The impact of media coverage on crime rates and crime style

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Abstract

Contributing to a more nuanced and detailed understanding of the effects that media contents may have on crime, this paper presents compelling empirical evidence that media portrayals of crime influences the probability of using similar crime styles, not of engaging in more criminal actions. We tracked 31,676 homicides carried out by drug cartels operating at the US-Mexico border, its stylistic characteristics, and the detail with which the media covered each of them. With this uniquely detailed and large data, we estimated reaction functions to determine the Granger causality between the quality of media coverage, crime rates and crime style. Our estimates show that when the media covers crimes in larger detail, criminals react by increasing the certain criminal styles such as leaving credit-taking banners or exposing the tortured bodies of their victims. Up to 53% of the variance in criminal styles can be traced back to changes in the quality of media coverage. These results indicate that media coverage does not encourage criminal acts, but may strongly influence the modality under which crimes are conducted.

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There is a widespread notion that detailed media coverage of criminal acts creates models of crime that function as direct causes of criminality, or as crime “triggers”, for at-risk populations (Surette, 2013). For example, evidence suggests that at least 30 separate occurrences of gun violence were inspired by the Russian Roulette scene from the movie The Deer Hunter (Gunter, 2008). Additionally, the shooter in The University of Virginia Tech massacre was initially thought to be copying events from an action movie (Nizza, 2013). Lastly, the rape of a nine-year-old with a bottle was connected to a scene from the movie “Born Innocent” (Gunter, 2008).

As a result, it is not surprising to see the implementation of public policies that aim to reduce crime by controlling media contents, particularly in developing countries. For example, Zimbabwe’s government attempted to regulate international news outlets and prevent negative media portrayals that might encourage violent uprisings against it (Surette, 2013). Likewise, during the nineties, Colombia convinced 35 top communication outlets to sign the “Discretion Agreement” and reduce the coverage of violent paramilitary groups by appealing to national security and violence reduction. Mexico followed a similar path in 2011, when the Federal government proposed an agreement (“Agreement on Media Coverage of Violence”) with 700 media outlets to reduce coverage of drug-related crime (Philip and Berruecos, 2012).

Despite all this, much research is still needed to prove whether the relationship between media coverage and crime rates is empirically robust and unidirectional (Surette, 2013). The unsettled debate about whether media coverage promotes criminal behavior or crimi-
nal ideation is one of the most lively areas of criminality research (Surette, 2013; Ferguson et al., 2008), and it is also becoming important to the study of political violence.

While some argue that exposure to media coverage of crime is itself criminogenic, meaning likely to cause crime, others see the media as an instructional guide for individuals that were going to commit crimes anyway. The first group has developed the General Aggression Model, which argues that exposure increases crime by “triggering” aggressive behavior and by assisting in the development of callous dispositions (Bushman and Anderson, 2002; Anderson et al., 2007). The second group has a more favorable view, arguing that exposure merely provides criminals with inspiration, it influences the style of the crime but does not cause it. In other words, media coverage of crime here acts as a “rudder”; although it can change the direction the boat is going, it is not the source of propulsion (Ferguson et al., 2008; Surette, 2013).

This paper examines whether media coverage of crime functions as a crime “trigger”, or as a crime “rudder”, by testing both models. To accomplish this, we rely on a unique database that records the violent criminal activities of drug cartels operating at the US-Mexico border, and the stylistic characteristics of their crimes. Specifically, we identify the rates of drug-related homicides per week in more than 2,500 counties/municipalities. We also identify whether these murders were accompanied by public banners, known as “narco-messages”, a stylistic feature that is sometimes used by drug cartels (Campbell and Hansen, 2014; Martin, 2012; Atuesta, 2017). Criminal activities, especially homicides, are typically understood as clandestine in nature, however, we find counterintuitive evidence that the use of narco-messages occurs the most when the press has covered similar modalities in the weeks before.
Our results show that “criminogenic styles”, such as using credit-taking banners and exposing bodies/dismemberment in crime scenes, react to media coverage. These “criminogenic styles” are such in that they do cause crimes to take on certain features, but do not cause the crime itself. Specifically, we provide evidence of Granger causality from media coverage to crime style, but not to crime rates. Furthermore, we provide evidence that crime style reacts to media coverage unidirectionally, rather than as a cycle. Our results show that as much as 53% of the error in the forecast of credit-taking crime styles is explained by changes in the quality of media coverage. Moreover, we find that when the media covers crimes in larger detail, criminals increase the use of credit-taking and body exposure styles in their crimes. These findings provide valuable insight into one of the most controversial areas of criminality research: the relationship between crime coverage in the media and criminal behavior.

The rest of the paper proceeds as follows. The first section discusses the existing literature about media coverage and crime. The second section presents original data and describes empirical tests. The third and fourth sections present results and robustness tests. Both sections show that media coverage of crime functions as a crime “rudder”, but not as crime “trigger”, particularly when media is detailed in covering the style of crimes. We conclude by discussing how the paper contributes to the literature, and by suggesting possible avenues for future research.

**Media coverage and crime**

A large body of criminology literature has tried to determine whether exposure to criminogenic media content “triggers” delinquency and aggression, or just acts as a “rudder”,
by providing instructional models of style for individuals that already had criminal intentions. The debate in the literature as to which understanding best describes the role of the media has, overall, lacked conclusive results.

