

Violence against the media and freedom of the press: Evidence from Mexico

Andrés Jurado
Brown University

Juan S. Morales
Collegio Carlo Alberto
University of Turin

September 16, 2020
University of Pittsburgh

Table of Contents

Introduction

Data

Empirical strategy and results

Concluding Remarks

Motivation

- ▶ 2006-2017, 104 journalists murdered (world's fourth highest)

Motivation

- ▶ 2006-2017, 104 journalists murdered (world's fourth highest)
- ▶ Most victims worked in small, regional newspapers, covering crime

Motivation

- ▶ 2006-2017, 104 journalists murdered (world's fourth highest)
- ▶ Most victims worked in small, regional newspapers, covering crime
- ▶ Press reports suggest perpetrators are often members of drug-trafficking organizations (DTO's)

Motivation

- ▶ 2006-2017, 104 journalists murdered (world's fourth highest)
- ▶ Most victims worked in small, regional newspapers, covering crime
- ▶ Press reports suggest perpetrators are often members of drug-trafficking organizations (DTO's)
- ▶ Mexico not at war and journalists are seldom killed in cross-fire (Syria, Iraq). Also not a one-time event (Malta) → ideal setting to study this type of censorship

Motivation

¹Own translation

Motivation

In the Spring of 2010, it came to our attention that there was a spokesman for organized crime. In the coming days a reporter –on behalf of this individual– scheduled a meeting with a group of colleagues. They warned us about who called the meeting and what would happen if we didn't attend [...] The spokesman explained the new rules: no one publishes material without approval by the “boss”; no one is allowed to ignore phone calls from them; no one can refuse to accept bribes [...]

(Valdez, 2016)¹

¹Own translation

Motivation

Motivation

Censorship

We still haven't shaken the fear that we had at one point, that's to say there are many things that could be investigated but that aren't.

Censorship

We still haven't shaken the fear that we had at one point, that's to say there are many things that could be investigated but that aren't.

Backlash

If they call us to tell us what to do, or what not to publish, we're going to publish it twice over and we're also going to write that they called us to tell us not to publish it.

(Ralley, 2014)²

²Own translation



EneasMx, "A march held after the death of Rubén Espinosa"

Research questions

Research questions

- ▶ How does the murder of a journalist change coverage of targeted outlets?

Research questions

- ▶ How does the murder of a journalist change coverage of targeted outlets?
- ▶ Are there spillover effects for the press at large?

Literature

Literature

Media bias and censorship

- ▶ Government advertising: di Tella and Franceschelli 2011
- ▶ Private financial incentives: Beattie, Durante, and Knight 2017; Reuter and Zitzewitz 2006; Gentzkow and Shapiro 2010
- ▶ Editorial standards in Mexico: Ramírez Alvarez 2017

Literature

Media bias and censorship

- ▶ Government advertising: di Tella and Franceschelli 2011
- ▶ Private financial incentives: Beattie, Durante, and Knight 2017; Reuter and Zitzewitz 2006; Gentzkow and Shapiro 2010
- ▶ Editorial standards in Mexico: Ramírez Alvarez 2017

Externalities and costs of drug violence in Mexico

- ▶ Economic costs of violence: Robles, Calderón, and Magaloni 2013; Murphy and Rossi 2017; Ashby and Ramos 2013
- ▶ Displacement: Basu and Pearlman 2017; Aldeco, Jurado and Ramírez 2019

Literature

Media bias and censorship

- ▶ Government advertising: di Tella and Franceschelli 2011
- ▶ Private financial incentives: Beattie, Durante, and Knight 2017; Reuter and Zitzewitz 2006; Gentzkow and Shapiro 2010
- ▶ Editorial standards in Mexico: Ramírez Alvarez 2017

Externalities and costs of drug violence in Mexico

- ▶ Economic costs of violence: Robles, Calderón, and Magaloni 2013; Murphy and Rossi 2017; Ashby and Ramos 2013
- ▶ Displacement: Basu and Pearlman 2017; Aldeco, Jurado and Ramírez 2019

Media repression

- ▶ Violence against the press: Holland and Rios 2017
- ▶ Legal reforms: Stanig 2015
- ▶ Imprisonment: Pan and Siegel 2019

This paper

This paper

- ▶ Uses comprehensive dataset of drug violence coverage by the press: 7 million tweets from 300 news media accounts (outlets and journalists)

This paper

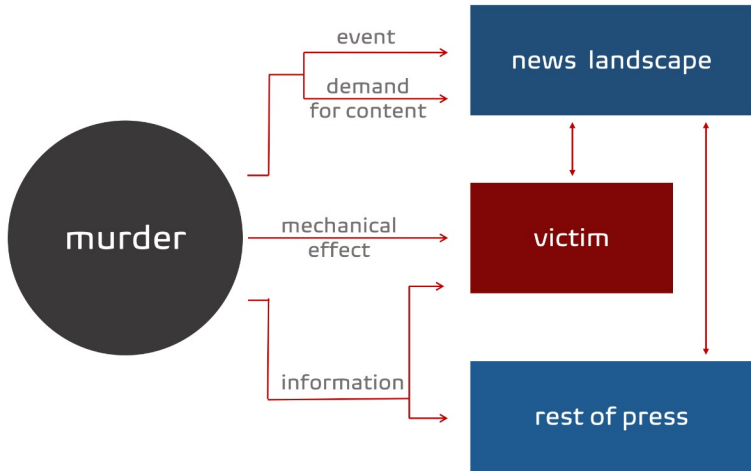
- ▶ Uses comprehensive dataset of drug violence coverage by the press: 7 million tweets from 300 news media accounts (outlets and journalists)
- ▶ Event-studies exploiting the precise timing of killings to study the direct and indirect effects on news reporting

