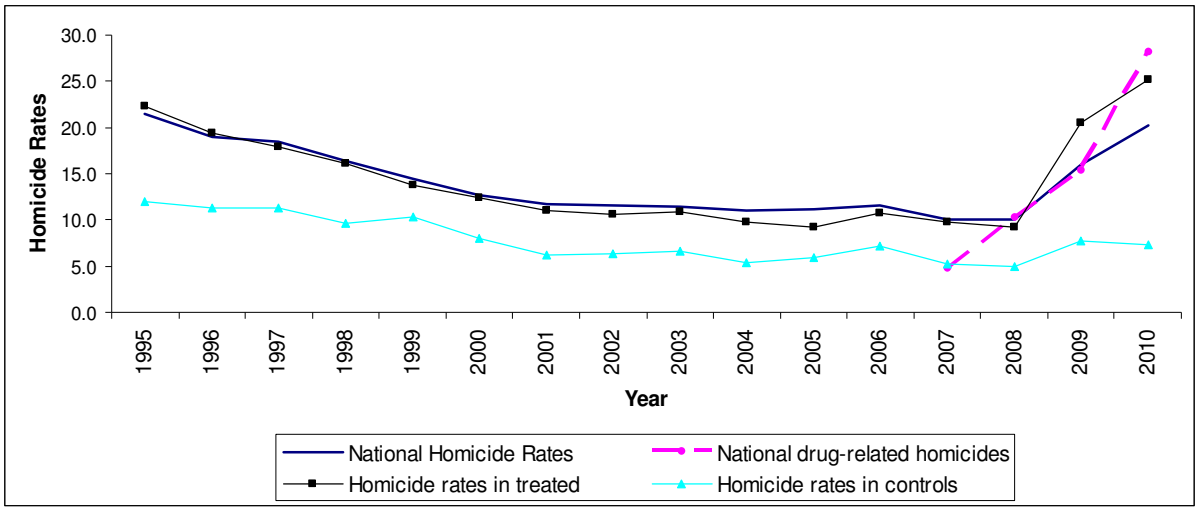

Figure 5. Homicide Rates across municipalities used as controls and treated with drug-related homicides. *Source: Homicide rates INEGI; drug-related homicides SNSP; population CONAPO.*

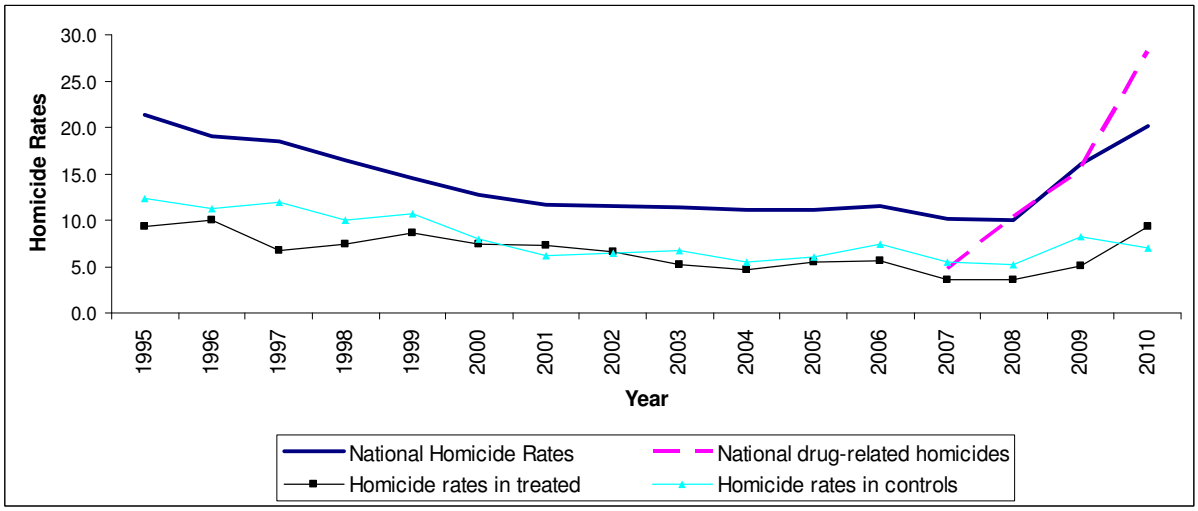

Figure 6. Homicide Rates across municipalities used as controls and treated with cartels but not drug-related homicides. *Source: Homicide rates INEGI; drug-related homicides SNSP; population CONAPO; cartels operating in municipalities Gutiérrez-Romero and Oviedo (2014).*

Table 1: Impact of Drug-Related Homicides and Cartels on Crime Rates. IV Panel Fixed Effects at Municipality Level

Dependent variable>	Car theft (1)	Theft of car accessories (2)	Household Burglary (3)	Mugging (4)	Kidnapping (5)	Lesions (6)	Sexual crime (7)	Fraud (8)	Extorsion (9)	Other thefts (10)	Other crimes (12)	Suffered any kind of crime (13)
Panel A: Controls vs all treated municipalities by drug-related homicides												
DID	0.005	0.160***	-0.163***	0.029	-0.022***	-0.027	-0.042***	-0.036**	0.047*	0.060**	-0.119***	-0.054
	(0.017)	(0.041)	(0.042)	(0.035)	(0.006)	(0.024)	(0.012)	(0.015)	(0.025)	(0.026)	(0.026)	(0.080)
Number respondents	57,525	57,470	57,518	57,342	57,529	57,502	57,532	57,530	57,513	57,519	57,520	57,827
Number municipalities	827	827	827	829	827	827	827	827	828	827	828	842
Panel B: Controls vs treated municipalities top 10 decile drug-related homicides												
DID	-0.141	0.196	0.543*	-0.397*	0.041	0.178	0.051	0.032	0.066	0.404**	0.011	1.140
	(0.087)	(0.199)	(0.294)	(0.236)	(0.033)	(0.159)	(0.049)	(0.090)	(0.120)	(0.189)	(0.185)	(1.034)
Number respondents	17,768	17,728	17,755	17,684	17,768	17,752	17,768	17,767	17,760	17,760	17,765	17,639
Number municipalities	442	442	442	442	442	442	442	442	443	442	443	450
Panel C: Controls vs treated municipalities in bottom 9 deciles of drug-related homicides												
DID	0.003	0.133***	-0.122***	0.015	-0.020***	-0.025	-0.037***	-0.030**	0.041*	0.051**	-0.101***	-0.048
	(0.016)	(0.037)	(0.038)	(0.032)	(0.006)	(0.022)	(0.011)	(0.013)	(0.023)	(0.023)	(0.024)	(0.073)
Number respondents	54,936	54,883	54,933	54,755	54,940	54,918	54,944	54,940	54,923	54,932	54,927	55,230
Number municipalities	771	771	771	773	771	771	771	771	772	771	771	784
Panel D: Controls vs treated by cartels but no drug-related homicides												
DID	0.014	-0.042	-0.040	-0.003	0.001	-0.025	-0.009	0.008	-0.020	-0.070*	0.075*	-0.107
	(0.015)	(0.038)	(0.051)	(0.036)	(0.003)	(0.028)	(0.010)	(0.017)	(0.024)	(0.038)	(0.040)	(0.098)
Number respondents	10,850	10,830	10,845	10,799	10,850	10,840	10,850	10,849	10,839	10,845	10,844	10,755
Number municipalities	281	281	281	281	281	281	281	281	281	281	281	283