In support of the “trigger” theory, many studies have shown some significant effects between media consumption and crime (Bushman and Anderson, 2002; Anderson and Carnagey, 2004; Anderson and Bushman, 2001; Doley et al., 2013; Chadee et al., 2017). Moreover, the relation between media and criminal conduct has also been attributed to the constant portray of violence that might result in ideas for potential criminal minds (Surette, 2013; Surette and Gardiner-Bess, 2013).

Other scholars have shown that violent media content can drive individuals that already have violent thoughts and behavior (Surette and Gardiner-Bess, 2013; Ivory and Kaestle, 2013; Ferguson, 2015). Gunter (2008) provides evidence that shows how criminals have modeled their crimes from media content. Moreover, this relation is stronger for people that have similarities with criminal character (Huesmann, 1986; Surette, 2013). Other scholars have found evidence of increased hostility and engagement in physical fights among individuals exposed to violent video games (Anderson et al., 2007, 2010), and violent song lyrics (Anderson et al., 2003).

However, there is also supporting evidence for the “rudder” theory, as many studies have shown a lack of correlation, or lack of causality, between media content and crime (Ferguson et al., 2012, 2009, 2008; Ferguson and Kilburn, 2009; Freedman, 1984; Savage, 2004; Freedman, 2008; Ferguson, 2002; Huesmann and Taylor, 2006; Gunter, 2008; Murray, 2008). Even if a significant and causal effect could be found, some academics claim that

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1For example, violent media tends to be watched the most by those with a relatively higher taste for violence (Brown and Hamilton-Giachritsis, 2005; Huesmann and Taylor, 2006; Coyne, 2007; Savage, 2008; Savage and Yancey, 2008; Bushman and Huesmann, 2014; Helfgot, 2015).
it could not be large enough to change aggregated criminal rates in notable ways (Surette and Gardiner-Bess, 2013; Elson and Ferguson, 2014; DeCamp and Ferguson, 2017). This literature refuses to assume viewers are “passive receptacles of learning”, and instead conceives individuals as “active shapers and processors of media culture” (Elson and Ferguson, 2014). As a result, they argue that the interaction between media and behavior is shaped by media users, not media content (Elson and Ferguson, 2014).

Furthermore, several studies have shown a stronger and more solid association between media coverage of crime and the stylistic decisions of criminals. To these scholars, the media is more a source of crime techniques than a source of crime motivation. In general, this literature argues that the media’s criminogenic influence concentrates in populations with pre-existing susceptibility to criminality. More specifically, it shows that environmental factors and psychological predispositions are behind disruptive behavior disorders, rather than just exposure to media or video games. Based on this research, courts have systematically ruled against attributing any significant impact to the media (Ferguson and Dyck, 2012; Ferguson et al., 2012; Grimes et al., 2008; Ferguson and Savage, 2012).

The work of Surette (2014), for example, analyzed anonymous surveys of 574 male and female correctional inmates. Surette concluded that the media influenced the style of crimes by providing instructional models to predisposed individuals, yet it did not prompt crime per se (Surette, 2014). He coined the term “ruddering” to illustrate how media portrayals of criminality shape the stylistic form the crime takes on, instead of acting as a direct catalyst for the crime itself (Surette, 2013).

This debate stands unresolved, mostly because of the difficulties involved in finding appropriate ways to measure and correlate the role of the media as a “trigger” or “rud-
The first difficulty is gathering data on “copycat” criminals. Most studies rely on evidence gathered from post-crime interviews with offenders. This means that all these studies are subject to perception biases and self-justification. Offenders may rationalize their criminal behavior by attributing it to the impact of the media, or to other third parties, because they find it comforting to avoid the cost of decision making. To mitigate this problem, studies have tried to identify copycat criminals based on the facts of the case. Despite this, the lack of a centralized and comparable source of information that describes crimes occurring at different times and in different police jurisdictions is a serious challenge. Furthermore, even if two crimes appear to be similar, scholars cannot be certain that they were inspired by the same source.

A second difficulty is that media coverage and criminal behavior may enforce one another. Front-pages prioritize content with higher audience ratings and editors approval. Criminal groups may perpetuate noticeable violent actions to gain more visibility to intimidate their enemies. Indeed, there is much evidence that media coverage is proactively sought by some criminals who wish to advance their criminal objectives by receiving attention and inducing fear. Terrorists are the most common type of such criminal, followed by other criminal organizations, and some research has found that criminals tend to value media coverage the most when there is intergroup competition, when criminal groups identify with ethnic separatist groups instead of groups with
broad goals (Min, 2013), when criminal groups operate in democratic governments (Min, 2013), when criminal groups are non-religious (Wright, 2009), when attacks are less lethal for civilians (Abrahms and Conrad, 2017), when criminals are trying to perform particularly dramatic attacks (Wright, 2009), when criminal groups are “leaderless resistance” or not hierarchical (Brown and Hamilton-Giachritsis, 2005), and when terrorist groups want to claim credit (Wright, 2009).

In sum, testing for the criminogenic effects of media exposure is problematic because of the dynamic process between the media, which may be driven by sensationalism, and criminals, who may be benefited by the direct/indirect reputational gains of media coverage. Identifying which of these two reactions happens first is a methodological challenge, particularly when—as has been the case—academics lack data on the strategic choices of criminals that has been observed over long-enough time periods to provide material for statistical inference.

