

# Attention Spillovers from News to Ads: Evidence from an Eye-Tracking Experiment

Andrey Simonov, Tommaso Valletti, Andre Veiga

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# Motivation

- ▶ Spring 2020:
  - ▶ Online media consumption up by 50%
  - ▶ Digital advertising down by 25-35%
- ▶ Why?
  - ▶ Overall uncertainty
  - ▶ “Block lists” → avoidance of “hard news”
    - ▶ advertisers worry about negative value of ad attention (negative brand associations)
- ▶ Policy concern: this can discourage coverage of wars, natural disasters, pandemics, etc

# Newspapers to lose £50m in online ads as firms use coronavirus 'blacklist'

Publishers struggle to make advertising revenue despite record digital readership

MEDIA & MARKETING

## Companies Avoid Advertising Next to Coronavirus News

The name of the virus overtakes 'Trump' as the keyword blocked by the most brands, a problem for digital news publishers

# Research Questions

1. What is the effect of attention to articles on attention to ads?
  - 1.1 interesting articles distract from ads → negative
  - 1.2 interesting articles engage reader for longer & reader periodically glances at nearby ads → positive
2. Does this incremental attention to ads benefit advertisers?
  - 2.1 Effects on recall / purchase
3. Does the type of content matter?
  - 3.1 Soft vs. hard news

# This Paper

1. Online eye-tracking experiment
  - 1.1 read news articles with randomly matched ads
  - 1.2 During: measure attention to article and ad
  - 1.3 After: measure recall/purchase
2. Simple Model
  - 2.1 attention allocation to articles and ads
  - 2.2 ad attention affects recall/purchase
3. Results
  - 3.1 Parameters of attention allocation
  - 3.2 Effects on recall / purchase
  - 3.3 Extensions and robustness checks
4. Implications for publishers, advertisers, and ad effects measurements

# Roadmap

1 The Experiment

2 Data Descriptives

3 Model

4 Results

5 Implications

# Experiment

- ▶ Recruited 1,013 participants
  - ▶ July-August 2020
  - ▶ 50-50 split in the US/UK and desktop/mobile
- ▶ Shown a sequence of 9 news articles (random order)
  - ▶ US: NYTimes, USA Today
  - ▶ UK: The Guardian, Daily Mail
  - ▶ “Hard” (Covid-19; BLM) and “soft” (e.g. celebrities) news
- ▶ Articles randomly matched with 8 brand ads
  - ▶ Popular US/UK brands
  - ▶ One “billboard” and two “side” ads
  - ▶ One brand per article
  - ▶ One article without “empty” ads
- ▶ Measured recall and purchase
  - ▶ Recall among 8 focal + 8 decoy brands
  - ▶ 8 choices between \$10 brand voucher vs. \$3-\$7 cash (or £)
    - ▶ one outcome realized, at random

# Article Example: Hard News

NATION

## 'I thought this was a hoax': Patient, 30, dies after attending 'COVID party,' doctor says

**Joel Shannon** USA TODAY

Published 7:15 p.m. ET Jul. 11, 2020 | Updated 7:31 p.m. ET Jul. 11, 2020



### San Antonio hospital treated patient who attended 'COVID party,' doctor says

Dr. Jane Appleby, the chief medical officer at Methodist Hospital in San Antonio, says the hospital treated a patient who attended a 'COVID party.' *Methodist Healthcare*

## Article Example: Soft News

# **Scooby Who? Great Dane's popularity falls to its lowest level in 50 years after peaking in the 1980s thanks to the Scooby Doo TV series**

- Over 3,000 Great Danes were registered in 1980 when Scrappy Doo appeared
- The Kennel Club say British people are falling out of love with larger dog breeds
- The most popular dogs are now smaller breeds like the French Bulldog and Pug
- Great Danes rose in popularity steadily from the launch of Scooby Doo in 1969 until 1980 when they reached a peak and have been declining since then

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By RYAN MORRISON FOR MAILONLINE 

PUBLISHED: 14:04, 13 July 2020 | UPDATED: 15:51, 13 July 2020

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## Brands

| Type of product/Country | US                | UK            |
|-------------------------|-------------------|---------------|
| Coffee shop             | Starbucks         | Starbucks     |
| Coffee shop             | Dunkin' Donuts    | Costa         |
| Clothing                | Banana Republic   | Primark       |
| Clothing                | GAP               | H&M           |
| Food                    | Domino's Pizza    | Pizza Express |
| Food                    | Burger King       | Wagamama      |
| Bath products           | Bath & Body Works | The Body Shop |
| DIY/Home improvement    | Home Depot        | B&Q           |