Note: DID is the difference-in-difference effect when comparing treated vs. control areas. Data are weighted by respondent's survey sampling weight. Controls used but omitted in table: respondent's gender, age, education, whether entrepreneur, size of household, lagged gini coefficient (2000 and 2005) aggregated at municipality level and measured in natural logarithm and unemployment rate at state level and lagged (2002 and 2006).
Instrument used to deal with endogenity of treatment: The interaction between whether the municipality was decentralized after 2005 and a post-treatment dummy variable. Deciles are constructed according to the total number of drug-related homicides per 100,000 inhabitants the municipalities experienced during 2006-2009.
*Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses.*
Source: ENSI 2005, 2010. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).

Table 2: Impact of Drug-Related Homicides and Cartels on Respondent's Perceptions. Panel Fixed Effects IV at Municipality Level

Dependent variable>	Believes crime increased in municipality (1)	Believes living in this municipality is unsafe (2)	Does not trust the local police (3)	No longer goes out at night (4)	No longer visits friends and relatives (5)	No longer uses taxis (6)	No longer uses public transport (7)
Panel A: Controls vs all treated municipalities by drug-related homicides							
DID	0.764***	0.270*	0.156	0.398**	0.482***	0.070	0.236*
	(0.161)	(0.155)	(0.134)	(0.155)	(0.132)	(0.214)	(0.129)
Number respondents	55,716	56,988	45,206	52,938	55,770	35,475	47,311
Number municipalities	827	827	827	827	827	789	825
Panel B: Controls vs treated by cartels but no drug-related homicides							
DID	0.239	0.374	0.143	0.004	0.160	-0.130	-0.050
	(0.245)	(0.233)	(0.245)	(0.221)	(0.184)	(0.522)	(0.163)
Number respondents	10,447	10,735	8,394	9,898	10,497	5,049	8,969
Number municipalities	281	281	281	281	281	258	280

Note: DID is the difference-in-difference effect when comparing treated vs. control areas. Data are weighted by respondent's survey sampling weight. Controls used but omitted in table: respondent's gender, age, education, whether entrepreneur, size of household, lagged gini coefficient (2000 and 2005) aggregated at municipality level and measured in natural logarithm and unemployment rate at state level and lagged (2002 and 2006).
Instrument used to deal with endogenity of treatment: The interaction between whether the municipality was decentralized after 2005 and a post-treatment dummy variable. Deciles are constructed according to the total number of drug-related homicides per 100,000 inhabitants the municipalities experienced during 2006-2010.
*Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses.*
Source: ENSI 2005, 2010. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).

Table 3: Impact of Drug-Related Homicides and Cartels on Respondent's Actions. Panel Fixed Effects IV at Municipality Level

	As a result of insecurity respondent:							
Dependent variable>	Bought an insurance policy	Improved security (locks, walls, alarms, got a dog)	Hired private police	Increased security in car	Experienced crime and moved of address afterwards	Experienced crime, but did not officially report crime	Officially reported crime, but nothing happened as a result	Officially reported crime, and recovered stolen items
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Controls vs all treated municipalities by drug-related homicides								
DID	0.021	0.705***	0.329***	0.373***	-0.043	0.398	-1.566	0.385
	(0.044)	(0.150)	(0.056)	(0.081)	(0.887)	(0.384)	(1.121)	(0.799)
Number respondents	56,706	57,324	56,717	48,335	872	4,508	1,058	960
Number municipalities	827	827	827	825	141	379	162	149
Panel B: Controls vs treated by cartels but no drug-related homicides								
DID	-0.141***	0.168	0.027	0.161*	4.876	-2.776	1.233	0.421
	(0.046)	(0.221)	(0.051)	(0.083)	(24.260)	(2.190)	(2.143)	(1.463)
Number respondents	10,639	10,801	10,591	8,515	623	3,173	776	696
Number municipalities	281	281	281	280	113	335	138	125

Note: DID is the difference-in-difference effect when comparing treated vs. control areas. Data are weighted by respondent's survey sampling weight. Controls used but omitted in table: respondent's gender, age, education, whether entrepreneur, size of household, lagged gini coefficient (2000 and 2005) aggregated at municipality level and measured in natural logarithm and unemployment rate at state level and lagged (2002 and 2006).
Instrument used to deal with endogenity of treatment: The interaction between whether the municipality was decentralized after 2005 and a post-treatment dummy variable. Deciles are constructed according to the total number of drug-related homicides per 100,000 inhabitants the municipalities experienced during 2006-2010.
*Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses.*
Source: ENSI 2005, 2010. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).