By directly tackling this issue, this paper contributes to studying how media immersion and narrative influences social behavior (Slater, 2007; Zhang et al., 2010; Valenzuela et al., 2012), to identifying the effects of violent media contents on criminal behavior (Surette, 2013), and to discerning how media, a crucial element of democracy, can tackle governance (McCarthy-Latimer and Kendrick Jr, 2016).

**Data**

Our study uses drug cartels operating at the US-Mexico border as our subjects because of their notably different stylistic patterns (Martini, 2012), and because their crime rates
Homicides perpetrated by drug cartels vary in style, stylistic differences can be found in the use of specific types of weapons, victims’ characteristics, types of torture, the display of dismembered or decapitated bodies at the crime scene, and in the use of other intentionally public displays, such as banners, that explain their motivations or intents (Shirk and Wallman, 2015; Durán-Martínez, 2015). Drug cartel-related crimes can be observed across 1,068 municipalities, from border cities like Río Bravo and Tamaulipas that had only 18 homicides from 2008 to 2010, to places like Juárez that endured 6,300 homicides during the same period. A burgeoning literature seeks to understand the levels of violence in Mexico (Dell, 2015; Ríos, 2015; Shirk and Wallman, 2015; Osorio, 2015; Calderón et al., 2015; Trejo and Ley, 2017), but research analyzing the dynamics within the conflict, such as communication strategies, has not kept pace.

Mexican drug cartels are highly relevant as case studies for the interaction of crime and media. It has been strongly questioned if media outlets should exhibit the violent activities of drug cartels. While some argue that media’s priority is to show to the public the truth, other arguments rely on the fact that violent media coverage inspire new forms of violence and serves as a channel for criminal organizations to gain visibility and disseminate their messages (Reyes, 2011). Despite this controversy, the Mexican National Institute of Information Access has decided to reserve the right to publish the records of drug cartel-related crime for up to 12 years, arguing that allowing publication sooner would also “allow criminal groups to generate instability and insecurity among the Mexican population” (Martin, 2012).

Our research was made possible due to the existence of two unique datasets that we collected to describe crime rates and crime styles among drug cartels operating at the
US-Mexico border. First, to measure “Crime Rates”, we obtained official registries of homicides attributed to drug cartels by Mexican intelligence and security institutions (SNSP 2011). During a short sui generis period (2007-2011), Mexican authorities allowed public access to a database that recorded whether a homicide was drug cartel-related. This gave us the unique opportunity to identify drug cartel-related violence in a georeferenced panel. To be considered drug cartel-related, a homicide needed to meet six criteria. These are (i) use of high-caliber firearms, (ii) signs of torture or severe lesions in victims, (iii) bodies found at the crime scene or in a vehicle, (iv) victims were taped, wrapped, or gagged, (v) murders happened in a prison and involved criminal organizations, and (vi) if one of several “special circumstance” occurred. Among these “special circumstances” are whether the victim was abducted prior to assassination (known as a “levantón” in Spanish), ambushed or chased, whether the victim was an alleged member of a criminal organization, and whether a criminal organization publicly claimed responsibility for the murder (Molzahn et al. 2012). In the period from 2008 to 2010, we identified 31,676 drug cartel-related homicides across 1,112 counties/municipalities. Overall, these homicides represent 95% of all homicides perpetrated during those years and in those areas.

Second, to measure “Criminogenic Style”, we constructed a database that identifies two discretionary stylistic features that sometimes accompany drug cartel-related homicides: credit-taking banners and bodies/dismemberment put on display. We matched official registries of homicides with our original data set of about 1,800 credit-taking banners displayed publicly by drug cartel organizations during 2007-2010. These banners, also known as “narco-messages” (Campbell and Hansen 2014; Martín 2012; Atuesta 2017; Mendoza Rockwell 2016; Durán-Martínez 2015), are used by drug cartels to take-credit for their criminal actions, or to clarify their degree of responsibility for them. Narco-
messages may also be displayed to intimidate potential victims, to communicate with local citizens, or to give instructions to investigators, policemen, or journalists (Martin, 2012). The content of the banners may be a threatening maxim like “you cannot be on good terms with both God and the Devil”, or an appeal to the public, like the claim that “this [battle for turf] is for the good of all”, or like the banner dedicated to “the brave, noble, and loyal people” wishing them “Merry Christmas, ho, ho, ho”. Narco-messages are a creepy stylistic innovation that stretches the boundaries of traditional graffiti with its bizarre mimicry of the formality of Mexican political campaign propaganda (Salopek, 2011).

Our database allowed us to identify the share of drug cartel murders that were accompanied by a credit-taking banner, we classified this as a dummy called “Credit-taking Style”.

