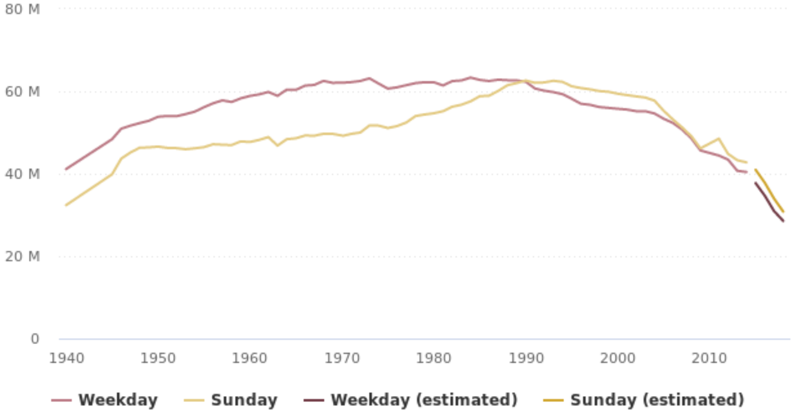
Fake News & Fact Checking: Impact on News Consumption and Dissemination

Jiding Zhang
joint work with
Ken Moon, Senthil Veeraraghavan

The Wharton School

The “Newsvendor’s Problem”

total circulation of US newspapers



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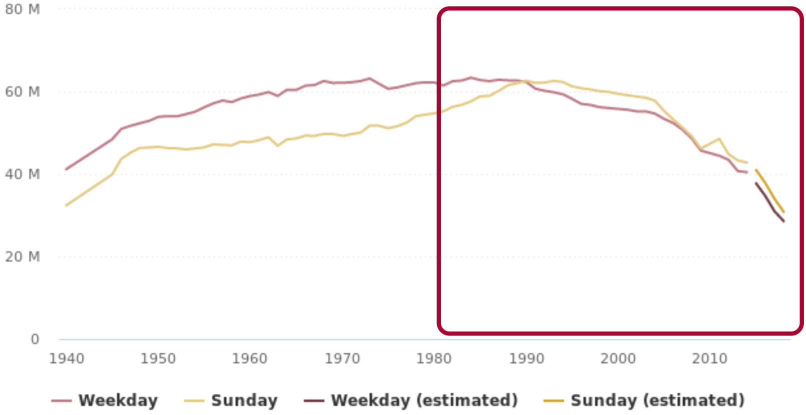
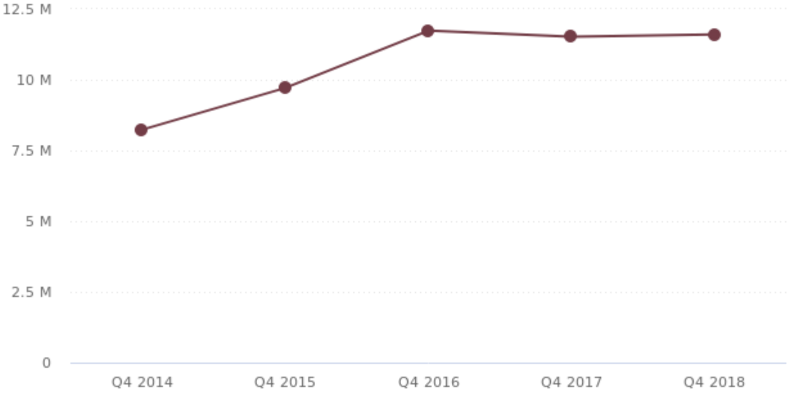
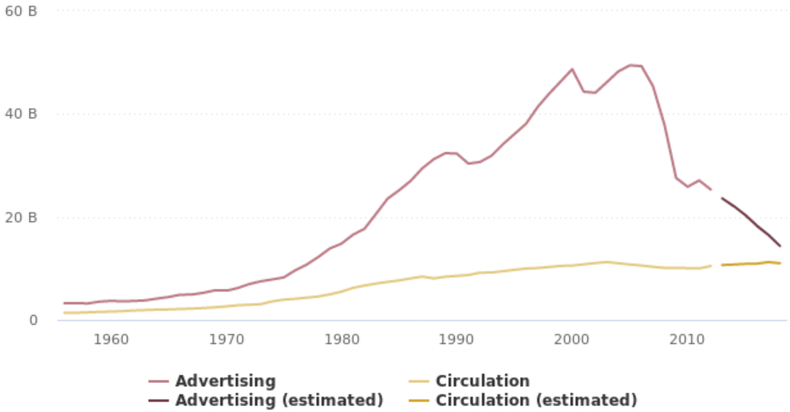