Table 4: Differences in security spending, participation and impunity between controls and treated municipalities in 2010 (IV)

Dependent variable>	Spent in security USD (1)	Believes his/her participation is important to reduce crime (2)	Believes that criminals are punished in this municipality (3)	Believes federal goverment strategy against organised crime is working (4)
Panel A: Controls vs all treated municipalities by drug-related homicides				
Respondent living in municipality treated by drug-related homicides	246.598	0.179**	0.103*	0.414***
	(588.675)	(0.075)	(0.056)	(0.087)
Number respondents	9,071	28,576	28,833	27,968
Panel B: Controls vs treated municipalities top 10 decile drug-related homicides				
Respondent living in municipality treated by drug-related homicides	1,165.624***	-0.121	0.058	-0.826***
	(385.299)	(0.179)	(0.137)	(0.204)
Number respondents	1,828	7,055	7,156	6,837
Panel C: Controls vs treated municipalities in bottom 9 deciles of drug-related homicides				
Respondent living in municipality treated by drug-related homicides	164.132	0.112*	0.049	0.336***
	(525.091)	(0.067)	(0.050)	(0.077)
Number respondents	8,920	27,891	28,128	27,303
Panel D: Controls vs treated by cartels but no drug-related homicides				
Respondent living in municipality treated by cartels but no drug-related homicides	-1,417.332***	-0.014	-0.148	0.912***
	(514.038)	(0.157)	(0.114)	(0.196)
Number respondents	1,377	5,466	5,546	5,282

Note: Data are weighted by respondent's survey sampling weight. Controls used but omitted in table: respondent's gender, age, education, whether entrepreneur, size of household, lagged gini coefficient (2000 and 2005) aggregated at municipality level and measured in natural logarithm and unemployment rate at state level and lagged (2002 and 2006).
Instrument used to deal with endogenity of treatment: Whether the municipality was decentralized after 2005. Deciles are constructed according to the total number of drug-related homicides per 100,000 inhabitants the municipalities experienced during 2006-2010.
*Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses.*
Source: ENSI 2010. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).

Appendix

Table A.1 Main Characteristics of Respondents

	All country		Drug-related homicides				Drug-related homicides top 10 decile				Treated by cartels but no drug-related homicides			
			Control Group		Treated Group		Control Group		Treated Group		Control Group		Treated Group	
	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010
	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage
Female	52.6	52.3	55.9	52.5	52.3	52.4	55.9	52.5	53.4	51.9	56.0	52.4	55.9	52.9
Aged 18-30	35.0	33.0	34.6	34.7	34.8	33.9	34.6	34.7	33.1	30.5	34.2	34.9	34.1	31.3
Selected respondent has highschool or more	33.9	22.1	16.9	10.7	27.7	18.1	16.9	10.7	19.6	11.7	15.7	8.6	18.4	14.9
Is an entrepreneur/self-employed	18.9	17.4	25.0	19.0	19.3	17.7	25.0	19.0	21.8	20.1	25.0	19.9	22.2	18.2
During previous year, a member of the respondent's household suffered a crime in the state of current residency	10.3	13.9	4.4	5.2	7.4	9.8	4.4	5.2	4.6	5.2	4.5	4.4	4.7	5.3
Before of last year, respondent was a victim of crime	22.2	14.7	10.8	7.1	17.0	11.2	10.8	7.1	12.8	8.5	9.7	5.8	12.8	9.0
Number of respondents	57,398	60,461	5,966	6,615	22,208	22,790	5,966	6,615	2,731	2,488	4,232	4,666	943	1,011

Note: Percentages are obtained using the respondent's survey sampling weight. Deciles are constructed according to the total number of drug-related homicides per 100,000 inhabitants the municipalities experienced during 2006-2010.
Source: ENSI 2005 and 2010. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).

Table A.2: Type of crime that the respondent suffered during the year previous to the interview

	All crimes, including those of unkown location		All crimes, including those of unkown location													
	All crimes, including those of unkown location				Drug-related homicides				Drug-related homicides top 10 decile				Treated by cartels but no drug-related homicides			
	All country		All country		Control Group		Treated Group		Control Group		Treated Group		Control Group		Treated Group	
	2005 Obs	2009 Obs	2005 Obs	2009 Obs	2005 Obs	2010 Obs	2005 Obs	2010 Obs	2005 Obs	2010 Obs	2005 Obs	2010 Obs	2005 Obs	2010 Obs	2005 Obs	2010 Obs
Car theft	367	545	367	536	1	11	56	107	1	11	1	1	1	3	0	1
Theft of car accessories	1001	1748	1001	1741	19	58	254	586	19	58	5	10	6	26	3	2
Household Burglary	1775	1406	1770	1403	101	78	429	444	101	78	9	11	39	34	12	11
Mugging	1229	1516	1228	1485	34	40	270	414	34	40	3	1	17	19	3	1
Kidnapping	41	41	41	41	1	3	5	13	1	3	0	1	0	1	0	0
Extorsion*	125	798	123	793	7	43	29	269	7	43	0	1	4	20	1	5
Lesions	495	300	495	298	40	18	151	104	40	18	8	1	20	7	4	5
Sexual crime	96	43	96	42	7	1	37	19	7	1	1	1	4	0	0	1
Fraud	112	188	112	186	11	15	43	52	11	15	3	0	6	7	2	2
Other theft*	500	644	499	501	50	31	160	143	50	31	0	2	34	18	7	6
Other crimes*	1023	142	1019	140	90	16	271	41	90	16	12	1	46	10	17	2
Had some kind of crime	7,267	7,371	7256	7,166	369	314	1,870	2,192	369	314	40	30	179	145	48	36

*Note: Data not weighted by respondent's survey sampling weight. *Some respondents reported experienced extortions, other theft and other crimes more than once in the previous year to the interview. Only for these instances the observations refer to the number of instances the crime was committed, for the rest of crimes refer to the number of people who experienced these crimes. Deciles are constructed according to the total number of drug-related homicides per 100,000 inhabitants the municipalities experienced during 2006-2009. Source: ENSI 2005 and 2010. Drug-related homicides SNSP. Municipalities with operating narcos, Gutiérrez-Romero and Oviedo (2014).*

Table A.3: Respondents' Perceptions about Unsafety

		2005 Percentage	2010 Percentage
Because being afraid of crime respondent:	Experienced crime and moved of address afterwards	0.1	0.1
	Among those that experienced crime, did not officially report crime	75.9	76.2
	Believes crime increased in municipality	40.9	53.8
	Believes living in this municipality is unsafe	40.4	54.9
	Does not trust the local police	76.6	89.8
	No longer goes out at night	39.6	44.3
	No longer visits friends and relatives	23.2	26.2
	No longer uses taxis	25.0	25.2
	No longer uses public transport	12.8	16.6
As a result of insecurity respondent:	Bought an insurance policy	3.1	3.1
	Improved security (locks, walls, alarms, got a dog)	41.1	28.1
	Hired private police	5.4	3.0
	Increased security in car	12.8	12.2

Note: Percentages are obtained using the respondent's survey sampling weight. Source: ENSI 2005 and 2010.