The use of credit-taking messages in Mexico is fascinating in its own right, but this is not the only example of such phenomena. We have evidence of similar criminal messaging occurring around the world, in places such as Colombia, Southern Italy, and in numerous U.S. cities (Cowell, 1992; Carbray, 2002; Martin, 2012; Ortiz, 2013). Criminal messaging is also a major part of terrorism, which has been described as violent propaganda or violent communication (e.g., (Schmid and De Graaf, 1982)). A line of research has examined why terrorist groups sometimes claim their attacks (Wright, 2009), among reasons for doing so are intergroup competition (Hoffman et al., 2010), communication within the group (Brown and Hamilton-Giachritsis, 2005), and operation in democratic countries (Min, 2013). However, this literature also established that there are reasons militant groups do not seek credit. Such reasons could be that the attack was especially heinous, or the desire to avoid a bad reputation (Hoffman, 2010; Abrahms and Conrad, 2017).
Interestingly, and specific to the case of US-Mexico border drug cartels, we were also able to identify the share of credit-taking banners that were combined with another criminogenic style: the display of bodies or dismemberment (typically beheadings) (Durán-Martínez, 2015). The stylistic display of human heads or bodies is worth analysis because it helps us understand why the appearance of the crime scene is important to these kinds of criminals and how they use violence as a narrative. Narco-messages and bodies/dismemberment are typically displayed openly in high-traffic public areas where authorities, citizens, and journalists can easily find them. They are often found on roads, hanging from bridges, or dispersed around various parts of a city (Lantz, 2016). Out of the total of 1,800 narco-messages, 51% were accompanied by a body, or part of one. We created a dummy for homicides with this characteristic and called it “Body Exposure Style”.

We also developed two ways to measure the extent and the quality of the media coverage of criminogenic contents. To create the variable “Media Coverage”, we identified the amount of drug cartel-related homicides that were covered by the press. Beginning in 2007, news-media organizations closely followed organized crime-related homicides, keeping count independent of government sources. The most comprehensive coverage was done by Reforma, a major national newspaper with a large pool of correspondents, but other national newspapers like Milenio and El Universal also had their own independent counts (Molzahn et al., 2012). The “Justice in Mexico Program” www.justiceinmexico.org has also gathered statistics regarding media coverage of drug-related homicides from 2006 to 2017 (Reforma, 2017; Milenio, 2017). Out of the 32,199 homicides officially classified as perpetrated by drug cartels, 23,737 were covered by the press. Coverage is very different across time, and geography. For example, although the press covered 76% of the homi-
cides in 2010, in 2007 it only covered 63%. Also, in Oaxaca, 26% of drug cartel-related homicides were not covered, meanwhile, in Querétaro were all were covered by the press. It is important to note that Mexican news outlets and the Mexican government used a similar methodology to classify a homicide as drug cartel-related (Milenio 2017).

Finally, to identify the quality of media coverage, we measured the degree of detail with which each of the 1,800 narco-messages was reported. We classified coverage as “detailed” when the specific content of the narco-message was reported. This means that messages like “Esto les va a pasar a los que no respeten a los grandes jefes de La Familia” (this will happen to those that don’t respect La Familia’s great chiefs) could be read in their entirety in the newspaper (El Sol de Toluca 2009). Coverage classified as “non-detailed” was when the reporter only hinted at the existence of a narco-message without explicitly quoting its content. Out of our total sample, 74% of the messages were detailed. The share of detailed messages over total messages is represented by the variable “Media Coverage Quality”.

Our final dataset is thus a weekly-frequency panel with 5,408 observations over a period of 508 weeks between 2007 and 2010. We exploit state-level variations in measures of the extent and quality of media coverage, and in measures of the relative frequency of the two criminogenic styles: narco-messages and body/dismemberment displays. Descriptive statistics of our measures of media coverage, quality of media coverage, and criminogenic styles are shown in Table 1.

(Table 1 about here)

\(^2\)We use weeks as our frequency measure because media coverage measures were only available per week (Reforma 2017; Milenio 2017).
On average the media fails to cover 1.28 homicides per week, per state. The lowest recorded coverage was during the 13th week of 2010 when, in the state of Chihuahua, the media failed to report on 77 drug related homicides. There are instances in which media covers more homicides than the official count like during the 43rd week of 2010 for the state of Guerrero (61 more homicides). This happens when mass murder graves are found. Official records generally avoid these records as they consider them just part of previous “missing persons” statistics. Of the total events covered by the media, on average only 10.8% are reported in detail. Drug cartels take credit on average for 2.7% of their homicides. There are cases in which credit taking is up to 250% larger than homicides because many drug cartels take credit for a single action. Finally, on average 7.9% of credit-taking style homicides were accompanied with the display of bodies or dismemberment.

Empirical test

To address possible bidirectionalities between media coverage and crime, we rely on reaction functions and Granger causality tests as our main empirical specifications. These methods are an efficient way to show co-movements of multiple time series. A large empirical literature supports the use of Granger causality tests (Granger, 1969) for testing cycles (Jaeger and Paserman, 2008; Huang et al., 2008; Gambacorta et al., 2014) and as a relevant tool for crime studies with time series analysis (Saridakis, 2004; Ramirez, 2013; Hsu and McDowall, 2017).