The “Newsvendor’s Problem”

avg. monthly unique visitors to top US newspaper websites



total revenue of US newspapers ($)



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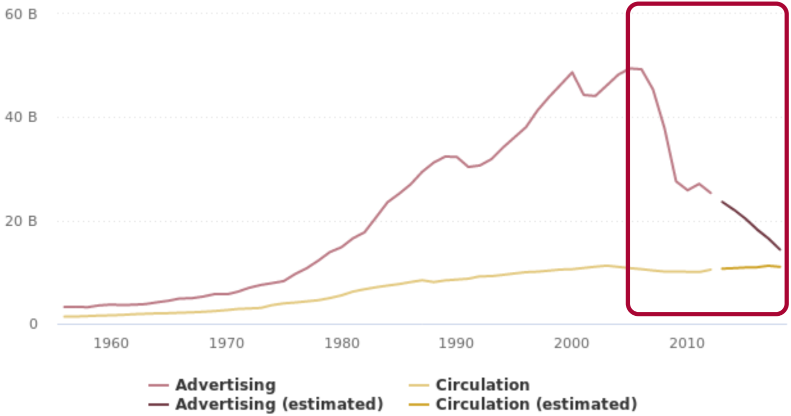
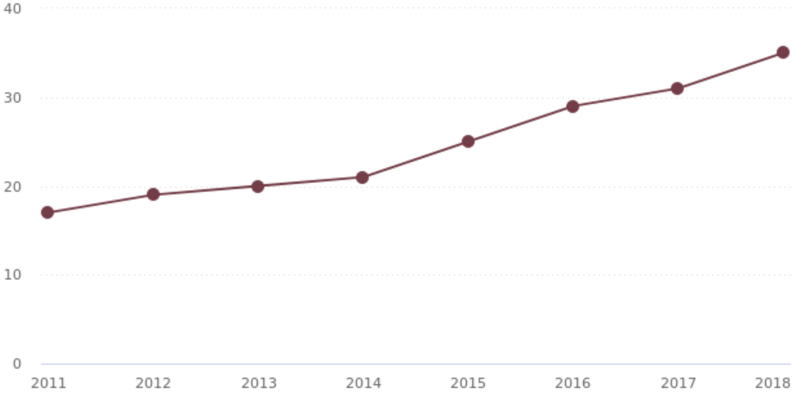


percentage of advertising revenue from digital advertising



The "Newsvendor's Problem"

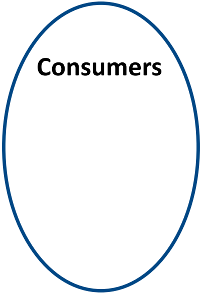
Facts:

- $\downarrow$ circulation volume of traditional newspapers
- $\uparrow$ digital news readership
- $\downarrow$ revenues
- $\uparrow$ revenue dependence on digital channel

We need:

- deeper understanding of the news operations

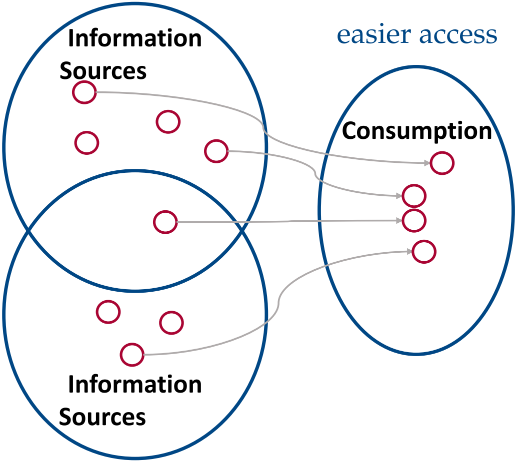
News Consumption and Dissemination



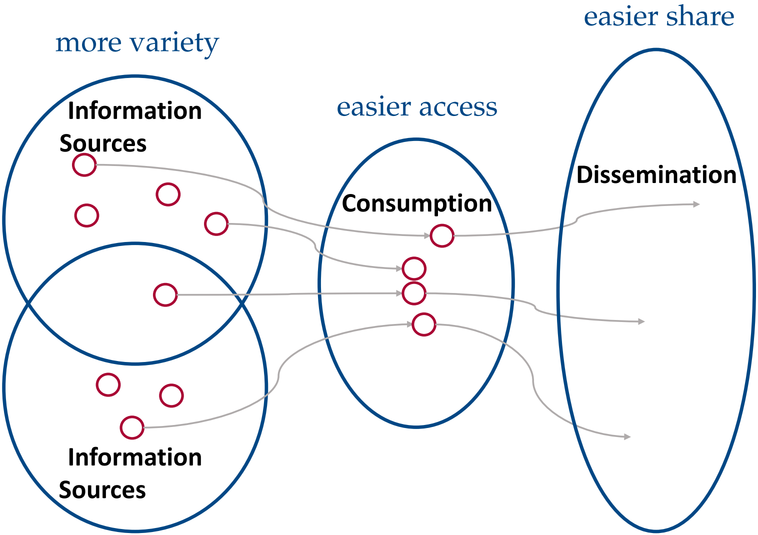
News Consumption and Dissemination

more variety

easier access



News Consumption and Dissemination



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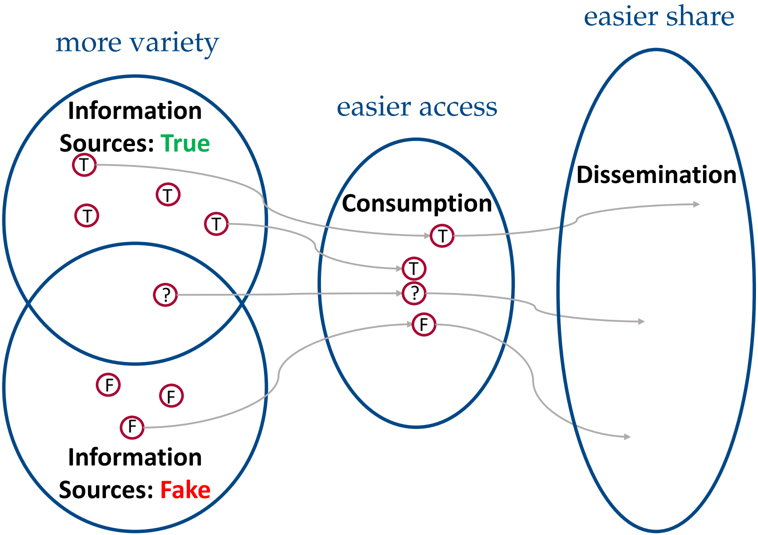

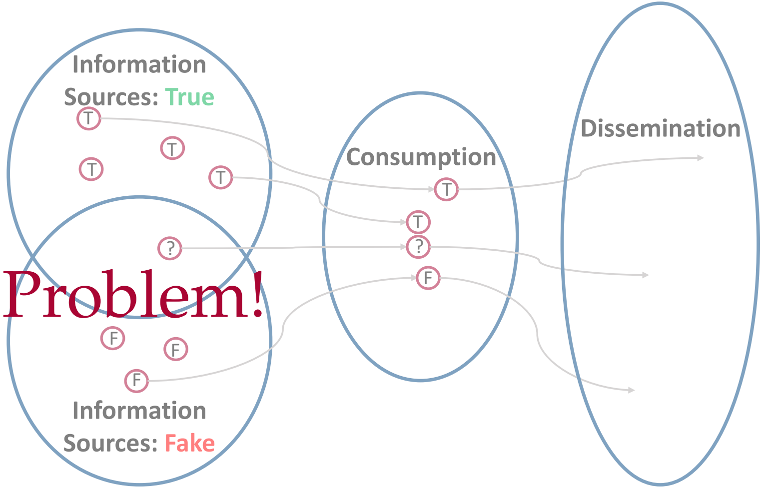
Information Sources: True
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Problem!
F
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Information Sources: Fake
Consumption
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Dissemination

Consequences of (Fake) News Consumption

- violence

Burned to death because of a rumour on WhatsApp

By Marcos Martínez
BBC Monitoring

12 November 2018

Share

A host of mobile phones were raised aloft to capture the moment Ricardo and Alberto were set on fire

- violence
- public health

A viral fake news story linked trans health care to 'thousands' of deaths

Hormone blockers used by some transgender people have multiple uses, including treating prostate cancer in terminally ill patients.