# Eye-Tracking

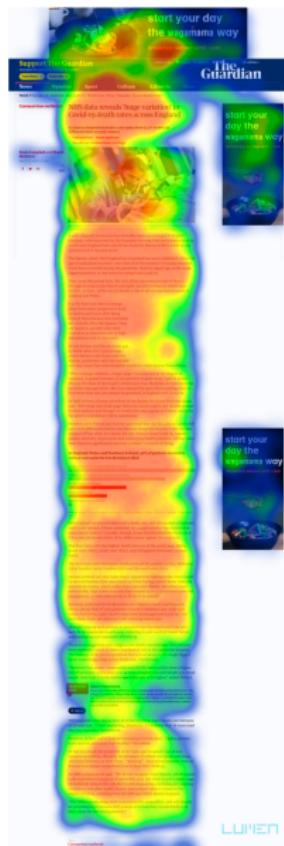
- ▶ Technology by Lumen Industries
- ▶ Use web camera and proprietary software to create 3D model of face and measure gaze on the screen
- ▶ 3 calibrations rounds, before articles # 1, 4, 7
- ▶ Privacy
  - ▶ only eye gaze data recorded
  - ▶ Software deletes itself after the experiment



# Eye-Tracking Data

- ▶ Two metrics of attention:
  - ▶ Article/ad dwell (our focus)
  - ▶ Article/ad visible (robustness, does not use eye-tracking)
- ▶ Dropped participants with low-quality data
  - ▶ eg, head moved too much, bad internet connection, etc
  - ▶ balanced on observables

# Eye-Tracking Data



# Roadmap

1 The Experiment

2 Data Descriptives

3 Model

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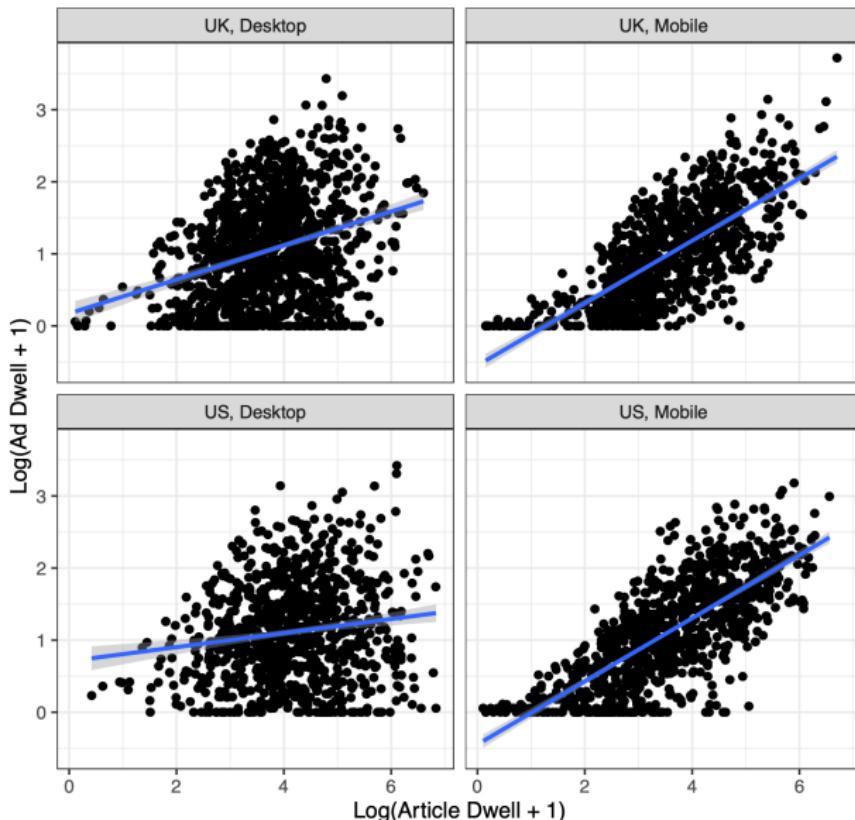
# Summary Statistics