Our panel vector autoregression consists of p lags of each variable in the equation, in this
case empirical reaction functions for Criminogenic style (Credit-taking or Body exposure style) and Media coverage (Media coverage or Media coverage quality):

\[ x_{it} = \beta_0 + \sum_{j=1}^{5} \beta_{1j} x_{it-j} + \sum_{j=1}^{5} \beta_{2j} z_{it-j} + e_{x_{it}} \]  

(1)

\[ z_{it} = \beta_0 + \sum_{j=1}^{5} \beta_{1j} z_{it-j} + \sum_{j=1}^{5} \beta_{2j} x_{it-j} + e_{z_{it}} \]  

(2)

where the \( \beta_1 \)'s and \( \beta_2 \)'s are matrices of coefficients for each state \( i \), on time \( t \). The terms \( z \) (for 1) and \( x \) (for 2) are vectors of exogenous variables that may shift the reaction function up or down, and \( e_x \) and \( e_z \) are the vector error terms. These equations can also be expressed in matrix form, letting \( Y_{it} = x_{it} z_{it} \) and \( e_{it} \):

\[ A(L)Y_t = e_{it} \]  

(3)

where \( e_{it} \) are structural shocks which are, by definition, uncorrelated with each other, and \( A(L) \) is a matrix lag polynomial of order \( A(L) = I - A_1 L^1 - A_2 L^2 + \cdots + A_p L^p \) where \( A_1 \) is:

\[ A_1 = \begin{pmatrix} \beta_{1,1}^x & \beta_{1,2}^x \\ \beta_{1,1}^z & \beta_{1,2}^z \end{pmatrix} \]  

(4)

Note that efficiency and consistency is achieved because all variables in the equations
are lagged \((t - 1\) or earlier), while the error term corresponds to time \(t\), and because all variables on the right side of the equations are the same.

This specification is advised to test whether two variables can be characterized as a cycle, or as a unidirectional effect. It fits our purposes because we want to determine if media coverage is reacting to past crime rates or crime styles, not to solve for a dynamic equilibrium.

Every panel vector autoregression model is accompanied by a Granger test, a joint significance test to check the significance of the coefficient of our lagged impulse and response variables. The null hypothesis that \(x\) does not Granger-cause \(y\) is accepted if and only if no lagged values of \(x\) are individually significant according to their t-statistics, provided that collectively they add explanatory power to the regression according to an F-test. The null hypothesis of the F-test is that there is not explanatory power jointly added by the \(x’\)'s. If our coefficients for the impulse variable are significant we can reject the hypothesis that the impulse variable is not causing the response variable to change. It is considered that the impulse variable will react to the response variable if the lagged values of the impulse variable have an effect on the current value of the response variable, controlling for the lagged values of the response variable.

When estimating a panel vector autoregression, we are generally not interested in our coefficients. Instead, we are interested in the dynamic responses of the variables to shocks. Therefore, we provide additional post-estimation analysis like nonparametric impulse reaction functions and forecast error in variance decomposition. An impulse-reaction function is a signal processing technique that allowed us to take our defined dynamic system with
an input signal, called an impulse, and to describe the reaction of the system to it as a function of time.

We followed Love and Zicchino (2006) to transform the system of equations into a recursive autoregressor vector with Choleski decomposition of variance-covariance matrix residuals. Note that residuals need to be orthogonal to control for other shocks. The forecast error in variance decomposition is useful to measure how relevant each shock is to the explanation of each variable in the equation system. This is the same as obtaining the size of the forecast error in variance for each variable, due to each shock at each period.

Results

Table 2 shows the results for the models that use combinations of variables for quality of media coverage and crime rates for both reaction functions, estimated from a panel vector autoregressor with five lags. Columns (1) and (2) show the relationship between quality of media coverage and crime rates. The results show that exposure to crime media does not trigger an increase in violent crime or aggression. Specifically, we can see that crime rates show no reaction in any of the five weeks following media coverage. Additionally, results show that quality of quality of media coverage also does not react to crime rates. Our Granger test supports this result, showing that we fail to reject the hypothesis that quality of media coverage does not “Granger cause” crime rates and vice versa.

Columns (3) and (4) show the relationship between the quality of media coverage and crime rates. The results show that crime rates do not react to criminogenic media content. Moreover, quality of media coverage has no reaction to crime rates. As expected, the
Granger test shows that quality of media coverage and crime rates both fail to predict each other.

(Table 2 about here)

In Tables 3 and 4, we present the same models as above, but for the two stylistic patterns: credit-taking (columns 1 and 2) and body exposure (columns 3 and 4).

Columns (1) and (2) of table 3 show the relationship between quality of media coverage and observations of crimes that have a credit-taking style. The results indicate that credit-taking styles of crime increase in a statistically significant way when similar crimes have been covered in the prior one, two and four weeks. The Granger test supports this result, showing that quality of media coverage helps to predict credit-taking behavior (5% significance level), but credit-taking behavior fails to predict quality of media coverage (35% level). Additionally, the forecast error in variance decomposition supports our findings. We can see that as much as 53% of the error in the prediction of credit-taking crimes is due to media coverage. In other words, about half of the variance of credit-taking style is explained, not by previous cases of credit-taking, but by increased detailed media coverage of cases of credit-taking. Drug cartels tend to take credit more for their crimes when the media has previously covered their crimes with detail.

Columns (3) and (4) show the relationship between quality of media coverage and observations of crimes that have a body-exposure style. The results are consistent with previous models, showing that body-exposure styles increase with quality of media coverage of similar crimes during the prior first and fifth weeks. The Granger test supports these findings that the quality of media coverage helps to predict body-exposure crime
styles but with lower significance than previous models. Accepting larger variance, the model shows that as much as 26% of the error in the forecast of the body-exposure crime style is due to quality of media coverage. A quarter of the variance of body-exposure style is explained, not by previous trends in cases of body-exposure, but by increased detailed media coverage of body-exposure crimes. In other words, rug cartels tend to expose bodies more when the media has previously covered their crimes with detail, yet this effect is less string than with credit-taking styles.