Table A.4 First Stage IV Results from Difference-in-Difference Controls vs. Respondents living in municipalities treated by at least one drug-related homicides

Dependent variable>	Car theft (1)	Theft of car accessories (2)	Household Burglary (3)	Mugging (4)	Kidnapping (5)	Lesions (6)	Sexual crime (7)	Fraud (8)	Extorsion (9)	Other thefts (10)	Other crimes (12)	Suffered any kind of crime (13)
Post-treatment dummy	0.797***	0.797***	0.796***	0.797***	0.796***	0.797***	0.796***	0.796***	0.797***	0.796***	0.796***	0.802***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Respondent is a female	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Respondent's age	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Respondent is an entrepreneur	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Respondent's has highschool or higher education level	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Respondent's size of household	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged Ln Gini of the municipality where crime ocurred	-0.213***	-0.208***	-0.214***	-0.214***	-0.215***	-0.213***	-0.215***	-0.213***	-0.212***	-0.214***	-0.212***	-0.200***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Lagged unemployment rate of the state where crime ocurred	-0.016***	-0.016***	-0.016***	-0.016***	-0.016***	-0.016***	-0.016***	-0.016***	-0.016***	-0.016***	-0.016***	-0.017***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Municipality where crime ocurred was decentralized in 2005*Post treatment dummy	-0.061***	-0.060***	-0.060***	-0.060***	-0.060***	-0.061***	-0.060***	-0.060***	-0.060***	-0.060***	-0.060***	-0.063***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
R2	0.784	0.784	0.784	0.784	0.784	0.784	0.784	0.784	0.784	0.783	0.784	0.787
Observations	57525	57470	57518	57342	57529	57502	57532	57530	57513	57519	57520	57827
F test of excluded instruments:	286.77	283.04	281.10	283.65	283.54	287.84	281.93	283.92	285.27	286.37	284.24	311.98
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Underidentification test												
Anderson canon. corr. LM statistic	285.4	281.7	279.8	283.6	282.2	286.4	280.6	282.6	283.9	285.0	282.9	310.3
p value	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
Weak Identification test												
Cragg-Donald Wald F statistic	286.8	283.0	281.1	283.6	283.5	287.8	281.9	283.9	285.3	286.4	284.2	312.0
Stock-Yogo weak ID test critical values 10% maximal	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Overidentification test of all instruments	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified
Endogeneity test of endogenous regressors:	0.04	13.95	16.71	0.46	12.82	1.35	13.262	6.28	2.21	5.11	21.01	0.93
p value	0.84	0.00	0.00	0.50	0.00	0.25	0.00	0.01	0.14	0.02	0.00	0.33

*Note: Data are weighted by respondent's survey sampling weight. Gini at municipality level and lagged (2000 and 2005). Unemployment rate at state level and lagged (2002 and 2006).Treated municipalities by at least one drug-related homicides during 2006-2009. Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses. Source: ENSI 2005, 2010. Gini, unemployment INEGI. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).*

Table A.5 First Stage IV Results from Difference-in-Difference Controls vs. Treated Municipalities in Top 10 Decile of Drug-Related Homicides

	Car theft (1)	Theft of car accessories (2)	Household Burglary (3)	Mugging (4)	Kidnapping (5)	Lesions (6)	Sexual crime (7)	Fraud (8)	Extorsion (9)	Other thefts (10)	Other crimes (12)	Suffered any kind of crime (13)
Post-treatment dummy	0.111***	0.111***	0.111***	0.115***	0.111***	0.111***	0.110***	0.111***	0.111***	0.110***	0.111***	0.116***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)
Respondent is a female	0.000	0.000	0.000	-0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Respondent's age	0.000	0.000	0.000	-0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Respondent is an entrepreneur	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Respondent's has highschool or higher education level	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Respondent's size of household	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Lagged Ln Gini of the municipality where crime ocurred	0.053**	0.054**	0.054**	0.052**	0.053**	0.055**	0.053**	0.052**	0.054**	0.054**	0.052**	0.053*
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.028)
Lagged unemployment rate of the state where crime ocurred	-0.058***	-0.058***	-0.058***	-0.061***	-0.058***	-0.058***	-0.058***	-0.058***	-0.058***	-0.057***	-0.058***	-0.062***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)
Municipality where crime ocurred was decentralized in 2005*Post treatment dummy	0.015***	0.015***	0.015***	0.013**	0.015***	0.015***	0.015***	0.016***	0.015***	0.015***	0.016***	0.013*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.008)
R2	0.104	0.105	0.105	0.108	0.104	0.105	0.104	0.105	0.105	0.104	0.105	0.109
Observations	17768	17728	17755	17684	17768	17752	17768	17767	17760	17760	17765	17639
F test of excluded instruments:	13.79	13.75	13.64	9.35	13.71	13.32	13.81	14.32	13.68	13.87	14.27	2.94
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0002	0.00	0.00	0.00	0.09
Underidentification test												
Anderson canon. corr. LM statistic	13.78	13.75	13.63	9.35	13.71	13.32	13.81	14.31	13.68	13.86	14.26	9.71
p value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weak Identification test												
Cragg-Donald Wald F statistic	13.79	13.75	13.64	9.35	13.71	13.32	13.81	14.32	13.68	13.87	14.27	9.71
Stock-Yogo weak ID test critical values 10% maximal	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	2.94
Overidentification test of all instruments	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified
Endogeneity test of endogenous regressors:	3.50	1.08	4.62	4.31	1.67	1.51	1.20	0.23	0.33	6.12	0.01	1.95
p value	0.06	0.30	0.03	0.04	0.20	0.22	0.27	0.63	0.56	0.01	0.92	0.16

*Note: Data are weighted by respondent's survey sampling weight. Gini at municipality level and lagged (2000 and 2005). Unemployment rate at state level and lagged (2002 and 2006). Treated municipalities in top 10 deciles of drug-related homicides during 2006-2009. Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses. Source: ENSI 2005, 2010. Gini, unemployment INEGI. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).*

