Reverse Engineering Chinese Censorship

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Institute for Quantitative Social Science
Harvard University

(Keystroke address, First Annual Asian Political Methodology Meeting, Tokyo, 1/6/2014)

\textsuperscript{1}Based on joint work with Jennifer Pan and Molly Roberts
Papers

- An Observational Study:
  

- Experimental and Participatory Studies:
  
  *A Randomized Experimental Study of Censorship in China*

Copies at GaryKing.org
Chinese Censorship

The largest selective suppression of human expression in history
Chinese Censorship

The largest selective suppression of human expression in history:

- implemented *manually*,
- by $\approx 200,000$ workers,
- located in government and inside social media firms
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Theories of the Goal of Censorship
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**Theories of the Goal of Censorship**

1. Stop criticism of the state
2. Stop collective action

Either or both could be right or wrong.
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Theories of the Goal of Censorship

1. Stop criticism of the state *Wrong*
2. Stop collective action
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Theories of the Goal of Censorship

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(They also censor 2 other smaller categories we’ll talk about)
Chinese Social Media: Fractured over 1,400+ sites
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(Plus 59% from Sina Blog)
Observational Study

Collect 3,674,698 social media posts in 85 topic areas over 6 months
Random sample: 127,283
(Repeat design; Total analyzed: 11,382,221)

For each post (on a timeline in one of 85 content areas):
Download content the instant it appears
(Carefully) revisit each later to determine if it was censored (from computers all over the world)
Use computer-assisted methods of text analysis (some existing, some new, all adapted to Chinese)
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Censorship is not Ambiguous: Example Error Page

Sorry, the host you were looking for does not exist, has been deleted, or is being investigated.
Censorship is not Ambiguous: BBS Error Page

The page you requested is temporarily down. How about you go look at another page.

Jingjing, one of China’s cartoon internet police
The Censors are Fast; Our Automated Methods are Faster
The Censors are Fast; Our Automated Methods are Faster

Example: Shanghai Subway Crash

<table>
<thead>
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<th>Days After Post Was Written</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>150</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>200</td>
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For 2 Unusual Topics: Constant Censorship Effort

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</tr>
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<td>0</td>
<td>10</td>
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Students Throw Shoes at Fang BinXing

Pornography Criticism of the Censors
For 2 Unusual Topics: Constant Censorship Effort

**Pornography**

**Criticism of the Censors**

Students Throw Shoes at Fang BinXing

10/29
All other topics: Censorship & Post Volume are “Bursty”
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We monitored 85 topic areas (Jan–July 2011) and found 87 volume bursts in total. We identified real world events associated with each burst. Our hypothesis is that the government censors all posts in volume bursts associated with events with collective action potential (regardless of how critical or supportive of the state).
All other topics: Censorship & Post Volume are “Bursty”

- Unit of analysis:

![Graph showing count of published and censored posts over time with a peak in June. The event Riots in Zengcheng is labelled on the graph.]

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Observational Test 1: Post Volume

Begin with our 87 volume bursts in 85 topic areas.

For each burst, calculate change in % censorship inside to outside each volume burst within topic areas – censorship magnitude.

If the goal of censorship is to stop collective action, we expect:

1. On average, % censored should increase during volume bursts.
2. Some bursts (associated with politically relevant events) should have much higher censorship.
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Event classification (each category can be +, −, or neutral comments about the state):

1. protest or organized crowd formation outside the Internet
2. individuals who have organized or incited collective action on the ground in the past;
3. topics related to nationalism or nationalist sentiment that have incited protest or collective action in the past.

(Inter-coder reliability: 98.9%)
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1. Collective Action Potential
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What Types of Events Are Censored?

Censorship Magnitude

Density

0 2 4 6 8 10 12

-0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

Collective Action
Criticism of Censors
Pornography
Policy
News

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What Types of Events Are Censored?

- Protests in Inner Mongolia
- Pornography Disguised as News
- Baidu Copyright Lawsuit
- Zengcheng Protests
- Pornography Mentioning Popular Book
- Ai Weiwei Arrested
- Collective Anger At Lead Poisoning in Jiangsu
- Google is Hacked
- Localized Advocacy for Environment Lottery
- Fuzhou Bombing
- Students Throw Shoes at Fang BinXing
- Rush to Buy Salt After Earthquake
- New Laws on Fifty Cent Party
- U.S. Military Intervention in Libya
- Food Prices Rise
- Education Reform for Migrant Children
- Popular Video Game Released
- Indoor Smoking Ban Takes Effect
- News About Iran Nuclear Program
- Jon Hunstman Steps Down as Ambassador to China
- Gov't Increases Power Prices
- China Puts Nuclear Program on Hold
- Chinese Solar Company Announces Earnings
- EPA Issues New Rules on Lead
- Disney Announced Theme Park
- Popular Book Published in Audio Format
- Pornography