(Table 3 about here)

Overall, the models above provide evidence that media coverage functions as a crime “rudder”, and not as crime “trigger”. Our empirical specifications show that there is not any solid association between media exposure and crime rates. Also, that media coverage influences the style of the crimes perpetrated by drug cartel organizations operating at the US-Mexico border, but does not motivate more crime. In other words, we find compelling evidence that detailed media coverage influences crime style, but not crime rates. It is also noteworthy that the effects of detailed media coverage on credit-taking styles lasts up to 4 weeks.

The impulse reaction functions for credit-style taking and media coverage are presented in figure[1]. They use 95 percent confidence intervals and 1000 repetitions of Monte-Carlo simulations to create a 5 percent band error interval. The graph in the bottom-left corner describes how the number of credit-taking style crimes reacts to quality of media coverage, while holding all other shocks at zero. The graph in the top-right shows how quality media coverage reacts to credit-taking style crimes, while holding all other shocks at zero. The shocks and the impacts are presented as standard deviations.
The bottom-left corner of Figure 1 shows that increased quality media coverage of credit-taking crime styles increases similar crimes in the second and fourth week. This effect is statistically significant. During the third week, the positive effect decreases and loses statistical significance; however, it increases during the fourth week and becomes statistically significant again. After the fourth week, the graph shows a slightly decreasing tendency. Figure 1 also shows (top-right corner) that when there is a shock in crime-taking style; quality of coverage increases during the first and second week, decreases during the third and fourth week, and slightly increases during the fifth week, and has practically no effect after the fifth week. In this case, the effect of the credit-taking style on quality of media coverage is only statistically significant for the second week. This pattern is intuitive and it reflects the news cycle. It is unlikely that one incident would be in the news for more than two weeks, but specialized opinion or monthly reviews can pick the story up again once ‘it has been in the cooler’ for a while. This could explain the peaks of the coverage function.

In Table 4, we present the same models as in Table 3, but instead examine media coverage, independently it its quality. We have estimates for crime styles in the form of credit-taking (columns 1 and 3) and body-exposure (columns 3 and 4).

The results show that we do find a statistically significant reaction to media coverage. As in Table 4 above, both crime styles increase in a statistically significant way with media coverage. The impact of both crime styles seems to be present during the first, third, and
fourth weeks. Additionally, the Granger test supports a rejection of the hypothesis that media coverage does not cause the credit-taking criminal style (5% significance level), and a rejection of the body-exposure hypothesis (5% significance level). As much as 1.9% of the error in the forecast for credit-taking style, and 0.6% of the error in forecast for body exposure style is explained by changes in media coverage.

Our results show that criminogenic media content provides criminals with inspiration regarding the features of the crime, but does not cause crime. Interestingly, and quite consistent with theories showing that criminogenic media contents influence the style of a crime, we find that such influence is dramatically stronger when media covers crime with full detail. In the case of the most detailed media coverage, we observe impacts that are 28 times larger.

Figure 2 presents the impulse-reaction functions with 95 percent confidence bands for credit-taking and for media coverage (columns 1 and 2 in Table 4). The graph in the bottom-left corner describes how credit-taking reacts to the media coverage, while holding all other shocks at zero. The graph in the top-right shows how media coverage reacts to crimes exhibiting the credit-taking style. The shocks and the impacts are presented as standard deviations.

The bottom-left corner of Figure 2 shows that when there is an increase in media coverage, credit-taking crimes increase in the following week. This effect is statistically significant. During the second week, the positive effect decreases but keeps its statistical significance. In the third week after coverage, the positive effect decreases again and loses significance. During the fourth week, however, the positive effect increases and becomes statistically
significant again. After the fourth week period, the graph indicates the beginning of a slightly decreasing tendency without statistical significance.

(Figure 2 about here)

Turning to the top-right corner of Figure 2 we see that credit-taking crimes cause coverage to increase during the first week, decrease during the second and third week, peak during the fourth week, but it has practically no effect after.. In this case, the effect of credit-taking crime on media coverage is only statistically significant for the third week. Again, this pattern reflects the news cycle.

Robustness tests

To interrogate our data further, we tested for heterogeneous effects driven by (a) the strength of drug cartel territorial entrenchment, and (b) the degree in which drug cartels follow media coverage. The logic of behind these tests is straightforward. First, if criminogenic media coverage serves as inspiration for crime style, as we proved in our previous models, then we should expect that media coverage will have a larger effect in are where drug cartels are more entrenched and thus, more physically present to be influenced. Second, if the media provides instructional cues to people intending to perform criminal acts, we may see different effects depending on how much drug cartels follow the dissemination of information by the media. We expect that media coverage will have a larger effect in areas where traffickers more closely follow media coverage.