Table A.6 First Stage IV Results from Difference-in-Difference Controls vs. Bottom 9 Deciles Treated by Drug-Related Homicides

	Car theft (1)	Theft of car accessories (2)	Household Burglary (3)	Mugging (4)	Kidnapping (5)	Lesions (6)	Sexual crime (7)	Fraud (8)	Extorsion (9)	Other thefts (10)	Other crimes (12)	Suffered any kind of crime (13)
Post-treatment dummy	0.790***	0.790***	0.789***	0.790***	0.789***	0.790***	0.789***	0.789***	0.790***	0.789***	0.789***	0.795***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Respondent is a female	0.003*	0.003*	0.003*	0.003**	0.003*	0.003**	0.003*	0.003*	0.003*	0.003*	0.003**	0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Respondent's age	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Respondent is an entrepreneur	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Respondent's has highschool or higher education level	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Respondent's size of household	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged Ln Gini of the municipality where crime ocurred	-0.211***	-0.205***	-0.211***	-0.211***	-0.212***	-0.211***	-0.212***	-0.210***	-0.209***	-0.211***	-0.209***	-0.196***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Lagged unemployment rate of the state where crime ocurred	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.015***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Municipality where crime ocurred was decentralized in 2005*Post treatment dummy	-0.069***	-0.068***	-0.068***	-0.068***	-0.068***	-0.069***	-0.068***	-0.069***	-0.069***	-0.069***	-0.069***	-0.071***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
R2	0.775	0.775	0.775	0.776	0.775	0.775	0.775	0.775	0.775	0.775	0.775	0.778
Observations	54936	54883	54933	54755	54940	54918	54944	54940	54923	54932	54927	55230
F test of excluded instruments:	195.04	193.97	195.32	208.79	195.31	196.03	196.80	194.85	193.56	193.088	192.25	204.76
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Underidentification test												
Anderson canon. corr. LM statistic	191.7	190.6	191.9	204.9	191.9	192.6	193.4	191.5	190.2	196.5	189.0	201.0
p value	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
Weak Identification test												
Cragg-Donald Wald F statistic	195.0	194.0	195.3	208.8	195.3	196.0	196.8	194.9	193.6	196.5	192.2	204.8
Stock-Yogo weak ID test critical values 10% maximal	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Overidentification test of all instruments	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified
Endogeneity test of endogenous regressors:	0.60	0.76	0.60	0.01	0.18	0.92	1.09	0.11	0.55	3.30	4.50	1.03
p value	0.44	0.38	0.44	0.92	0.67	0.34	0.30	0.74	0.46	0.07	0.03	0.31

*Note: Data are weighted by respondent's survey sampling weight. Gini at municipality level and lagged (2000 and 2005). Unemployment rate at state level and lagged (2002 and 2006). Treated municipalities in bottom 9 deciles of drug-related homicides during 2006-2009. Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses. Source: ENSI 2005, 2010. Gini, unemployment INEGI. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).*

Table A.7 First Stage IV Results from Difference-in-Difference Controls vs. Treated by Cartels

	Car theft (1)	Theft of car accessories (2)	Household Burglary (3)	Mugging (4)	Kidnapping (5)	Lesions (6)	Sexual crime (7)	Fraud (8)	Extorsion (9)	Other thefts (10)	Other crimes (12)	Suffered any kind of crime (13)
Post-treatment dummy	0.074***	0.074***	0.074***	0.076***	0.074***	0.075***	0.074***	0.074***	0.074***	0.074***	0.074***	0.076***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Respondent is a female	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Respondent's age	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Respondent is an entrepreneur	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Respondent's has highschool or higher education level	0.007*	0.006	0.007*	0.008**	0.007*	0.007	0.007*	0.007*	0.007*	0.007*	0.007*	0.008*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Respondent's size of household	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lagged Ln Gini of the municipality where crime ocurred	-0.958***	-0.960***	-0.957***	-0.954***	-0.958***	-0.960***	-0.958***	-0.958***	-0.960***	-0.961***	-0.959***	-0.957***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
Lagged unemployment rate of the state where crime ocurred	0.125***	0.124***	0.125***	0.123***	0.125***	0.124***	0.124***	0.125***	0.125***	0.124***	0.124***	0.121***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Municipality where crime ocurred was decentralized in 2005*Post treatment dummy	-0.094***	-0.094***	-0.094***	-0.097***	-0.094***	-0.094***	-0.094***	-0.094***	-0.094***	-0.094***	-0.093***	-0.096***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
R2	0.317	0.316	0.316	0.315	0.317	0.317	0.316	0.317	0.317	0.317	0.316	0.314
Observations	10850	10830	10845	10799	10850	10840	10850	10849	10839	10845	10844	10755
F test of excluded instruments:	193.97	193.97	195.32	208.79	195.31	196.03	196.80	194.85	193.56	196.52	192.25	204.76
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Underidentification test												
Anderson canon. corr. LM statistic	195.04	190.63	191.94	204.90	191.93	192.62	193.36	191.48	190.24	193.09	188.97	201.00
p value	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00
Weak Identification test												
Cragg-Donald Wald F statistic	135.3	194.0	195.3	208.8	195.3	196.0	196.8	194.9	193.6	196.5	192.2	204.8
Stock-Yogo weak ID test critical values 10% maximal	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Overidentification test of all instruments	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified
Endogeneity test of endogenous regressors:	0.60	0.76	0.60	0.01	0.18	0.92	1.09	0.11	0.55	3.30	4.50	1.03
p value	0.44	0.38	0.44	0.92	0.67	0.34	0.30	0.74	0.46	0.07	0.03	0.31

*Note: Data are weighted by respondent's survey sampling weight. Gini at municipality level and lagged (2000 and 2005). Unemployment rate at state level and lagged (2002 and 2006). Treated municipalities with cartels operating in 2006 or after but no drug-related homicides during 2006-2009. Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses. Source: ENSI 2005, 2010. Gini, unemployment INEGI. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).*

Table A.8: First Stage IV results from Impact of Drug-Related Homicides and Cartels on Respondent's Perceptions