Censorship Magnitude

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Criticism of Censors
Pornography
Censoring Collective Action: Ai Weiwei’s Arrest

January

March

April

May

June

July

Ai Weiwei arrested

Count Published

Count Censored

Count

Count

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Censoring Collective Action: Protests in Inner Mongolia

Protests in
Inner Mongolia

Count
Jan Feb Mar Apr May Jun Jul
Count Published
Count Censored

Count

Protests in
Inner Mongolia

Count

Jan Feb Mar Apr May Jun Jul
Low Censorship on One Child Policy

Speculation of Policy Reversal at NPC

- Count Published
- Count Censored
Low Censorship on News: Power Prices

Power shortages
Gov't raises power prices to curb demand
Observational Test 3: Content of Posts

We adapted "ReadMe" (Hopkins-King) methodology to the content of censored posts in Chinese. We standardized the encoding of Chinese text, eliminated punctuation and stop words, experimented with segmenting characters into words, and calculated the quantity of interest (% of posts censored in a category). We code a validation set and estimate ReadMe predictions: % of posts in each category. The formula for calculating the conditional probability is:

\[ P(\text{Censored} | \text{Category}) = \frac{P(\text{Category} | \text{Censored}) \cdot P(\text{Censored})}{P(\text{Category})} \]
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Observational Test 3: Content of Posts

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- Standardize encoding of Chinese text
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P(Censored|Category) = \frac{P(Category|Censored)P(Censored)}{P(Category)}
\]
“ReadMe” Algorithm Validated in Chinese
“ReadMe” Algorithm Validated in Chinese

Example: Labor Strikes, 2010 (Training set: 100; Test set: 900)
“ReadMe” Algorithm Validated in Chinese

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“ReadMe” Algorithm Validated in Chinese

Example: Labor Strikes, 2010 (Training set: 100; Test set: 900)
### Uncensored: Non-Collective Action Posts (that Support or Oppose the State)

<table>
<thead>
<tr>
<th>Censored Posts</th>
<th>Percent Censored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criticize</td>
<td>0.0</td>
</tr>
<tr>
<td>Support</td>
<td>0.2</td>
</tr>
<tr>
<td>Criticize</td>
<td>0.4</td>
</tr>
<tr>
<td>Support</td>
<td>0.6</td>
</tr>
<tr>
<td>Criticize</td>
<td>0.8</td>
</tr>
<tr>
<td>Support</td>
<td>1.0</td>
</tr>
</tbody>
</table>

- One Child Policy
- Corruption Policy
- Food Prices Rise
Uncensored: Non-Collective Action Posts (that Support or Oppose the State)

- One Child Policy: Criticize 0.2, Support 0.8
- Corruption Policy: Criticize 0.0, Support 1.0
- Food Prices Rise: Criticize 0.2, Support 0.8

Percent Censored: 0.0 0.2 0.4 0.6 0.8 1.0
Censored: Collective Action Posts (that Support or Criticize the State)
Censored: Collective Action Posts (that Support or Criticize the State)
Additional Research Designs

Randomized Experiment (for causal inferences)
Selected 100 top social media sites (≈87% of blogs, >500M Users, geographically diverse)
Created 2 accounts on each (from inside China all over the country)
Wrote 1,200 unique social media posts (CA/not CA, Pro/Anti)
Submitted posts randomly assigned to type
Checked on censorship (from computers in many countries)

Participatory Study (for descriptive inferences)
Current method of learning how they censor: ask (carefully!)
Our goal: change our sources' incentives
Procedure: create our own social media website in China
Bought URL; contracted with firms for servers & software; posted and censored ourselves
To learn: we tried every software option, read the documentation, and called customer support(!)
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Mechanisms of Censorship
Mechanisms of Censorship

1. Submit text for posting
   - Immediately held for review before publication
   - Post is published after review
   - Post deleted during review
   - Account blocked
   - Publish immediately
   - Post remains online
   - Post is removed (within 24 hours)

   - Immediately published
   - Censored

   - The government goes on about anti-corruption everyday, but is it doing anything? Today, it's Guo Yongxiang from Sichuan... All officials are corrupt, it's only those who have offended someone that are investigated...