We began by testing heterogeneous effects by the strength of drug cartel territorial en-
trenchment. We determine whether a state is drug cartel territory by identifying the presence of drug cartels in different territories over time. To measure drug cartel presence, we relied on a published big-data framework that uses a text-analysis algorithm to extract web content about recorded criminal activities by subnational economy. The algorithm “reads” digitalized records, news content, blogs and Google-News indexed content searching for instances in which drug cartel operations are mentioned. The Python crawler was created to extract JSON objects using unambiguous query terms to perform text analysis. The final data, cleaned using a hyper-geometric cumulative distribution function, includes 2,449 sub-national economies, and 178 “actor terms” associated with traffickers and drug cartel organizations. Each actor was classified according as part of 13 drug cartels and a residual category. We have information of 13 drug cartels operating in Mexico for 19 years (1991 - 2010). Drug cartel organizations operate in 713 municipalities in Mexico, and in most of the US-Mexico border. A more detailed description of the methodology that we followed can be found at the published paper (Coscia and Rios, 2012).

This framework allowed us to obtain information of a phenomenon that would otherwise require large scale, expensive intelligence exercises. Most importantly, this procedure helped us to disentangle drug cartels performing violent crimes from drug traffickers that are present in peace. Many of the recorded drug cartel operations are non-violent, consistent in peacefully trading, transporting, producing or cultivating illegal drugs. This data set has been a source to study criminal activity in many published papers (Osorio, 2015; Castillo et al., 2014; Dube et al., 2016; Holland and Rios, 2017).

Table 5 shows our estimates for the quality of media coverage and credit-taking style for two subsets: areas that are geographical bastions for drug cartels, and areas that are not.
The results indicate that crimes with credit-taking style react in a statistically significant way on the first, second and fourth, as detailed coverage increases. Meanwhile, locations where drug cartels are not entrenched only exhibit association between criminogenic media content and the stylistic decisions made by criminals during the second week. The Granger test bolsters these findings, showing that media coverage helps to predict credit-taking crimes (10% significance level) in places where drug cartels are entrenched, but fails to do so otherwise (30% significance level). Furthermore, the forecast error in variance decomposition supports our findings. We can see that as much as 52% of the error in the forecast for credit-taking crimes is due to quality of media coverage.

(Table 5 about here)

A second robustness tests was conducted to evaluate heterogeneous effects the degree in which drug cartels follow media coverage. Following the research of Holland and Rios (2017), we used statistics of violence against the press as a proxy to measure how much drug cartels care about the dissemination of information. The degree in which individuals care about the dissemination of information is crucial in determining the violence that they are willing to employ against potential informants (Reuter, 1983; Kalyvas, 2006). Only drug cartels that are powerful and that care and pay attention to the media will incur in the potentially quite large cost of inflicting violence against journalists to silence the press. Violence against the press is costly because it may lead to increased federal attention and enforcement on local illicit activity. Thus, incurring on the high cost of inflicting violence to journalists is a proxy for how much drug cartels care and pay attention to media contents.

To identify the existence of violence against the press, we used journalist homicide data
collected by the Committee to Protect Journalists (CPJ). This same data has been used before in published academic articles like Holland and Rios (2017). The US-Mexico border is one of the most dangerous areas in the Western Hemisphere to practice journalism, with various sources reporting between 85 and 100 journalists having been killed or disappeared since 2000 (Edmonds-Poli, 2013). In many recent years, journalists in Mexico have faced levels of danger comparable to countries in war like Iraq and Pakistan (CPJ, 2014). In fact, in 2010 and 2011, more journalists were assassinated in Mexico than in any other country in the world, except Pakistan (CPJ, 2014).

Table 6 shows that credit-taking reacts to criminogenic media content in states where cartels care the most about the dissemination of information. Specifically, there is a positive and statistically significant association during first, second, and fourth week after the detailed coverage occurred. Meanwhile, states in which criminals do not follow media coverage do not show any significant statistical reaction between credit-taking and the quality of media coverage. The Granger test supports these findings, showing that media coverage helps to predict credit-taking crimes (1% significance level) in states where criminals more closely follow press contents, but fails to do so in states where they do not (65% significance level). Moreover, the forecast error in variance decomposition also reinforces our findings. We can see that as much as 52% of the error in the forecast for credit-taking crimes is due to media coverage.

(Table 6 about here)

In sum, our results have clearly defined the relationship between media coverage and crime style. There is strong evidence that news coverage of stylized crimes is significantly and predictably responsible for the replication of those styles. In other words, we find
that detailed media coverage of crime creates templates for crime. However, there is no evidence that coverage impacts crime rates. Furthermore, there is a stronger and more solid association between criminogenic media content and stylistic decisions than there is between media and crime rates. We interpret these results as evidence of a world in which the media influences the style of crimes for those already so inclined, but provides no other kind of encouragement.

It is also notable that we find no evidence to suggest that the relationship between media coverage and crime style is bidirectional. There exists a Granger causality that runs from media coverage to criminal style, but not from criminal style to media coverage. We have also found that the share of drug-related homicides that were publicly claimed increases when the press covers similar credit-taking crimes. This means that publicity-seeking criminals use more stylized crimes when they know that their messages will be better spread by the press, but this does not mean that they commit more crimes. On this view, media coverage and criminal behavior is not a vicious cycle, but instead a unidirectional relationship that mostly flows from media coverage to criminal style.