This paper

- ▶ Uses comprehensive dataset of drug violence coverage by the press: 7 million tweets from 300 news media accounts (outlets and journalists)
- ▶ Event-studies exploiting the precise timing of killings to study the direct and indirect effects on news reporting
- ▶ Exploits text content to study changes in tone

This paper

- ▶ Uses comprehensive dataset of drug violence coverage by the press: 7 million tweets from 300 news media accounts (outlets and journalists)
- ▶ Event-studies exploiting the precise timing of killings to study the direct and indirect effects on news reporting
- ▶ Exploits text content to study changes in tone
- ▶ Census data, diff-in-diff and triple-diff exercises looking at demographics to estimate long-run effects on occupation choice and migration decisions



How do attacks on the press affect coverage?

How do attacks on the press affect coverage?

- ▶ *Who* is affected?
 - ▶ Direct effects (on victimized outlets)
 - ▶ Indirect effects (on other journalists or outlets)

How do attacks on the press affect coverage?

- ▶ *Who* is affected?
 - ▶ Direct effects (on victimized outlets)
 - ▶ Indirect effects (on other journalists or outlets)
- ▶ *How* is the press affected?
 - ▶ Mechanical effects (changes in workforce / content to be covered / taste)
 - ▶ Behavioural effects

How do attacks on the press affect coverage?

- ▶ *Who* is affected?
 - ▶ Direct effects (on victimized outlets)
 - ▶ Indirect effects (on other journalists or outlets)
- ▶ *How* is the press affected?
 - ▶ Mechanical effects (changes in workforce / content to be covered / taste)
 - ▶ Behavioural effects
- ▶ *What* is the effect?
 - ▶ Deterrence / 'chilling' (due to fear)
 - ▶ Backlash

How do attacks on the press affect coverage?

- ▶ *Who* is affected?
 - ▶ Direct effects (on victimized outlets)
 - ▶ Indirect effects (on other journalists or outlets)
- ▶ *How* is the press affected?
 - ▶ Mechanical effects (changes in workforce / content to be covered / taste)
 - ▶ Behavioural effects
- ▶ *What* is the effect?
 - ▶ Deterrence / 'chilling' (due to fear)
 - ▶ Backlash
- ▶ *When* does it arise?
 - ▶ Short-run vs. long-run effects

Preview of results

Preview of results

1. Sharp reductions in coverage and increasing rates of market exit following an attack (while public interest in content *increases*)

Preview of results

1. Sharp reductions in coverage and increasing rates of market exit following an attack (while public interest in content *increases*)
2. Smaller outlets twice as likely to exit the market (*mechanical* effects)

Preview of results

1. Sharp reductions in coverage and increasing rates of market exit following an attack (while public interest in content *increases*)
2. Smaller outlets twice as likely to exit the market (*mechanical* effects)
3. Average content from targeted outlets becomes more negative with a stronger emphasis on violent aspects of organized crime (*backlash*)

Preview of results

1. Sharp reductions in coverage and increasing rates of market exit following an attack (while public interest in content *increases*)
2. Smaller outlets twice as likely to exit the market (*mechanical* effects)
3. Average content from targeted outlets becomes more negative with a stronger emphasis on violent aspects of organized crime (*backlash*)
4. Decrease in number of journalists in dangerous states (*deterrence*)

Preview of results

1. Sharp reductions in coverage and increasing rates of market exit following an attack (while public interest in content *increases*)
2. Smaller outlets twice as likely to exit the market (*mechanical* effects)
3. Average content from targeted outlets becomes more negative with a stronger emphasis on violent aspects of organized crime (*backlash*)
4. Decrease in number of journalists in dangerous states (*deterrence*)
5. Journalists that follow the victim on Twitter decrease their publishing more (*deterrence*)

Table of Contents

Introduction

Data

Empirical strategy and results

Concluding Remarks

Data

Data

1. 2010 and 2015 Census report number of journalists (IPUMS)

Data

1. 2010 and 2015 Census report number of journalists (IPUMS)
2. General population homicides from the National Statistics Office (INEGI)

Data

1. 2010 and 2015 Census report number of journalists (IPUMS)
2. General population homicides from the National Statistics Office (INEGI)
3. Date, place of murder and up to 4 affiliations for each of the killed 104 journalists (CPJ & Article 19)

Press coverage

Press coverage

1. 2.3 million articles, TV and radio segments from the **national** press with violent content (2006-2017)

Press coverage

1. 2.3 million articles, TV and radio segments from the **national** press with violent content (2006-2017)
2. 1.8 million tweets from 76 victimized outlets (out of 103, 2009-2017)

Press coverage

1. 2.3 million articles, TV and radio segments from the **national** press with violent content (2006-2017)
2. 1.8 million tweets from 76 victimized outlets (out of 103, 2009-2017)
3. 5 million tweets from top 200 journalists (2009-2017)

Table of Contents

Introduction

Data

Empirical strategy and results

Concluding Remarks

Direct effects of murder

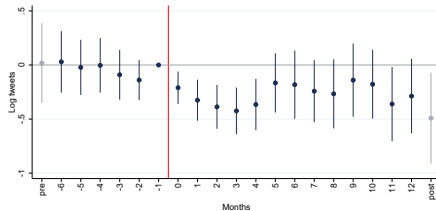
$$\begin{aligned}
 y_{msot} = & \gamma_o + \gamma_{sM} + \sum_{k=-6}^{12} \beta_k \times monthsSinceKilling_{ot} \\
 & + \delta \times x_{msM} + \beta_{pre} \times Pre_{ot} + \beta_{post} \times Post_{ot} + \epsilon_{msot}
 \end{aligned}$$