Table 1: Summary Statistics

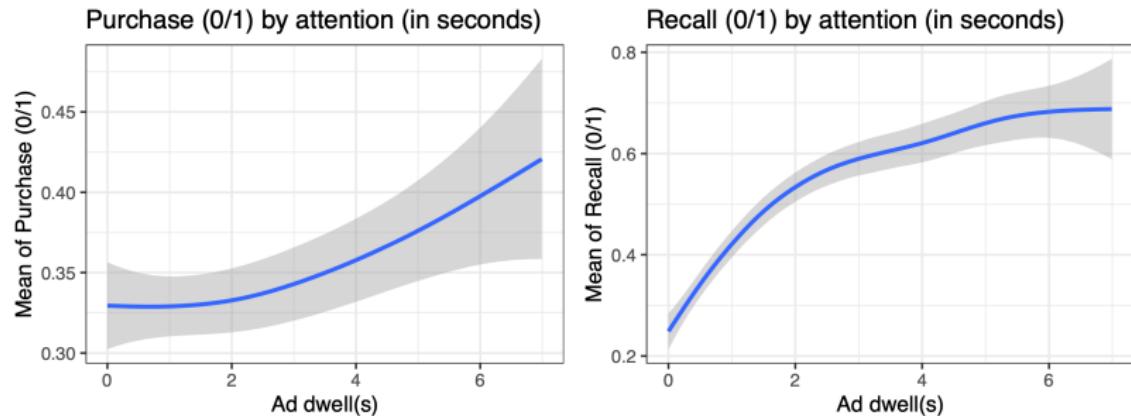
| Statistic           | N     | Mean    | St. Dev. | Min    | Max       |
|---------------------|-------|---------|----------|--------|-----------|
| Desktop             | 6,431 | 0.563   | 0.496    | 0      | 1         |
| Female              | 6,431 | 0.556   | 0.497    | 0      | 1         |
| U.S.                | 6,431 | 0.483   | 0.500    | 0      | 1         |
| Hard News           | 6,431 | 0.550   | 0.498    | 0      | 1         |
| Article Visible (s) | 6,431 | 143.301 | 169.341  | 20.130 | 1,894.635 |
| Ad Visible (s)      | 5,707 | 19.027  | 17.371   | 0.000  | 291.905   |
| Price (USD/GBP)     | 5,707 | 5.017   | 1.436    | 3.000  | 7.000     |
| Recall              | 5,707 | 0.484   | 0.500    | 0.000  | 1.000     |
| Buy                 | 5,707 | 0.347   | 0.476    | 0.000  | 1.000     |
| Article Dwell (s)   | 4,426 | 74.813  | 97.918   | 0.112  | 966.945   |
| Ad Dwell (s)        | 3,925 | 2.755   | 3.161    | 0.000  | 40.214    |

Each observation is at the individual x article level.

## Data Descriptives: Article and Ad Attention



## Data Descriptives: Recall and Purchase vs. Ad Dwell



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# A Simple Model of Attention Allocation

- ▶ Reader  $i$  decides attention to
  - ▶ article  $j$  ( $x_{art}$ )
  - ▶ ads of brand  $k$  shown next to this article ( $x_{ad}$ )
- ▶ Utility:

$$U_{ijk}(x_{art}, x_{ad}) = \alpha_{ij}x_{art} - \frac{x_{art}^2}{2} + 1_{ijk} \left( -\beta x_{art} + \delta_{ik}x_{ad} + \gamma x_{art}x_{ad} - \frac{x_{ad}^2}{2} \right)$$

- ▶  $\alpha_{ij}$ : reader  $i$ 's interest in article  $j$
- ▶  $1_{ijk}$ : indicator for brand  $k$  is shown to individual  $i$  next to article  $j$
- ▶  $\beta$ : disutility of attention to article when an ad is shown next to it
- ▶  $\delta_{ik}$ : taste for devoting attention to ads of brand  $k$
- ▶  $\gamma$ : attention spillovers from article to ad
- ▶ Optimal choice:

$$x_{art,ijk}^* = \alpha_{ij} + 1_{ijk} (-\beta + \gamma x_{ad,ijk}^*)$$

$$x_{ad,ijk}^* = 1_{ijk} (\delta_{ij} + \gamma x_{art,ijk}^*)$$

## Recall and Purchase

- ▶ Recall and purchase decisions are determined by

$$r_{ijk} = f_{ik}(\cdot) + \rho x_{ad,ijk}^* + \varepsilon_{ijk}^i$$

$$v_{ijk} = g_{ik}(\cdot, p_{ik}) + \lambda x_{ad,ijk}^* + \varepsilon_{ijk}^v$$

- ▶  $r_{ijk} \in \{0,1\}$  and  $v_{ijk} \in \{0,1\}$  are recall and purchase indicators
- ▶  $f_{ik}(\cdot), g_{ik}(\cdot, p_{ik})$ : effects of consumer and brand characteristics
  - ▶ for purchase, price also matters
- ▶  $\rho, \lambda$ : effects of ad attention on recall/purchase
- ▶  $\varepsilon_{ijk}^i, \varepsilon_{ijk}^v$  are idiosyncratic shocks