	Respondents living in municipalities used as control vs treated by drug-related homicides							Respondents living in municipalities used as control vs treated by cartels but not drug-related homicides						
	Believes crime increased in municipality (1)	Believes living in this municipality is unsafe (2)	Does not trust the local police (3)	No longer goes out at night (4)	No longer visits friends and relatives (5)	No longer uses taxis (6)	No longer uses public transport (7)	Believes crime increased in municipality (8)	Believes living in this municipality is unsafe (9)	Does not trust the local police (10)	No longer goes out at night (12)	No longer visits friends and relatives (13)	No longer uses taxis (14)	No longer uses public transport (15)
Post-treatment dummy	0.879***	0.878***	0.883***	0.881***	0.879***	0.900***	0.870***	0.111***	0.110***	0.116***	0.122***	0.113***	0.102***	0.106***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.009)	(0.006)
Respondent is a female	0.003**	0.003**	0.002	0.003**	0.003**	0.004**	0.004**	0.003	0.002	0.001	0.001	0.002	-0.004	-0.000
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Respondent's age	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000*	-0.000**	0.000	-0.000	-0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Respondent is an entrepreneur	0.006**	0.006**	0.004**	0.005**	0.006**	0.001	0.009***	0.002	0.002	0.002	0.001	0.002	0.003	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)
Respondent's has highschool or higher education level	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	0.006	0.007	0.001	0.010**	0.006	0.008	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.006)	(0.005)
Respondent's size of household	-0.000	-0.000	-0.000	-0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.001	-0.000	-0.001	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lagged Ln Gini of the municipality where crime ocurred	0.001	0.001	0.027	-0.003	0.001	0.067***	0.006	-0.666***	-0.692***	-0.643***	-0.663***	-0.666***	-0.317***	-0.613***
	(0.016)	(0.015)	(0.017)	(0.016)	(0.016)	(0.018)	(0.017)	(0.043)	(0.042)	(0.047)	(0.044)	(0.042)	(0.065)	(0.045)
Lagged unemployment rate of the state where crime ocurred	-0.019***	-0.018***	-0.021***	-0.017***	-0.018***	-0.002	-0.012***	0.150***	0.152***	0.135***	0.147***	0.147***	0.180***	0.143***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.007)	(0.006)
Municipality where crime ocurred was decentralized in 2005*Post treatment dummy	-0.061***	-0.059***	-0.065***	-0.062***	-0.061***	-0.045***	-0.052***	-0.084***	-0.082***	-0.075***	-0.093***	-0.084***	-0.036***	-0.074***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.011)	(0.008)
R2	0.845	0.845	0.844	0.847	0.845	0.877	0.843	0.270	0.274	0.256	0.273	0.269	0.282	0.249
Observations	55716	56988	45206	52938	55770	35475	47311	10447	10735	8394	9898	10497	5049	8969
F test of excluded instruments:	363.75	348.09	331.04	363.73	366.71	150.53	220.83	199.18	193.14	156.66	223.09	202.39	20.88	148.05
Prob > F	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
Underidentification test														
Anderson canon. corr. LM statistic	361.41	346.00	328.66	361.27	364.34	149.92	219.83	195.52	189.80	153.86	218.23	198.63	20.83	145.72
p value	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weak Identification test														
Cragg-Donald Wald F statistic	363.75	348.09	331.04	363.73	366.71	150.53	220.84	199.18	193.14	156.66	223.09	202.39	20.88	148.05
Stock-Yogo weak ID test critical values 10% maximal	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38
Overidentification test of all instruments	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified
Endogeneity test of endogenous regressors:	19.49	1.73	1.18	5.00	11.91	0.06	2.72	0.85	2.23	0.27	0.01	0.82	0.06	0.03
p value	0.00	0.19	0.28	0.03	0.00	0.81	0.10	0.36	0.14	0.61	0.95	0.36	0.81	0.86

*Note: Data are weighted by respondent's survey sampling weight. Gini at municipality level and lagged (2000 and 2005). Unemployment rate at state level and lagged (2002 and 2006). Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses. Source: ENSI 2005, 2010. Gini, unemployment INEGI. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).*

Table A.9: First Stage IV impact of Drug-Related Homicides and Cartels on Respondent's Actions