- ▶ y_{msot} : outcome for outlet o , in municipality m , state s and time period t
- ▶ x_{mst} : log homicides in the past 30 days
- ▶ Pre , $Post$: indicator variables for pre 6 months, post 12 months, respectively
- ▶ Robust standard errors clustered by outlet

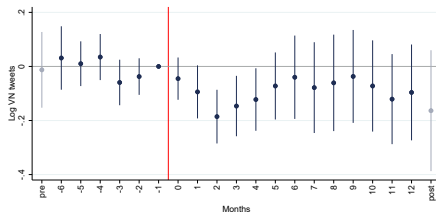
Overall violence

Coverage of attacks/interest

Direct effects on volume of tweets



(a) All tweets

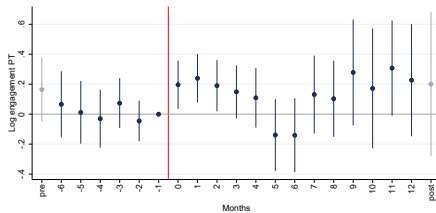


(b) Tweets about violence

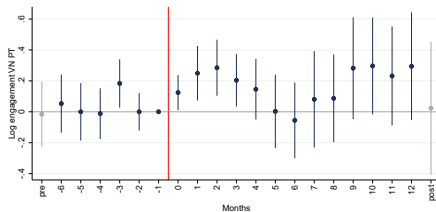
Robustness: timing

Robustness: Google CSE

Direct effects on engagement



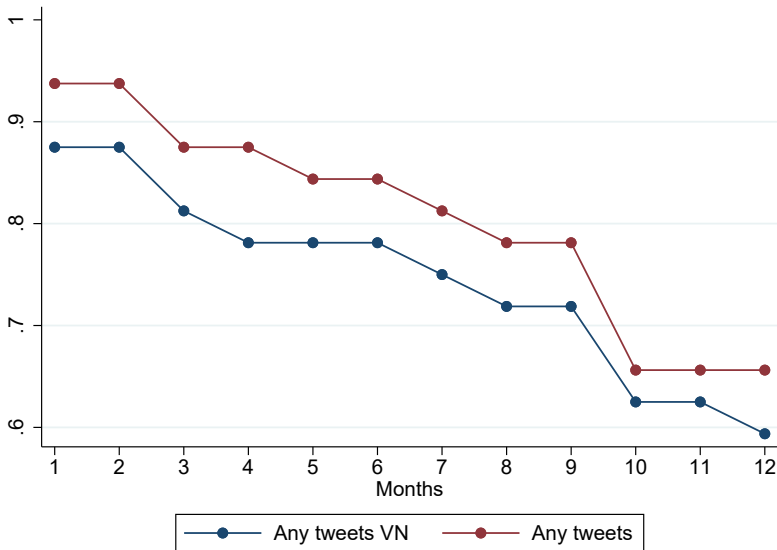
(a) All tweets



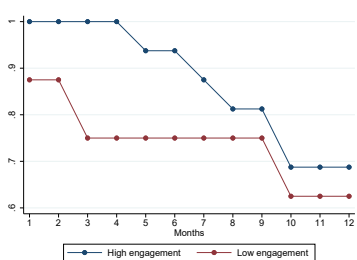
(b) Tweets about violence

Attacks and survival rates

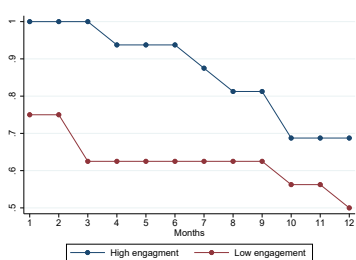
survival(k): fraction of victimized outlets that published a tweet k months and onward after the attack



Direct effects on volume of tweets



(a) All tweets



(b) Tweets about violence

Are non-victimized journalists affected by the killing?

indirect effect of journalists' killings:

$$y_{isft} = \sum_{k=-6}^{12} \beta_k \times \text{monthsSinceKilling} \times \text{friend} \times \text{inState}_{isft} + \lambda_i + \lambda_{st} + \lambda_{ft} + \epsilon_{isft}$$

y_{isft} : (log) number of tweets for journalist i in the 30-day window

$\text{monthsSinceKilling}_{isft}$: event-time dummies counting periods since 'friend'
in same state of i was victimized