## Parameterization

- ▶ We parameterize

$$f_{ik}(\cdot) = \theta_{o_{ik}}^r + \eta_k^r + \mu^r X_i$$

$$g_{ik}(\cdot, p_{ik}) = \theta_{o_{ik}}^v + \eta_{k,p_{ik}}^v + \mu^v X_i$$

- ▶  $\theta_{o_{ik}}^r, \theta_{o_{ik}}^v$  are FE for “step order”
  - ▶ order in which ad shown
- ▶  $\eta_k^r, \eta_{k,p_{ik}}^v$  are brand / brand  $\times$  price FE
- ▶  $X_i$  include FE for income, gender, education, age and self-reported political leaning

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## Results: Attention Allocation Model

- ▶ Recall the FOCs:

$$x_{art,ijk}^* = \alpha_{ij} + 1_{ijk} (-\beta + \gamma x_{ad,ijk}^*)$$
$$x_{ad,ijk}^* = 1_{ijk} (\delta_{ij} + \gamma x_{art,ijk}^*)$$

- ▶ We estimate the parameters in two steps:
  1. Estimate  $\delta, \gamma$  by regressing  $x_{ad,ijk}^*$  on  $x_{art,ijk}^* +$  individual and brand controls
    - 1.1 OLS
    - 1.2 concern about simultaneity → IV: instrument  $x_{art,ijk}^*$  with the average amount of attention to article  $j$  by other participants
  2. Estimate  $\alpha, \beta$  by regressing  $x_{art,ijk}^* - \hat{\gamma} x_{ad,ijk}^*$  on  $1_{ijk} +$  individual and brand controls

# Results: Attention Allocation Model

Table 2: Estimates of attention spillovers and ad avoidance

| Panel I                                 | Ad Dwell              |                     |                     |                       |                     |                     |
|---|-----------------------|---------------------|---------------------|-----------------------|---------------------|---------------------|
|   | OLS                   |                     |                     | IV                    |                     |                     |
|   | (1)                   | (2)                 | (3)                 | (4)                   | (5)                 | (6)                 |
| $\hat{\beta}_1$                         | 2.715***<br>(0.197)   |                     |                     | 3.083***<br>(0.306)   |                     |                     |
| $\hat{\gamma}$                          | 0.011***<br>(0.002)   | 0.012***<br>(0.002) | 0.012***<br>(0.001) | 0.008***<br>(0.003)   | 0.009***<br>(0.002) | 0.009***<br>(0.002) |
| 1st Stage Incr. F-Stat                  |                       |                     |                     | 65.86                 | 119.78              | 124.93              |
| Observations                            | 3,925                 | 3,925               | 3,925               | 3,925                 | 3,925               | 3,925               |
| R <sup>2</sup>                          | 0.145                 | 0.156               | 0.549               | 0.135                 | 0.150               | 0.547               |
| Article Dwell - $\hat{\gamma}$ Ad Dwell |                       |                     |                     |                       |                     |                     |
| Panel II                                | (1)                   | (2)                 | (3)                 | (4)                   | (5)                 | (6)                 |
|   | 105.894***<br>(4.521) |                     |                     | 105.907***<br>(4.521) |                     |                     |
|   | $\hat{\alpha}_1$      |                     |                     |                       |                     |                     |
| $\hat{\beta}$                           | 7.024*<br>(3.919)     | 6.845*<br>(3.741)   | 8.798**<br>(3.509)  | 7.015*<br>(3.919)     | 6.837*<br>(3.741)   | 8.791**<br>(3.509)  |
| Observations                            | 4,426                 | 4,426               | 4,426               | 4,426                 | 4,426               | 4,426               |
| R <sup>2</sup>                          | 0.030                 | 0.112               | 0.640               | 0.030                 | 0.112               | 0.640               |
| FE:                                     |                       |                     |                     |                       |                     |                     |
| Step Order                              | Y                     | Y                   | Y                   | Y                     | Y                   | Y                   |
| Article                                 | N                     | Y                   | Y                   | N                     | Y                   | Y                   |
| Brand                                   | N                     | Y                   | Y                   | N                     | Y                   | Y                   |
| Individual                              | N                     | N                   | Y                   | N                     | N                   | Y                   |