	Respondents living in municipalities used as control vs treated by drug-related homicides								Respondents living in municipalities used as control vs treated by cartels but not drug-related homicides							
	Bought an insurance policy (1)	Improved security (locks, walls, alarms, got a dog) (2)	Hired private police (3)	Increased security in car (4)	Experienced crime and moved of address afterwards (5)	Experienced crime, but did not officially report crime (6)	reported crime, but nothing happened as a result (7)	Officially reported crime, and recovered stolen items (8)	Bought an insurance policy (9)	Improved security (locks, walls, alarms, got a dog) (10)	Hired private police (12)	Increased security in car (13)	Experienced crime and moved of address afterwards (14)	ed crime, but did not officially report crime (15)	Officially reported crime, but nothing happened as a result (12)	Officially reported crime, and recovered stolen items (13)
Post-treatment dummy	0.878***	0.878***	0.878***	0.892***	0.954***	0.995***	1.028***	1.007***	0.076***	0.075***	0.070***	0.102***	-0.001	-0.008**	-0.015	-0.009
	(0.003)	(0.003)	(0.003)	(0.003)	(0.015)	(0.006)	(0.011)	(0.010)	(0.006)	(0.006)	(0.006)	(0.007)	(0.004)	(0.004)	(0.010)	(0.010)
Respondent is a female	0.004**	0.003**	0.003**	0.004**	-0.002	-0.006	0.004	-0.001	0.001	0.001	0.001	0.002	0.002	-0.001	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.009)	(0.004)	(0.006)	(0.005)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.005)	(0.005)
Respondent's age	-0.000	-0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Respondent is an entrepreneur	0.006**	0.006**	0.006**	0.006**	0.017*	-0.001	-0.013*	-0.007	0.002	0.003	0.003	0.003	-0.003	-0.002	0.004	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.010)	(0.004)	(0.008)	(0.007)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.002)	(0.006)	(0.006)
Respondent's has highschool or higher education level	-0.001	-0.002	-0.001	-0.001	-0.005	0.003	-0.002	0.009	0.008*	0.007*	0.008*	0.007*	0.000	-0.001	-0.010**	-0.009*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.009)	(0.004)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.005)	(0.005)
Respondent's size of household	-0.000	-0.000	-0.000	0.000	0.003	0.001	0.005**	0.002	0.000	0.000	0.000	0.000	-0.000	-0.001**	-0.003*	-0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Lagged Ln Gini of the municipality where crime ocurred	-0.006	0.000	-0.005	-0.020	-0.042	0.096**	0.262***	0.092	-0.949***	-0.958***	-0.955***	-1.027***	-0.012	-0.068**	-0.061	-0.049
	(0.015)	(0.015)	(0.015)	(0.016)	(0.084)	(0.038)	(0.065)	(0.057)	(0.031)	(0.031)	(0.031)	(0.035)	(0.023)	(0.024)	(0.058)	(0.059)
Lagged unemployment rate of the state where crime ocurred	-0.018***	-0.019***	-0.018***	-0.016***	-0.048***	-0.040***	-0.041***	-0.020**	0.120***	0.124***	0.122***	0.126***	0.006*	0.012***	0.020**	0.015**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.012)	(0.005)	(0.008)	(0.007)	(0.005)	(0.005)	(0.005)	(0.006)	(0.003)	(0.003)	(0.007)	(0.007)
Municipality where crime ocurred was decentralized in 2005*Post treatment dummy	-0.062***	-0.060***	-0.060***	-0.074***	0.037*	-0.083***	-0.075***	-0.047***	-0.094***	-0.094***	-0.090***	-0.131***	-0.002	0.018***	0.043***	0.030**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.020)	(0.008)	(0.015)	(0.013)	(0.007)	(0.007)	(0.007)	(0.008)	(0.005)	(0.005)	(0.012)	(0.012)
R2	0.845	0.845	0.845	0.857	0.943	0.940	0.964	0.974	0.311	0.316	0.312	0.345	0.015	0.028	0.062	0.044
Observations	56706	57324	56717	48335	872	4508	1058	960	10639	10801	10591	8515	623	3173	776	696
F test of excluded instruments:	378.27	357.98	361.94	494.17	3.27	100.14	24.57	12.28	192.62	196.19	177.36	281.02	0.12	15.96	13.49	6.65
Prob > F	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.01
Underidentification test																
Anderson canon. corr. LM statistic	375.8	355.8	359.7	489.2	3.3	98.0	24.1	12.2	189.3	192.8	174.5	272.0	0.1	15.9	13.4	6.7
p value	0.00	0.0	0.0	0.0	0.07	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.01
Weak Identification test																
Cragg-Donald Wald F statistic	378.3	358.0	361.9	494.2	3.3	100.1	24.6	12.3	192.6	196.2	177.4	281.0	0.1	16.0	13.5	6.7
Stock-Yogo weak ID test critical values 10% maximal	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Overidentification test of all instruments	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified
Endogeneity test of endogenous regressors:	0.1	23.0	42.5	22.1	0.0	1.6	2.6	0.3	10.0	0.6	0.1	2.5	0.0	2.1	0.3	0.1
p value	0.7	0.0	0.0	0.0	1.0	0.2	0.1	0.6	0.0	0.4	0.8	0.1	0.9	0.1	0.6	0.7

*Note: Data are weighted by respondent's survey sampling weight. Gini at municipality level and lagged (2000 and 2005). Unemployment rate at state level and lagged (2002 and 2006). Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses. Source: ENSI 2005, 2010. Gini, unemployment INEGI. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).*

Table A.10 First Stage IV differences in security spending, participation and impunity in 2010 between respondents living in controls and treated municipalities

	Spent in security USD				Believes his/her participation is important to reduce crime				Believes that criminals are punished in this municipality				Believes federal goverment strategy against organised crime is working			
	Panel A	Panel B	Panel C	Panel D	Panel A	Panel B	Panel C	Panel D	Panel A	Panel B	Panel C	Panel D	Panel A	Panel B	Panel C	Panel D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Post-treatment dummy	-0.008	0.017	-0.009	0.022	-0.003	0.012*	-0.003	0.004	-0.002	0.010	-0.002	0.003	-0.001	0.011	-0.001	0.005
	(0.008)	(0.012)	(0.008)	(0.018)	(0.005)	(0.007)	(0.005)	(0.009)	(0.005)	(0.007)	(0.005)	(0.009)	(0.005)	(0.007)	(0.005)	(0.009)
Respondent is a female	-0.000	0.001**	-0.000	0.000	0.000	0.001**	0.000	0.000	-0.000	0.001**	-0.000	0.000	0.000	0.001***	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Respondent's age	-0.007	-0.029*	-0.005	-0.023	-0.007	-0.005	-0.006	0.001	-0.007	-0.011	-0.007	-0.000	-0.008	-0.007	-0.007	0.001
	(0.010)	(0.015)	(0.010)	(0.022)	(0.006)	(0.009)	(0.006)	(0.011)	(0.006)	(0.009)	(0.006)	(0.011)	(0.006)	(0.009)	(0.007)	(0.011)
Respondent is an entrepreneur	0.057***	-0.002	0.059***	0.048*	0.051***	-0.007	0.053***	0.055***	0.052***	-0.010	0.054***	0.056***	0.049***	-0.007	0.051***	0.052***
	(0.009)	(0.017)	(0.009)	(0.026)	(0.007)	(0.011)	(0.007)	(0.015)	(0.007)	(0.011)	(0.007)	(0.015)	(0.007)	(0.011)	(0.007)	(0.015)
Respondent's has highschool or higher education level	-0.006**	-0.010**	-0.006**	-0.005	-0.006***	-0.008***	-0.006***	-0.005**	-0.007***	-0.008***	-0.007***	-0.006**	-0.007***	-0.008***	-0.007***	-0.005**
	(0.002)	(0.003)	(0.002)	(0.005)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
Respondent's size of household	0.886***	0.344***	0.883***	0.468***	0.987***	0.534***	0.976***	0.441***	0.984***	0.532***	0.972***	0.413***	0.990***	0.532***	0.979***	0.429***
	(0.044)	(0.058)	(0.044)	(0.088)	(0.026)	(0.033)	(0.026)	(0.045)	(0.026)	(0.033)	(0.026)	(0.045)	(0.026)	(0.034)	(0.027)	(0.046)
Lagged Ln Gini of the municipality where crime ocurred	0.071***	-0.013*	0.073***	0.058***	0.076***	-0.018***	0.080***	0.044***	0.075***	-0.019***	0.078***	0.045***	0.073***	-0.020***	0.077***	0.044***
	(0.005)	(0.007)	(0.005)	(0.012)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)	(0.006)
Lagged unemployment rate of the state where crime ocurred	-0.045***	0.082***	-0.052***	-0.083***	-0.072***	0.059***	-0.080***	-0.077***	-0.071***	0.058***	-0.080***	-0.077***	-0.072***	0.063***	-0.080***	-0.079***
	(0.008)	(0.012)	(0.008)	(0.018)	(0.005)	(0.007)	(0.005)	(0.009)	(0.005)	(0.007)	(0.005)	(0.009)	(0.005)	(0.007)	(0.005)	(0.009)
Municipality where crime ocurred was decentralized in 2005	1.383***	0.359***	1.375***	0.401***	1.433***	0.562***	1.411***	0.438***	1.439***	0.566***	1.417***	0.423***	1.446***	0.559***	1.426***	0.436***
	(0.039)	(0.058)	(0.040)	(0.095)	(0.024)	(0.033)	(0.024)	(0.047)	(0.024)	(0.033)	(0.024)	(0.046)	(0.024)	(0.033)	(0.025)	(0.048)
R2	0.066	0.065	0.068	0.064	0.079	0.056	0.082	0.059	0.078	0.057	0.081	0.058	0.077	0.059	0.080	0.057
Observations	9071	1828	8920	1377	28576	7055	27891	5466	28833	7156	28128	5546	27968	6837	27303	5282
F test of excluded instruments:	30.07	44.05	37.86	21.04	214.63	74.81	255.219	72.60	210.93	71.86	252.88	74.51	278.57	82.52	250.320	73.24
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Underidentification test																
Anderson canon. corr. LM statistic	30.0	43.2	37.7	20.9	213.092	74.114	257.493	71.761	209.467	71.233	250.709	73.64	209.26	81.645	252.553	72.363
p value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00
Weak Identification test																
Cragg-Donald Wald F statistic	30.1	44.0	37.9	21.0	214.626	74.806	3.245	72.596	210.934	71.859	252.883	74.51	209.258	82.523	333.653	73.243
Stock-Yogo weak ID test critical values 10% maximal	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Overidentification test of all instruments	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified	exactly identified
Endogeneity test of endogenous regressors:	0.03	9.91	0.00	10.55	6.536	0.306	3.553	0.201	3.645	0.917	1.009	2.519	26.468	15.963	21.24	24.2
p value	0.86	0.00	0.97	0.00	0.01	0.58	0.07	0.65	0.06	0.34	0.32	0.11	0.00	0.00	0.00	0.00