   - Sorry, the host you were looking for does not exist, has been deleted, or is being investigated

   - By 2020 China will have 30 million bare branches (extra men), this is a critical situation. Behind it is the fact that every year more boys than girls are born, which is due to the one-child policy. Over the years, the one-child policy has created many social problems...

   - You have been silenced by the administrator, the type of silence is forever!
Mechanisms of Censorship

Post is published after review

Post is removed (within 24 hours)

Post remains online

Submit text for posting

Publish immediately

Immediately held for review before publication

Administrator has set up review for new topics, your post will be shown after it has passed review.

Sorry, the host you were looking for does not exist, has been deleted, or is being investigated

By 2020 China will have 30 million bare branches (extra men), this is a critical situation. Behind it is the fact that every year more boys than girls are born, which is due to the one-child policy. Over the years, the one-child policy has created many social problems...

(Post reviewed then deleted)

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Mechanisms of Censorship

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- Observation study

64% of websites review some content
40% of all submissions reviewed
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect

Panxu Protest

Censorship Difference (Pro − Anti)
Posts For v. Against Government: Zero Causal Effect

Panxu Protest

Tibetan Self-Immolations

Censorship Difference (Pro − Anti)
Posts For v. Against Government: Zero Causal Effect

Panxu Protest
Ai Weiwei Album
Tibetan Self-Immolations

Censorship Difference (Pro – Anti)
Posts For v. Against Government: Zero Causal Effect

Panxu Protest
Tibetan Self-Immolations
Ai Weiwei Album
Protests in Xinjiang

Censorship Difference (Pro − Anti)
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Panxu Protest
Tibetan Self-Immolations
Ai Weiwei Album
Protests in Xinjiang
Corruption Policy
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

Panxu Protest
Ai Weiwei Album
Corruption Policy
Tibetan Self-Immolations
Protests in Xinjiang
Eliminate Golden Week
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

Panxu Protest

Ai Weiwei Album

Corruption Policy

Tibetan Self-Immolations

Protests in Xinjiang

Eliminate Golden Week

Protests in Xinjiang

Corruption Policy

Eliminate Golden Week

Rent Tax
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

Panxu Protest

Ai Weiwei Album

Corruption Policy

Tibetan Self-Immolations

Protests in Xinjiang

Eliminate Golden Week

Yellow Light Fines

Rental Tax

Protests in Xinjiang

Corruption Policy

Tibetan Self-Immolations

Ai Weiwei Album

Panxu Protest

Censorship Difference (Pro − Anti)
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

Panxu Protest
Ai Weiwei Album
Corruption Policy
Eliminate Golden Week
Stock Market Crash
Tibetan Self-Immolations
Protests in Xinjiang
Yellow Light Fines
Rental Tax

25/29
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect

![Graph showing censorship difference (Pro - Anti) for various topics such as Panxu Protest, Ai Weiwei Album, Tibet Self-Immolations, Protests in Xinjiang, Corruption Policy, Eliminate Golden Week, Yellow Light Fines, Stock Market Crash, Investigation of Sichuan Vice Governor, Gender Imbalance, Rental Tax, and Stock Market Crash.](image-url)
Posts For v. Against Government: Zero Causal Effect
Collective Action Events: Large Causal Effect
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Censorship Difference (CA Event − Non-CA Event)

Panxu Protest
Tibetan Self-Immolations

Censorship Difference (CA Event − Non-CA Event)
Collective Action Events: Large Causal Effect

Censorship Difference (CA Event − Non−CA Event)

Panxu Protest
Tibetan Self−Immolations
Ai Weiwei Album
Collective Action Events: Large Causal Effect

Censorship Difference (CA Event - Non-CA Event)

- Panxu Protest
- Tibetan Self-Immolations
- Ai Weiwei Album
- Protests in Xinjiang

Graph showing the censorship difference for various collective action events.
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

Mar. 29, 5 days prior
Apr. 3, Ai Weiwei Arrested

% of Posts Censored
Actual % censorship
Predicted % censorship trend based on 3/19−3/29 data

Mar 19 Mar 29 Apr 08 Apr 18 2011

Placebo Test: Most extreme of all effects 27/29
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

Mar. 29, 5 days prior

Apr. 3, Ai Weiwei Arrested

% of Posts Censored

Mar 19 Mar 29 Apr 08 Apr 18

0.0 0.2 0.4 0.6 0.8 1.0

2011

Actual % censorship

Predicted % censorship trend based on 3/19–3/29 data

Placebo Test:

Most extreme of all effects

27/29
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

Placebo Test: Most extreme of all effects

Actual % censorship

Predicted % censorship trend based on 3/19–3/29 data
Concluding Remarks

Chinese people’s speech: Individually Free, Collectively in Chains

The Chinese Censorship Program:
- Stops collective action, not criticism
- Reveals government intentions; predicts actions

Our methodology:
- Observational, Experimental, Participatory
- Automated text analysis methods validated in Chinese (without translation)
- Enables continuous time measurement of Chinese government censorship activities
- Reveals information about state action when traditional media is silent
- Possibly applicable to other countries
Concluding Remarks

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  - Possibly applicable to other countries
For more information

GaryKing.org

j.mp/JenPan

j.mp/MollyRoberts
### Predicting the South China Sea Peace Agreement

<table>
<thead>
<tr>
<th>Date</th>
<th>Predicted % Censor</th>
<th>Actual % Censor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun. 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jun. 25, Peace Agreement</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Placebo Test:** Most extreme of all effects

31/29
Predicting the South China Sea Peace Agreement

Jun. 20, 5 days prior

Jun. 25, Peace Agreement

Predicted % censor trend based on 6/10–6/20 data

Actual % censorship

% of Posts Censored
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7
Jun 12 Jun 22 Jul 02
2011
Predicting the South China Sea Peace Agreement

Jun. 20, 5 days prior
Jun. 25, Peace Agreement

Predicted % censor trend based on 6/10–6/20 data

Actual % censorship

Placebo Test:

Jun. 12 Jun 22 2011
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7
% of Posts Censored
Predicting the South China Sea Peace Agreement

Jun. 20, 5 days prior
Jun. 25, Peace Agreement

Predicted % censor trend based on 6/10–6/20 data

Actual % censorship

Placebo Test: Most extreme of all effects
Censorship Pre-empting Collective Action: Wang Lijun’s Demotion
Censorship Pre-empting Collective Action: Wang Lijun’s Demotion

- Actual % censorship
- Predicted % censorship trend based on 1/18–1/28 data

Jan. 28, 5 days prior
Feb. 2, Wang Lijun demoted
Censorship Pre-empting Collective Action: Wang Lijun’s Demotion

Jan. 28, 5 days prior
Feb. 2, Wang Lijun demoted

Actual % censorship

Predicted % censorship trend based on 1/18−1/28 data

Placebo Test:
Censorship Pre-empting Collective Action: Wang Lijun’s Demotion

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Actual % censorship

Predicted % censorship trend based on 1/18–1/28 data

Placebo Test: Most extreme of all effects
Uncensored Posts (w/o Collective Action Potential)
Critical of the State
Uncensored Posts (w/o Collective Action Potential)

Critical of the State

<table>
<thead>
<tr>
<th></th>
<th>Collective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>Free</td>
</tr>
<tr>
<td>yes</td>
<td>CENSORED</td>
</tr>
<tr>
<td>no</td>
<td>Free</td>
</tr>
<tr>
<td>no</td>
<td>CENSORED</td>
</tr>
</tbody>
</table>
This is a city government [Yulin City, Shaanxi] that treats life with contempt, this is government officials run amuck, a city government without justice, a city government that delights in that which is vulgar, a place where officials all have mistresses, a city government that is shameless with greed, a government that trades dignity for power, a government without humanity, a government that has no limits on immorality, a government that goes back on its word, a government that treats kindness with ingratitude, a government that cares nothing for posterity...
Censored Post (with Collective Action Potential)
Supporting the State
### Censored Post (with Collective Action Potential)

**Supporting the State**

<table>
<thead>
<tr>
<th>State Critique</th>
<th>Collective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>censored</td>
</tr>
<tr>
<td>free</td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>censored</td>
</tr>
<tr>
<td>free</td>
<td></td>
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</table>
The bombing led not only to the tragedy of his death but the death of many government workers. Even if we can verify what Qian Mingqi said on Weibo that the building demolition caused a great deal of personal damage, we should still condemn his extreme act of retribution. The government has continually put forth measures and laws to protect the interests of citizens in building demolition. And the media has called attention to the plight of those experiencing housing demolition. The rate at which compensation for housing demolition has increased exceeds inflation. In many places, this compensation can change the fate of an entire family.

爆炸案造成他本人和多名政府工作人员死伤的悲剧，即使钱明奇在微博里所称拆迁造成的个人损失是属实的，我们也应谴责他的极端报复行为。政府在连续出台保护被拆迁者利益的政策法规，媒体也在为公平对待被拆迁者大声疾呼，各地拆迁补偿款的上升速度，大多高于商品房售价上升的速度，在不少地方，补偿款已经足以改变一个家庭的命运。