Sept. 27, 2019, 6:16 PM EDT

By Tim Fitzsimons

A recent article published by Catholic news outlet LifeSiteNews alleged that the drugs used to treat gender dysphoria in some transgender children are linked to "thousands" of deaths.

The story went viral on right-wing news websites such as the Christian Post and the Daily Wire. According to CrowdTangle, a social media metric platform, these posts – including shares by Daily Wire founder Ben Shapiro and commentator Matt Walsh – are currently some of the top performing LGBTQ-related content on Facebook and Twitter.

The problem is: the "thousands" of people who die while taking these drugs are likely the terminally ill cancer patients who receive hormone blockers to fight hormone-sensitive cancers, like prostate cancer, according to experts.

Consequences of (Fake) News Consumption

- violence
- public health
- politics

Social Media and Fake News in the 2016 Election

Hunt Allcott

Matthew Gentzkow

JOURNAL OF ECONOMIC PERSPECTIVES
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(pp. 211-36)

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Abstract

Following the 2016 US presidential election, many have expressed concern about the effects of false stories ("fake news"), circulated largely through social media. We discuss the economics of fake news and present new data on its consumption prior to the election. Drawing on web browsing data, archives of fact-checking websites, and results from a new online survey, we find: 1) social media was an important but not dominant source of election news, with 14 percent of Americans calling social media their "most important" source; 2) of the known false news stories that appeared in the three months before the election, those favoring Trump were shared a total of 30 million times on Facebook, while those favoring Clinton were shared 8 million times; 3) the average American adult saw on the order of one or perhaps several fake news stories in the months around the election, with just over half of those who recalled seeing them believing them; and 4) people are much more likely to believe stories that favor their preferred candidate, especially if they have ideologically segregated social media networks.

What We Study

- How do people consume news?

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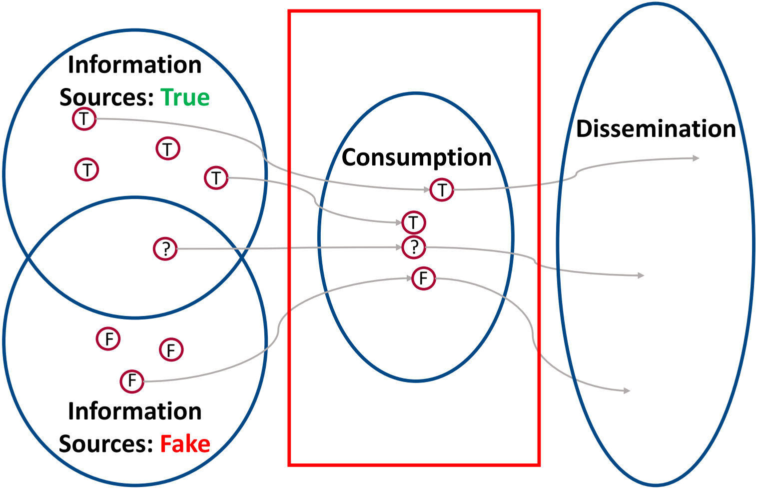
- How do people consume "true" news and fake news?
- Fake news is harmful, but to whom?
- What's the role of fact-checking in digital news?

A Conceptual Look of News Consumption



Literature

Existing research:

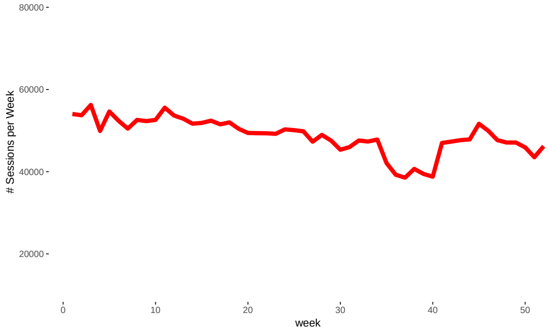
- **Economics, Social Science and Information Systems:** Allcott et al. (2019a), Allcott et al. (2019b), Gentzkow and Shapiro (2010), Gentzkow and Shapiro (2008), Acemoglu et al. (2001), Vosoughi et al. (2018), Goel et al. (2015), etc.
- **Computer Science:** Bakshy et al. (2011), Romero et al. (2011), Wen et al. (2015), Wang et al. (2018), etc.
- **Operations:** Papanastasiou (2018)