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

- ▶  $\gamma$ : 1s extra attention on article  $\rightarrow$  0.01s extra attention to ad
  - ▶ IV similar to OLS because attention to ad  $\ll$  attention to article
- ▶  $\beta$ : without an ad, people pay 7s more attention to article

# Results: Effect on Recall and Purchase, OLS

Table 3: Estimates of advertising effects on recall and purchase: OLS

|                  | Recall ( $\hat{\rho}$ ) |                     |                     |                     | Purchase ( $\hat{\lambda}$ ) |                    |                    |                    |                    |                  |           |        |
|------------------|-------------------------|---------------------|---------------------|---------------------|------------------------------|--------------------|--------------------|--------------------|--------------------|------------------|-----------|--------|
|                  | All                     |                     | Device              |                     | News Type                    |                    | All                |                    | Device             |                  | News Type |        |
|                  |                         | Mobile              | Desktop             | Hard                | Soft                         |                    | Mobile             | Desktop            | Hard               | Soft             |           | Mobile |
| <b>Panel I</b>   | (1)                     | (2)                 | (3)                 | (4)                 | (5)                          | (6)                | (7)                | (8)                | (9)                | (10)             |           |        |
| Ad Visible       | 0.003***<br>(0.001)     | 0.003***<br>(0.001) | 0.004***<br>(0.001) | 0.004***<br>(0.001) | 0.002***<br>(0.001)          | 0.001**<br>(0.001) | 0.002**<br>(0.001) | 0.001*<br>(0.001)  | 0.001**<br>(0.001) | 0.001<br>(0.001) |           |        |
| Observations     | 5,707                   | 2,495               | 3,212               | 3,154               | 2,553                        | 5,707              | 2,495              | 3,212              | 3,154              | 2,553            |           |        |
| R <sup>2</sup>   | 0.091                   | 0.103               | 0.120               | 0.102               | 0.096                        | 0.130              | 0.164              | 0.147              | 0.147              | 0.147            |           |        |
| <b>Panel II</b>  | (1)                     | (2)                 | (3)                 | (4)                 | (5)                          | (6)                | (7)                | (8)                | (9)                | (10)             |           |        |
| Ad Dwell         | 0.034***<br>(0.004)     | 0.028***<br>(0.006) | 0.036***<br>(0.005) | 0.041***<br>(0.004) | 0.029***<br>(0.005)          | 0.007**<br>(0.003) | 0.009**<br>(0.004) | 0.009**<br>(0.004) | 0.009**<br>(0.004) | 0.005<br>(0.004) |           |        |
| Observations     | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760                        | 3,925              | 1,824              | 2,101              | 2,165              | 1,760            |           |        |
| R <sup>2</sup>   | 0.143                   | 0.133               | 0.188               | 0.167               | 0.139                        | 0.136              | 0.200              | 0.153              | 0.168              | 0.159            |           |        |
| FE:              |                         |                     |                     |                     |                              |                    |                    |                    |                    |                  |           |        |
| Brand            | Y                       | Y                   | Y                   | Y                   | Y                            |                    | Y                  | Y                  | Y                  | Y                |           |        |
| Price x Brand    |                         |                     |                     |                     |                              |                    |                    |                    |                    |                  |           |        |
| Step Order       | Y                       | Y                   | Y                   | Y                   | Y                            | Y                  | Y                  | Y                  | Y                  | Y                |           |        |
| Country x Device | Y                       | Y                   | Y                   | Y                   | Y                            | Y                  | Y                  | Y                  | Y                  | Y                |           |        |
| Dem. Controls    | Y                       | Y                   | Y                   | Y                   | Y                            | Y                  | Y                  | Y                  | Y                  | Y                |           |        |

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

All specifications include a quartic polynomial in log of average time that an average article was visible for by each individual. All specifications include step order and device x country fixed effects. All specifications include fixed effects for individual covariates (income, gender, education, age, and self-reported political leaning). Regressions with recall as an outcome include brand fixed effects, and regressions with purchase as an outcome include brand by price fixed effects. Standard errors clustered at the individual level.