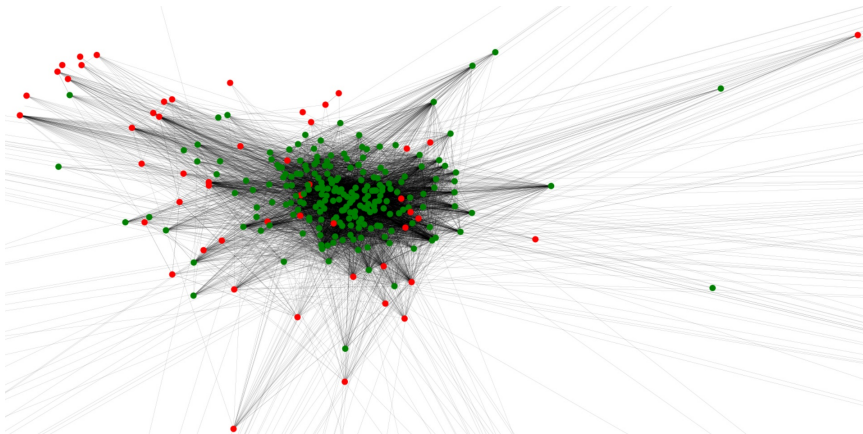
λ_i : user fixed effects

λ_{st} : state \times calendar-month fixed effects

λ_{ft} : 'friend' \times calendar-month fixed effects

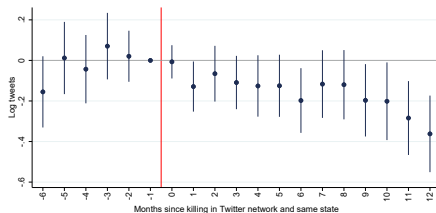
Robust standard errors clustered by journalist

Twitter network of selected accounts

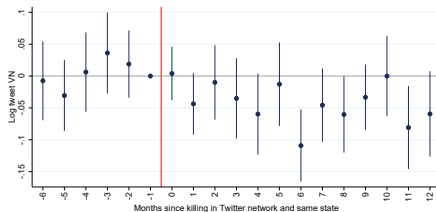


Note: The figure shows a partial Twitter network for the accounts in our dataset. Red nodes represent victimized outlets and green nodes are journalists. An edge is drawn between two nodes if either of the accounts follows the other.

Network effects: journalists in same state and network



(a) All tweets



(b) Tweets about violence

Long-run effects of violence on occupational choice

Difference in differences

$$y_{ist} = \alpha + \beta \times violence_s \times post_M + \gamma_t + \gamma_s + \varepsilon_{ist} \quad (1)$$

- ▶ $y_{ist} = 1$ if individual i in state s reported in Census t (2010, 2015) that he/she was a journalist
- ▶ $violence_s$: number of journalists killed/indicator for any journalist killed between 2010 and 2015
- ▶ Sample: workers with codes “close” to journalist: accountants, researchers, psychologists, artists and performers

Demographics

Migration

Long-run effects of violence on occupational choice

Table: Relationship between violence against journalists and share of journalists

	(1)	(2)	(3)	(4)
post x Nr. MW murd.	-0.0009* (0.0004)		-0.0010** (0.0005)	
post x Any. MW murd.		-0.0087*** (0.0030)		-0.0100*** (0.0034)
post x log hom.	-0.0001 (0.0014)	0.0000 (0.0016)	-0.0005 (0.0014)	-0.0003 (0.0016)
N	117673	117673	101421	101421
N-clusters	32	32	32	32
State FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Only wage earners	no	no	yes	yes

Notes: Outcome is an indicator equal to one if individual reports being a journalist. Standard errors clustered at the state level in parenthesis. Significance levels shown below * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Measuring changes in tone

Measuring changes in tone

- ▶ Consider 180 days before/after attack

Measuring changes in tone

- ▶ Consider 180 days before/after attack
- ▶ Predict whether tweet/article was published before or after attack based on text content

Measuring changes in tone

- ▶ Consider 180 days before/after attack
- ▶ Predict whether tweet/article was published before or after attack based on text content
- ▶ Estimate Multinomial Inverse Regression framework (**MNIR**; Taddy, 2013), a supervised machine learning model (conceptually, similar to a LASSO regression)

framework

Intuition

1. Estimate the relationship between word content and timing

Intuition

1. Estimate the relationship between word content and timing
2. Project high dimensional space of words onto the real line (**Sufficient Reduction**). Similar to PC, it captures relevant information to predict timing

Intuition

1. Estimate the relationship between word content and timing
2. Project high dimensional space of words onto the real line (**Sufficient Reduction**). Similar to PC, it captures relevant information to predict timing
3. Regress timing on **SR** to bound the index to the unit interval. Compute fitted probabilities

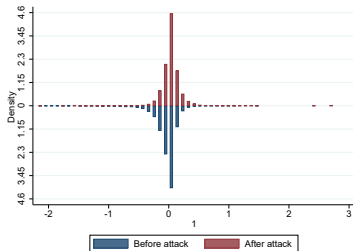
Intuition

1. Estimate the relationship between word content and timing
2. Project high dimensional space of words onto the real line (**Sufficient Reduction**). Similar to PC, it captures relevant information to predict timing
3. Regress timing on **SR** to bound the index to the unit interval. Compute fitted probabilities
4. Run event study on fitted probabilities

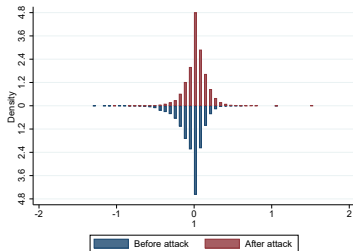
Intuition

1. Estimate the relationship between word content and timing
2. Project high dimensional space of words onto the real line (**Sufficient Reduction**). Similar to PC, it captures relevant information to predict timing
3. Regress timing on **SR** to bound the index to the unit interval. Compute fitted probabilities
4. Run event study on fitted probabilities
5. Identify words that predict change by looking at coefficients (nr. 1), and relative frequencies