Our Research: the fundamental question of preference and consumption

Data

- individual (household) level web-browsing behavior on personal computers
- $> 30,000$ households in the United States
- from January 1, 2017 to December 31, 2017
- demographics: highest education, household oldest age, whether have children, zip code, household income

Data



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Sessions per Week
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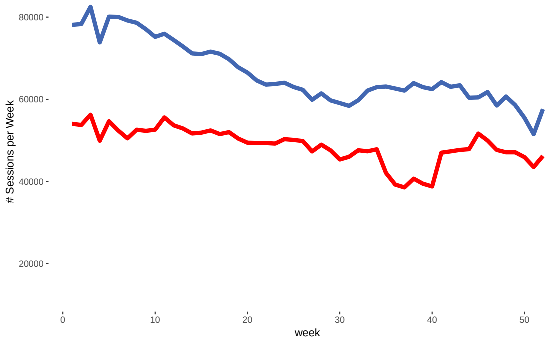
week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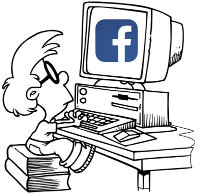
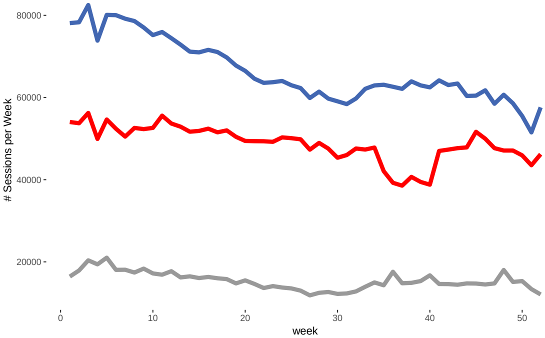


Data



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The New York Times

True News vs. Fake News: Classification

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- **Fake News:** Top 15 fake news sites according to Alexa traffic: *dailywire.com*, *ijr.com*, etc. (same list as provided in Allcott et al. (2019))

Las Vegas Shooting: 59 Killed and More Than 500 Hurt Near Mandalay Bay

Concertgoers flee the Route 91 Harvest country music festival in Las Vegas on Sunday. David Becker / Getty Images

True News vs. Fake News: Classification

MORGUE EMPLOYEE CREMATED BY MISTAKE WHILE TAKING A NAP

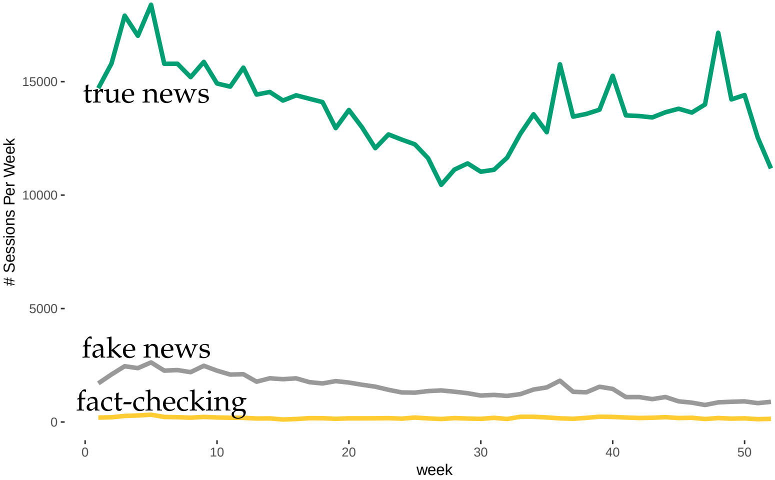
1M

Beaumont, Texas | An employee of the Jefferson County morgue died this morning after being accidentally cremated by one of his coworkers.