Note: Panel A: Controls vs. all treated municipalities by drug-related homicides. Panel B: Controls vs. treated municipalities top 10 decile drug-related homicides. Panel C: Controls vs. treated municipalities in bottom 9 deciles of drug-related homicides. Panel D: Controls vs. treated by cartels but no drug-related homicides.

*Data are weighted by respondent's survey sampling weight. Gini at municipality level and lagged (2000 and 2005). Unemployment rate at state level and lagged (2002 and 2006). Significance Level * p<0.10, ** p<0.05, *** p<0.001. Standard errors in parentheses. Source: ENSI 2005, 2010. Gini, unemployment INEGI. Drug-related homicides SNSP. Municipalities with operating narcos Gutiérrez-Romero and Oviedo (2014).*

Conclusions

Over the last several decades, a number of analyses have studied the question of how to prevent and reduce the incidence of crime. In developed and developing regions, crime has become a major concern and has been recognized as a severe obstacle to development.

Taken as a whole, this PhD thesis is an effort to deepen our understanding of the role that some economic and sociodemographic factors play in determining crime. The thesis makes two main contributions to the literature of the economics of crime. First, it explores how economic and political incentives influence some of the major forms of modern criminal behavior, including the theft of property in the developing and developed world, and how drug-cartels might induce further crime victimization in Mexico. Second, the results are also relevant to policies that could be designed to reduce crime victimization and the impact on the welfare of general population. The main findings of the thesis are described below.

The first chapter examines the link between inequality and national crime rates. Our results support the hypothesis that in Europe, over the period of 1993-2008, income inequality is highly significant in the explanation of property crimes. This analysis does not simply confirm the relationship between income inequality, burglary, and MVT, but also proposes that the relationship is non-linear and decelerating. Moreover, individual perceptions and beliefs about income distribution (at an aggregate level) play a chief role in the decision to commit crimes. A strength of the methodology used in this analysis is the use of the instrumental variable technique to account for the potential endogeneity of people's beliefs about income inequality. The main results extend to different types of crimes, including homicides, robberies and drug-related offences, and to the control for country characteristics as well as country-fixed effects to account for time-invariant unobservable variables. Since the perception of inequality turns out to be a significant incentive for crime, government redistribution policies have the positive side effect of reducing criminality.

In the second chapter, I explore the incidence of homicide across 70 countries. With the model of social conflict proposed by Esteban and Ray (2011) as the theoretical background, this analysis tests the impact of the different dimensions of population heterogeneity on national homicide rates. The approach finds a positive relationship between ethnic fractionalization and homicide, across 70 countries, for the period of 1995-2007, and across a number of different specifications.

By proposing the idea that intentional homicides are linked to three distinct dimensions of ethnic division, this paper provides a completely alternative view of the analysis of ethnic cleavages as major determinants of homicides. One of the important implications of the current study for future cross-country studies is that ethnic heterogeneity in the population appears to increase homicide rates. Consequently all public policies facilitating a harmonious relationship among diverse ethnic and economic groups will significantly contribute to the reduction of homicide.

The last chapter addresses victimization in Mexico and provides an econometric analysis of the impact of drug cartels and drug-related homicides on crime and security perceptions. Results reveal a mixed picture of how citizens have been affected across different areas. The perception of the lack of safety is high among respondents living in areas affected by drug-related homicides. These respondents also take more measures to increase their security, spend more on security than those living in areas not affected by drug-related violence. Perceptions of the lack of security, on the other hand, do not change in areas where cartels operate without committing drug-related homicides. These results support previous research that assumes that drug-cartels increase crime rates and perceptions of the lack of safety. From the analysis presented in the last chapter, it is clear that governments need to address the drug trade as a motivator of violence. Effective measures against the drug trade could help to build trust between institutions and communities.