Changes in content

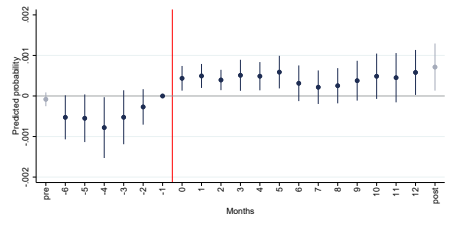


(a) All tweets

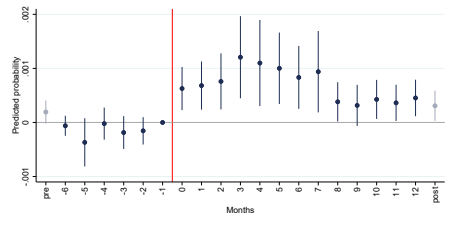


(b) Violent tweets

Changes in content

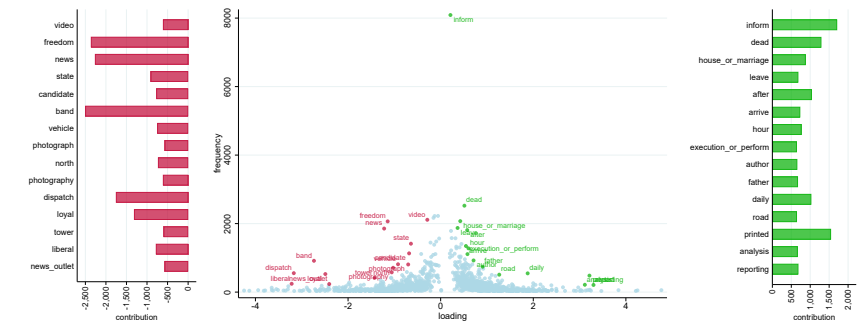


(a) All tweets



(b) Violent tweets

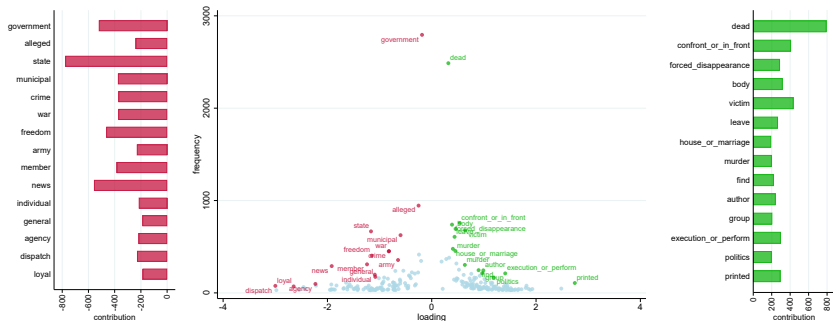
Words that drive change in tone (All)



Terms that drive change in tone: consider words with $\phi_j \neq 0$.

Run PLS of y on \hat{x} . Define *contribution* $\equiv \hat{\lambda} \times \hat{x}$

Words that drive change in tone (violent)



Polarity

Table of Contents

Introduction

Data

Empirical strategy and results

Concluding Remarks

Concluding remarks

Concluding remarks

- ▶ The murder of journalists in Mexico leads to a chilling effect with large reductions in Twitter activity by affected outlets

Concluding remarks

- ▶ The murder of journalists in Mexico leads to a chilling effect with large reductions in Twitter activity by affected outlets
- ▶ Fewer journalists work in dangerous states in the long-run

Concluding remarks

- ▶ The murder of journalists in Mexico leads to a chilling effect with large reductions in Twitter activity by affected outlets
- ▶ Fewer journalists work in dangerous states in the long-run
- ▶ Mechanical effects: smaller outlets experienced larger declines in publishing

Concluding remarks

- ▶ The murder of journalists in Mexico leads to a chilling effect with large reductions in Twitter activity by affected outlets
- ▶ Fewer journalists work in dangerous states in the long-run
- ▶ Mechanical effects: smaller outlets experienced larger declines in publishing
- ▶ Behavioral responses: journalists “closer” to victims reduced their twitting relative to other

Concluding remarks

- ▶ The murder of journalists in Mexico leads to a chilling effect with large reductions in Twitter activity by affected outlets
- ▶ Fewer journalists work in dangerous states in the long-run
- ▶ Mechanical effects: smaller outlets experienced larger declines in publishing
- ▶ Behavioral responses: journalists “closer” to victims reduced their twitting relative to other
- ▶ Some evidence of permanent changes in tone

Thank you!

References I

-  Ashby, N. J. and M. A. Ramos (2013). “Foreign direct investment and industry response to organized crime: The Mexican case”. In: *European Journal of Political Economy* 30, pp. 80–91.
-  Basu, S. and S. Pearlman (Dec. 2017). “Violence and migration: evidence from Mexico’s drug war”. In: *IZA Journal of Development and Migration* 7.1, p. 18.
-  Beattie, G., R. Durante, and B. Knight (2017). “Advertising Spending and Media Bias: Evidence from News Coverage of Car Safety Recalls”. In: *Working Paper*.
-  Gentzkow, M. and J. Shapiro (2010). “What Drives Media Slant? Evidence From U.S. Daily Newspapers”. In: *Econometrica* 78.1, pp. 35–71. arXiv: 9809069v1 [arXiv:gr-qc].
-  Holland, B. E. and V. Rios (2017). “Informally Governing Information: How Criminal Rivalry Leads to Violence against the Press in Mexico”. In: *Journal of Conflict Resolution* 61.5, pp. 1095–1119.