True News vs. Fake News: Classification

- **True News:** Top 12 authentic news sites according to Alexa traffic: *cnn.com*, *nytimes.com*, *wsj.com*, *washingtonpost.com*, etc.
- **Fake News:** Top 15 fake news sites according to Alexa traffic: *dailywire.com*, *ijr.com*, etc. (same list as provided in Allcott et al. (2019))
- **Fact Checking:** Top 3 fact checking sites: *snopes.com*, *factcheck.org*, *politifact.com*

Consumption: True News vs. Fake News



Does Fake News Suppress True News?

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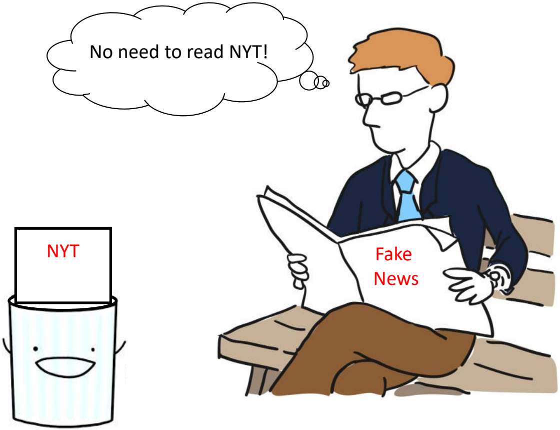
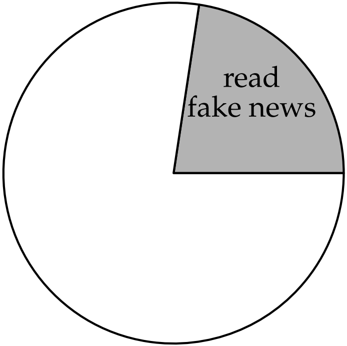
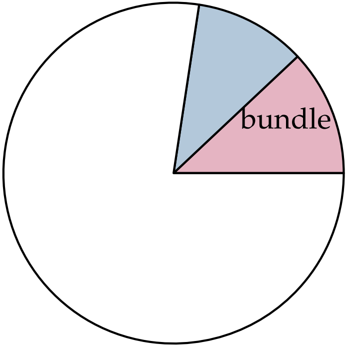


Among people who read true news, 24.6% read fake news.



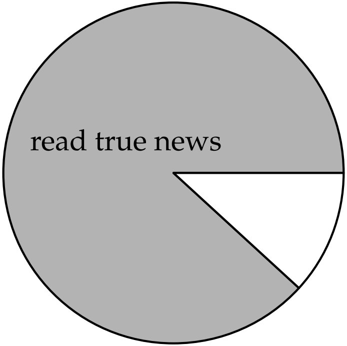
Good News and Bad News

Among people who read true news, 24.6% read fake news, and 12.0% read fake news in same periods of time (bundle).

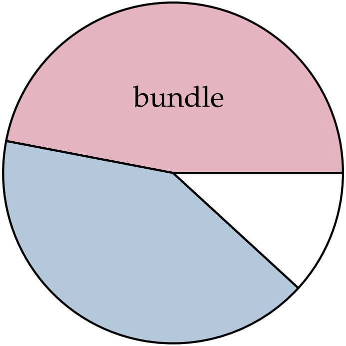


Good News and Bad News

Among people who read fake news, 88.2% read true news.



Among people who read fake news, 88.2% read true news, and 47.0% read true news in same periods of time (bundle).



Mechanisms: Reading Both in Same Periods

Correlation-driven	*Complementarity-driven*
("love news in general")	*("opera-and-football")*

Mechanisms: Reading Both in Same Periods

Correlation-driven
("love news in general")

- Similarity in the consumption patterns between readers
- Promote News: Reduced consumption of fake news

Complementarity-driven
("opera-and-football")

- Heterogeneity in the consumption patterns across readers
- Promote News: Increased consumption of fake news

Utility-Based Choice Model

Utility of for consumer i to consume news type j at time t for $j \in \{Fake, Checking, True\}$:

$$u_{ijt} = \delta_j + X_i \beta_j + \nu_{ij}$$

- ν_{ij}: idiosyncratic taste for different news types
- ν_{ij} modeled as random effect: $\nu_{ij} \sim N(0, \Sigma_\nu)$