- ▶ 1s extra ad dwell → 3.4 p.p. higher recall and 0.7 p.p. higher purchase probability

# Results: Effect on Recall and Purchase, OLS

Table 3: Estimates of advertising effects on recall and purchase: OLS

|                  | Recall ( $\hat{\rho}$ ) |                     |                     |                     |                     | Purchase ( $\hat{\lambda}$ ) |                    |                    |                    |                  |
|------------------|-------------------------|---------------------|---------------------|---------------------|---------------------|------------------------------|--------------------|--------------------|--------------------|------------------|
|                  | All                     |                     | Device              |                     | News Type           | All                          |                    | Device             |                    | News Type        |
|                  | Mobile                  | Desktop             | Hard                | Soft                |                     | Mobile                       | Desktop            | Hard               | Soft               | (10)             |
| <b>Panel I</b>   | (1)                     | (2)                 | (3)                 | (4)                 | (5)                 | (6)                          | (7)                | (8)                | (9)                | (10)             |
| Ad Visible       | 0.003***<br>(0.001)     | 0.003***<br>(0.001) | 0.004***<br>(0.001) | 0.004***<br>(0.001) | 0.002***<br>(0.001) | 0.001**<br>(0.001)           | 0.002**<br>(0.001) | 0.001*<br>(0.001)  | 0.001**<br>(0.001) | 0.001<br>(0.001) |
| Observations     | 5,707                   | 2,495               | 3,212               | 3,154               | 2,553               | 5,707                        | 2,495              | 3,212              | 3,154              | 2,553            |
| R <sup>2</sup>   | 0.091                   | 0.103               | 0.120               | 0.102               | 0.096               | 0.130                        | 0.164              | 0.147              | 0.147              | 0.147            |
| <b>Panel II</b>  | (1)                     | (2)                 | (3)                 | (4)                 | (5)                 | (6)                          | (7)                | (8)                | (9)                | (10)             |
| Ad Dwell         | 0.034***<br>(0.004)     | 0.028***<br>(0.006) | 0.036***<br>(0.005) | 0.041***<br>(0.004) | 0.029***<br>(0.005) | 0.007**<br>(0.003)           | 0.009**<br>(0.004) | 0.008**<br>(0.004) | 0.009**<br>(0.004) | 0.005<br>(0.004) |
| Observations     | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925                        | 1,824              | 2,101              | 2,165              | 1,760            |
| R <sup>2</sup>   | 0.143                   | 0.133               | 0.188               | 0.167               | 0.139               | 0.136                        | 0.200              | 0.153              | 0.168              | 0.159            |
| FE:              |                         |                     |                     |                     |                     |                              |                    |                    |                    |                  |
| Brand            | Y                       | Y                   | Y                   | Y                   | Y                   |                              |                    |                    |                    |                  |
| Price x Brand    | Y                       | Y                   | Y                   | Y                   | Y                   | Y                            | Y                  | Y                  | Y                  | Y                |
| Step Order       | Y                       | Y                   | Y                   | Y                   | Y                   | Y                            | Y                  | Y                  | Y                  | Y                |
| Country x Device | Y                       | Y                   | Y                   | Y                   | Y                   | Y                            | Y                  | Y                  | Y                  | Y                |
| Dem. Controls    | Y                       | Y                   | Y                   | Y                   | Y                   | Y                            | Y                  | Y                  | Y                  | Y                |

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

All specifications include a quartic polynomial in log of average time that an average article was visible for by each individual. All specifications include step order and device x country fixed effects. All specifications include fixed effects for individual covariates (income, gender, education, age, and self-reported political leaning). Regressions with recall as an outcome include brand fixed effects, and regressions with purchase as an outcome include brand by price fixed effects. Standard errors clustered at the individual level.