References II

-  Murphy, T. E. and M. A. Rossi (2017). "Following the Poppy Trail : Causes and Consequences of Mexican Drug Cartels".
-  Pan, J. and A. A. Siegel (2019). "How Saudi Crackdowns Fail to Silence Online Dissent". In: *American Political Science Review*, pp. 109–125.
-  Ramírez Alvarez, A. (2017). "Media and Crime Perceptions: Evidence from Mexico".
-  Reuter, J. and E. Zitzewitz (2006). "Do Ads Influence Editors? Advertising and Bias in the Financial Media". In: *The Quarterly Journal of Economics* 121.1, pp. 197–227.
-  Robles, G., G. Calderón, and B. Magaloni (2013). "The Economic Consequences of Drug Trafficking Violence in Mexico". In: *Working Paper Poverty and Governance*, Stanford University, pp. 1–38.
-  Stanig, P. (2015). "Regulation of speech and media coverage of corruption: An empirical analysis of the Mexican Press". In: *American Journal of Political Science* 59.1, pp. 175–193.

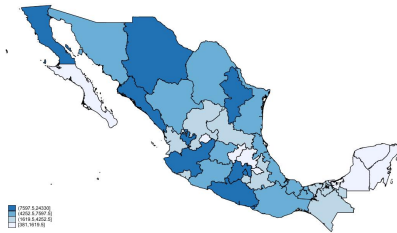
References III



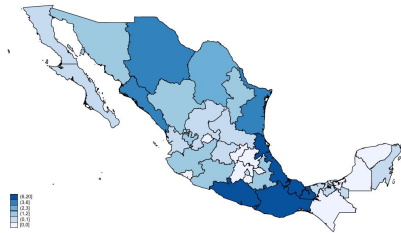
Tella, R. di and I. Franceschelli (2011). “Government advertising and media coverage of corruption scandals”. In: *American Economic Journal: Applied Economics* 3.4, pp. 119–151.

Appendix

Homicides across space

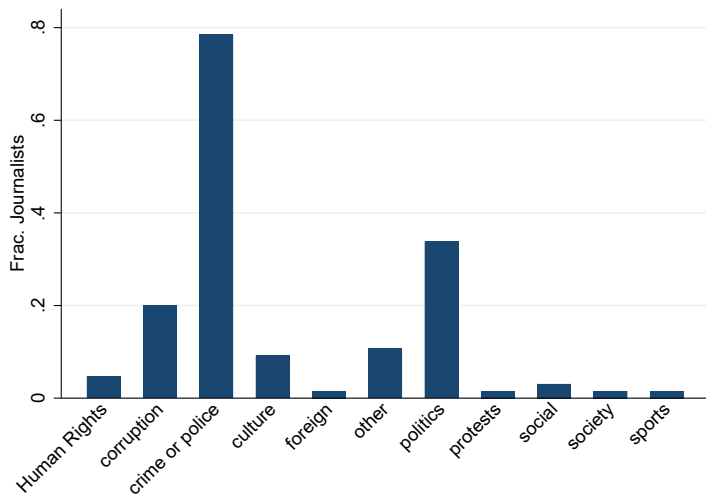


(a) Total homicides



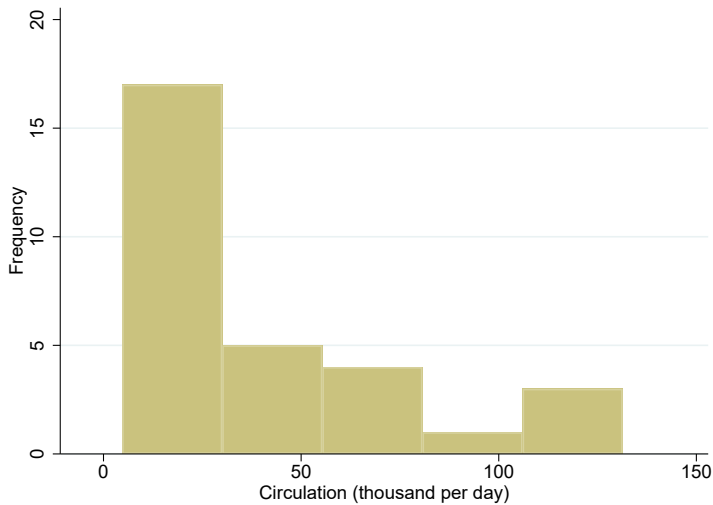
(b) Journalists murdered

Subjects covered by murdered journalists



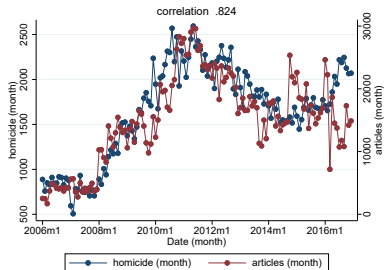
Source: Committee to Protect Journalists (CPJ)

Daily circulation of VO

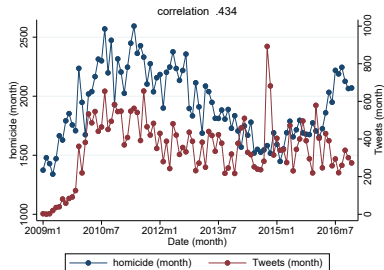


$N = 30$

Homicides in the country and coverage of violence



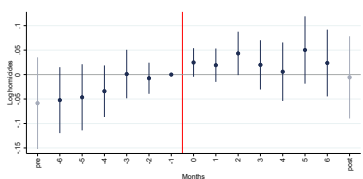
(a) Articles with violent content



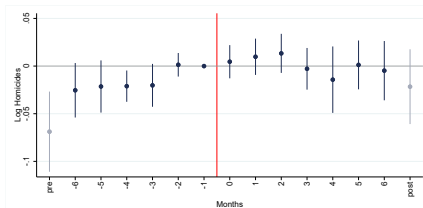
(b) Tweets with violent content

Total *net* homicides around an attack

$$\begin{aligned} \text{homicides}_{set} = & \gamma_{se} + \gamma_t + \sum_{k=-6}^6 \beta_k \times \text{monthsSinceKilling}_{set} \\ & + \beta_{pre} \times Pre_{set} + \beta_{post} \times Post_{set} + \epsilon_{set} \end{aligned}$$