Utility-Based Choice Model

Utility of consuming the bundle $B \in 2^{\{Fake, Checking, True\}}$:

$$u_{iBt} = \underbrace{\sum_{j \in B} u_{ijt}}_{\text{utility from each item}} +$$

Utility-Based Choice Model

Utility of consuming the bundle $B \in 2^{\{Fake, Checking, True\}}$:

$$u_{iBt} = \underbrace{\sum_{j \in B} u_{ijt}}_{\text{utility from each item}} + \underbrace{X_i \Gamma_B}_{\text{“opera-and-football” utility boost}} +$$

- $\Gamma_j = 0$ for $j \in \{F, C, T\}$, $\Gamma_{F\&T\&C} = \Gamma_{F\&T} + \Gamma_{T\&C} + \Gamma_{F\&C}$

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- $\Gamma_j = 0$ for $j \in \{F, C, T\}$, $\Gamma_{F\&T\&C} = \Gamma_{F\&T} + \Gamma_{T\&C} + \Gamma_{F\&C}$
- idiosyncratic error ϵ follows the Type I extreme value distribution

Correlation or Complementarity?

Correlation-driven
("love news in general")

October

	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
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Results

- True news and fake news are **complements**.

Estimators on Complementarity (Γ)

	F & C	C & T	F & T
Education	-0.088***	0.011	-0.057***
No Kid	0.185***	-0.048*	0.024**
Age 39-	-0.065	0.208***	-0.0579
Age 65+	-0.017	-0.101	0.066***
Baseline Complementarity	0.758***	1.849***	0.116***

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- Fact-checking websites might drive consumption of fake news.

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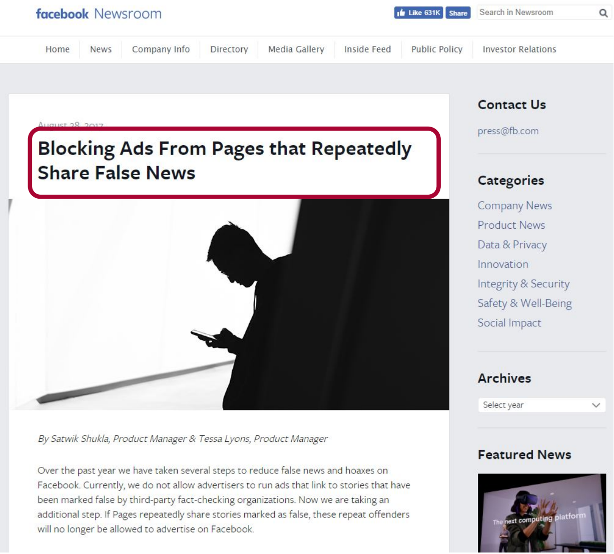
A Natural Experiment



Instrumenting for Fake News Supply

$$True_{it} = Fake_{it} + Fake_{it} : Demo_i + \eta_i + e_{it}$$

	Dependent variable: True			
Fake	0.184***	0.205***	0.779***	1.687***
	(0.007)	(0.024)	(0.147)	(0.602)
Fake:hoh_most_education		0.046***		0.069
		(0.008)		(0.177)
Fake:factor(census_region)2		−0.062***		−0.269
		(0.024)		(0.634)
Fake:factor(census_region)3		0.084***		−1.375**
		(0.022)		(0.537)
Fake:factor(census_region)4		−0.005		−0.012
		(0.027)		(0.594)
Fake:hoh_oldest_age		−0.005		−0.074
		(0.003)		(0.066)
Fake:children		−0.021		−0.075
		(0.015)		(0.325)
Fake:household_income		0.018***		−0.095
		(0.004)		(0.090)
Instrument: week $\geq$ 35			Y	Y

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Fake:household_income		0.018***		−0.095
		(0.004)		(0.090)
Instrument: week $\geq$ 35			Y	Y

Takeaways

- We develop a utility-based choice model to study the consumption pattern of news.
- We disentangle bundling driven by correlation and complementarity.
- True news and fake news are complements. There is reader level heterogeneity in such complementarity.
- Fact-checking is a strong complement to fake news.

Thank you!

Fake News & Fact Checking:
Impact on News Consumption and Dissemination
(work in progress)

Jiding Zhang, Ken Moon, Senthil Veeraraghavan

jiding@wharton.upenn.edu