The results above are further cemented by our finding of heterogeneous effects in states where drug cartels operate. Specifically, we found a clear association between the media and crime style in states with cartel operations, but not in states without them. Additionally, we found that states in which the press was endangered by cartel operations exhibit a strong association between media coverage and crime style, but this did not hold for states without cartel operations. For both cases, we found evidence that the relationship between media coverage and crime style is not bidirectional.
Conclusion

Our research was inspired by one of the most enduring controversies in criminology literature: whether exposure to criminogenic media content causes crime by “triggering” delinquency and aggression (Bushman and Anderson 2002; Anderson and Carnagey 2004; Anderson and Bushman 2001; Doley et al. 2013; Chadee et al. 2017), or just provides “rudders” that guide the style of individuals already intending to commit crime (Ferguson and Dyck 2012; Ferguson et al. 2012; Grimes et al. 2008; Ferguson and Savage 2012).

This debate has been difficult to resolve because measuring copycat crime presents major empirical challenges (Surette 2014), but also because criminogenic media content and crime rates may be modeled as a self-reinforcing cycle. This would mean that media coverage may induce criminal events, and criminal events may also induce increases in criminogenic media content, if such events are interesting for audiences.

To provide insight into the controversy, and to overcome these empirical challenges, we examined drug cartel operations at the US-Mexico border by leveraging two exceptionally fruitful and unique datasets. To do so, we developed an empirical specification that address the possibility that the relationship between media coverage and criminal behavior may be bidirectional. Specifically, we defined reaction functions and Granger causality tests to identify the relationships between media coverage, or media quality, and crime rates, or crime styles.

Our major finding is that media coverage of crime provides criminals with stylistic inspiration, but does not cause crime rates to increase. Specifically, we found evidence that two “Criminogenic Styles” tend to react to media coverage: credit-taking banners and displays of bodies/dismemberment. These results indicate that publicity-seeking crimi-
nals will intensify the most gruesome aspects of their crimes if they believe that doing so means that their messages will get more attention. Additionally, contrary to suppositions, a strong Granger causality from media coverage to crime style shows that this relationship is unidirectional.

When media covers crimes in larger detail, criminals increase the use of credit-taking and body exposure styles. As much as 53% of the variance in credit-taking styles of crime is explained by changes in the quality of media coverage. The use of body-exposure styles is also influenced by the quality of press coverage, but much less, only 26%, and with higher variance. This may be related to the higher costs related to copycat different styles. While credit-taking requires displaying a public banner next to a homicide, body-exposure requires dismembering and displaying the body of the victim. Interestingly, we also present evidence that detailed criminogenic contents (media coverage in which all the details of the crime are covered) have up to 28 larger effects on crime style. Our robustness tests also show that, as expected we find stronger in territories where drug cartels are more entrenched, and where they follow media coverage with more attention.

Although this paper has contributed to a better understanding of the relationship between the press and criminal behavior, future research would need to test for causal relationships beyond Granger causality. Furthering this area of research is critical to the social sciences and to democratic governance because it exposes the tension between two important values: freedom of the press and the de-escalation of horrific publicity-seeking crime styles ([Doley et al., 2013]). In addition to guiding us as we consider this issue, this research will assist with the development of better strategies to stifle terrorism, criminal organizations, copycat criminals, and individuals who aspire to notoriety.
References


### Tables

Table 1: Descriptive statistics

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Note: * p <0.1; ** p <0.05; *** p <0.01.
Table 3: Quality of media coverage and crime styles

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Note: * p < 0.1; ** p < 0.05; *** p < 0.01.
Table 4: Media coverage and crime styles

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Note: * p <0.1; ** p <0.05; *** p <0.01.
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<td>Granger test (Prob&gt;chi2)</td>
<td>0.484</td>
<td>0.056**</td>
<td>0.775</td>
<td>0.293</td>
</tr>
</tbody>
</table>

Note: * p < 0.1; ** p < 0.05; *** p < 0.01.
Table 6: Degree in which drug cartels follow media coverage

<table>
<thead>
<tr>
<th>Variable</th>
<th>Violence against the press</th>
<th>No violence against the press</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coverage quality (t-1)</td>
<td>0.1303**</td>
</tr>
<tr>
<td></td>
<td>Coverage quality (t-2)</td>
<td>0.0211</td>
</tr>
<tr>
<td></td>
<td>Coverage quality (t-3)</td>
<td>0.0026</td>
</tr>
<tr>
<td></td>
<td>Coverage quality (t-4)</td>
<td>0.0806</td>
</tr>
<tr>
<td></td>
<td>Coverage quality (t-5)</td>
<td>0.0165</td>
</tr>
<tr>
<td></td>
<td>Credit-taking (t-1)</td>
<td>-0.0499</td>
</tr>
<tr>
<td></td>
<td>Credit-taking (t-2)</td>
<td>0.0764</td>
</tr>
<tr>
<td></td>
<td>Credit-taking (t-3)</td>
<td>0.0344</td>
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<tr>
<td></td>
<td>Credit-taking (t-4)</td>
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</tr>
<tr>
<td></td>
<td>Credit-taking (t-5)</td>
<td>-0.0199</td>
</tr>
<tr>
<td></td>
<td>Granger test (Prob&gt;chi2)</td>
<td>0.539</td>
</tr>
</tbody>
</table>

Note: * p < 0.1; ** p < 0.05; *** p < 0.01.
Figures
Figure 1: Impulse reaction functions, Quality of media coverage and Credit-taking style crimes
Figure 2: Impulse reaction functions, Media coverage and Credit-taking style crimes