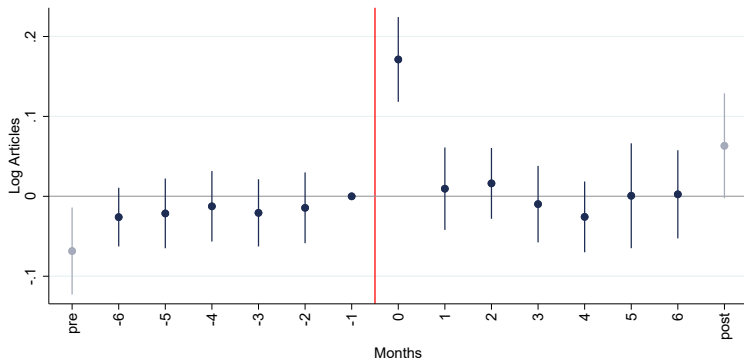
(a) State of aggression



(b) Municipality of outlet

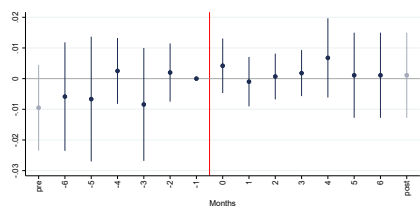
Direct Effects

Mentions of municipalities in the national press

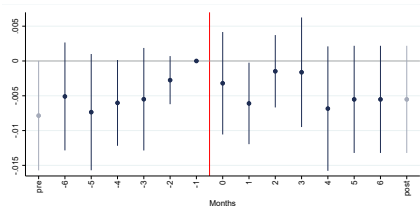


Direct Effects

Mentions of cartels before/after murder (national press)



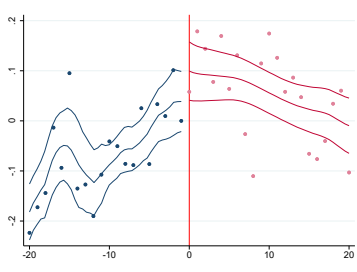
(a) Sinaloa Cartel



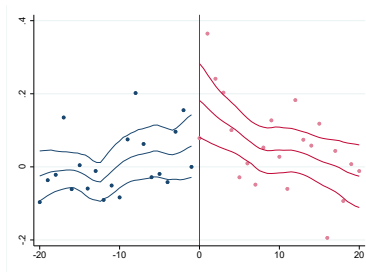
(b) Jalisco New Generation Cartel

Note: dependent variable is log + 1 mentions of municipalities *and* criminal organization

Google searches



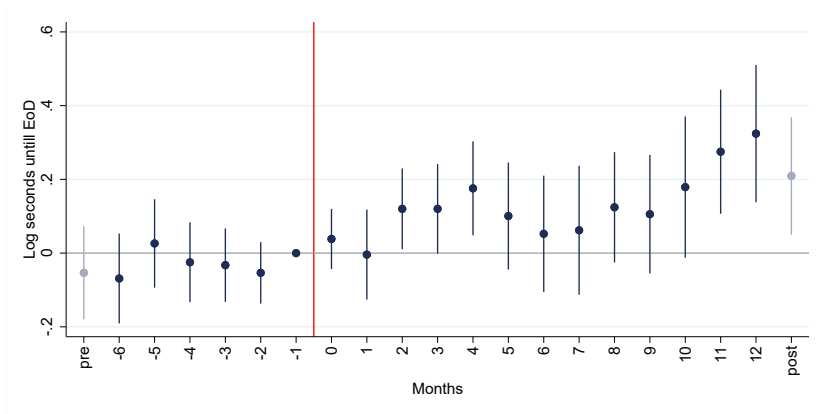
(a) *Murder*



(b) *Journalist*

Direct Effects

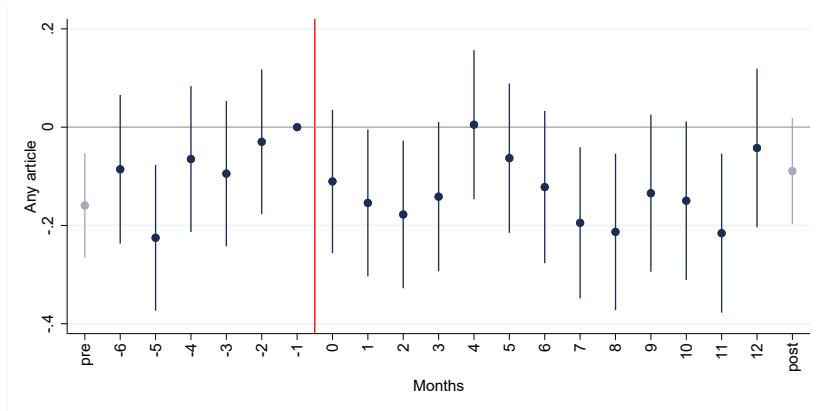
Robustness check: timing of tweets



Higher values = more seconds elapsed till end-of-day = tweets earlier in the day = fewer tweets

[Back](#)

Robustness check: articles (from Google CSE)



Back

Long-run effects of violence on demographic characteristics

Triple differences

$$\begin{aligned} y_{isto} = & \alpha + \beta_0 \times \text{violence}_s \times \text{post}_t + \beta_1 \times \text{violence}_s \times \text{journalist}_o \\ & + \beta_2 \times \text{journalist}_o \times \text{post}_t + \beta_3 \times \text{violence}_s \times \text{journalist}_o \times \text{post}_t \\ & + \gamma_o + \gamma_t + \gamma_s + \varepsilon_{ist} \end{aligned} \quad (2)$$

- ▶ y_{isto} : outcome for individual i in state s , census t (2010, 2015) and occupation o
- ▶ journalist_o : indicator variable for journalist

Back

Long-run effects of violence on demographic characteristics

Table: Relationship between violence against journalists and census outcomes

	(1) School yrs	(2) Married	(3) Kids	(4) Age	(5) Urban	(6) Male	(7) Income
post x Nr. MW killed x journ.	-0.0355 (0.0342)	-0.0104** (0.0047)	-0.0106** (0.0040)	-0.0191 (0.0798)	-0.0026** (0.0010)	0.0035 (0.0038)	-0.0215*** (0.0071)
post x log hom. x journ.	-0.1123 (0.1123)	-0.0188 (0.0328)	-0.0277 (0.0336)	0.3898 (0.4736)	-0.0011 (0.0088)	-0.0231 (0.0247)	0.0349 (0.0569)
N	117673	117673	117673	117673	117673	117673	101421
N-clusters	32	32	32	32	32	32	32
State FE	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes

Notes: Standard errors clustered at the state level in parenthesis.
Significance levels shown below * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Effects of violence on migration of journalists

$$\begin{aligned} y_{hst} = & \alpha + \beta \times X_{hst} + \gamma \times hom_{hst} + \delta \times homjournal_{st} \\ & + \zeta \times homjournal_{st} \times journal_{hst} + \epsilon_{hst} \end{aligned}$$

- ▶ y : indicator for net/out migration of household h in state s and census t
- ▶ X : individual controls; household type, size, age group, marital status, indigenous, education attainment
- ▶ hom : log homicides
- ▶ $homjournal$: number of journalists killed
- ▶ $journal$: indicator for journalist occupation

Effects of violence on migration of journalists

Table: Relationship between violence and inflows/outflows

	(1) Inflows	(2) Inflows	(3) Inflows	(4) Outflows	(5) Outflows	(6) Outflows
log hom.	-0.0045 (0.0057)	-0.0028 (0.0072)	-0.0025 (0.0071)	0.0043 (0.0029)	0.0023 (0.0056)	0.0029 (0.0053)
Any MW killed	-0.0106 (0.0064)	-0.0006 (0.0037)	-0.0000 (0.0039)	0.0025 (0.0042)	0.0060 (0.0038)	0.0060 (0.0036)
Journ. x any MW killed	-0.0178 (0.0139)	-0.0173 (0.0110)	-0.0157 (0.0129)	0.0138 (0.0118)	0.0142 (0.0109)	0.0146 (0.0114)
Log avg. wages	0.0014* (0.0008)	0.0008 (0.0008)	0.0008 (0.0007)	-0.0030 (0.0034)	-0.0102** (0.0039)	-0.0087 (0.0056)
N	2041370	2041370	2041370	2333526	2333526	2333526
State FE	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	No	Yes	Yes	No	Yes

Notes: Standard errors clustered at the state level in parenthesis.
Significance levels shown below * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

MNIR framework

Predict probability of term based on word count of tweet and post-attack:

$$x_i \sim MN(q_i, m_i) \text{ with } q_{ij} = \frac{e^{\eta_{ij}}}{\sum_{l=1}^p e^{\eta_{il}}},$$

where $\eta_{ij} = \alpha_j + \phi_j y_i$

- ▶ x_i bag-of-words representation document i
- ▶ $y_1 = 1$ if document i published after attack
- ▶ term j
- ▶ p total terms
- ▶ LASSO penalty assures that some $\phi_j = 0$

MNIR framework

Compute the **Sufficient Reduction** (SR): “index” that captures relevant information

$$z_i \equiv x_i' \times \Phi$$

Project SR to the unit interval (**Forward regression**)

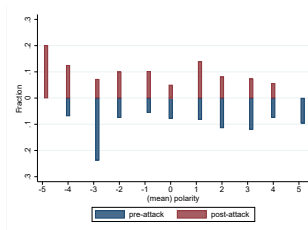
$$y_{oi} = \gamma_o + \gamma_m + \beta \times z_{oi} + \epsilon_{oi}$$

Perform event study using predicted probability

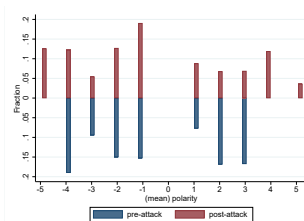
Back

Polarity

Figure: Distribution of terms by polarity



(a) All tweets



(b) Violence tweets

Back

Violent tweets keywords I

1. cartel
2. *narco*
3. violence
4. homicide
5. death
6. body
7. threat
8. justice
9. alleged
10. accuse
11. criminal
12. assassin
13. kidnap
14. forced disappearance

Violent tweets keywords II

15. victim
16. convict
17. drug
18. government
19. corrupt
20. police
21. military
22. general attorney
23. torture
24. conflict
25. war
26. *Chapo*
27. investigation
28. impunity

Violent tweets keywords III

- 29. crime
- 30. ties to
- 31. arrest
- 32. member of
- 33. confrontation
- 34. injured

Back