- ▶ Similar estimates by news type. If anything, hard news have LARGER effect

## Results: Effect on Recall and Purchase, IV

- ▶ Stigler/Becker/Murphy critique: ads have consumption value
  - ▶ e.g., individuals who like burgers, buy burgers and devote more attention to burger ads
- ▶ Instrument ad attention ( $x_{ad,ijk}^*$ ) with article attention ( $x_{art,ijk}^*$ ).  
Intuition:
  - ▶ News articles are of different quality/interest to consumers
  - ▶ Interesting articles randomly paired with ads → incremental attention to ads

# Results: Effect on Recall and Purchase, IV

Table 5: Estimates of advertising effects on recall and purchase: Article Dwell IV

|                        | Recall ( $\hat{\rho}$ ) |                     |                     |                     |                     |                     |                     |                     | Purchase ( $\hat{\lambda}$ ) |                     |        |     |           |      |  |  |
|------------------------|-------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------------------------|---------------------|--------|-----|-----------|------|--|--|
|                        | All                     |                     | Device              |                     | News Type           |                     |                     |                     | All                          |                     | Device |     | News Type |      |  |  |
|                        | Mobile                  | Desktop             | Hard                | Soft                | (1)                 | (2)                 | (3)                 | (4)                 | (5)                          | (6)                 | (7)    | (8) | (9)       | (10) |  |  |
| <b>Panel I</b>         |                         |                     |                     |                     |                     |                     |                     |                     |                              |                     |        |     |           |      |  |  |
| Ad Visible             | 0.0003<br>(0.002)       | 0.008<br>(0.007)    | -0.001<br>(0.002)   | 0.001<br>(0.003)    | -0.0004<br>(0.003)  | 0.006***<br>(0.002) | 0.013**<br>(0.006)  | 0.004*<br>(0.002)   | 0.007**<br>(0.003)           | 0.005*<br>(0.002)   |        |     |           |      |  |  |
| Observations           | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925               | 1,824               | 2,101               | 2,165                        | 1,760               |        |     |           |      |  |  |
| R <sup>2</sup>         | 0.105                   | 0.097               | 0.138               | 0.122               | 0.103               | 0.123               | 0.128               | 0.146               | 0.148                        | 0.149               |        |     |           |      |  |  |
| First Stage            |                         |                     |                     |                     |                     |                     |                     |                     |                              |                     |        |     |           |      |  |  |
| Article Dwell          | 0.058***<br>(0.007)     | 0.024***<br>(0.007) | 0.076***<br>(0.009) | 0.057***<br>(0.010) | 0.059***<br>(0.007) | 0.058***<br>(0.007) | 0.026***<br>(0.007) | 0.075***<br>(0.008) | 0.057***<br>(0.010)          | 0.059***<br>(0.007) |        |     |           |      |  |  |
| Observations           | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925               | 1,824               | 2,101               | 2,165                        | 1,760               |        |     |           |      |  |  |
| R <sup>2</sup>         | 0.459                   | 0.282               | 0.566               | 0.430               | 0.516               | 0.467               | 0.307               | 0.582               | 0.447                        | 0.531               |        |     |           |      |  |  |
| 1st Stage Incr. F-Stat | 75.85                   | 12.83               | 76.71               | 31.92               | 71.4                | 77.74               | 14.53               | 79.01               | 33.5                         | 70.79               |        |     |           |      |  |  |
| <b>Panel II</b>        | (1)                     | (2)                 | (3)                 | (4)                 | (5)                 | (6)                 | (7)                 | (8)                 | (9)                          | (10)                |        |     |           |      |  |  |
| Ad Dwell               | 0.001<br>(0.010)        | 0.008<br>(0.007)    | -0.009<br>(0.032)   | 0.005<br>(0.014)    | -0.002<br>(0.013)   | 0.028**<br>(0.011)  | 0.015**<br>(0.007)  | 0.052<br>(0.037)    | 0.036**<br>(0.016)           | 0.025*<br>(0.013)   |        |     |           |      |  |  |
| Observations           | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925               | 1,824               | 2,101               | 2,165                        | 1,760               |        |     |           |      |  |  |
| R <sup>2</sup>         | 0.107                   | 0.122               | 0.117               | 0.130               | 0.100               | 0.119               | 0.199               | 0.079               | 0.145                        | 0.143               |        |     |           |      |  |  |
| First Stage            |                         |                     |                     |                     |                     |                     |                     |                     |                              |                     |        |     |           |      |  |  |
| Article Dwell          | 0.011***<br>(0.002)     | 0.022***<br>(0.002) | 0.005***<br>(0.002) | 0.011***<br>(0.002) | 0.011***<br>(0.002) | 0.011***<br>(0.002) | 0.023***<br>(0.002) | 0.005***<br>(0.002) | 0.011***<br>(0.002)          | 0.011***<br>(0.002) |        |     |           |      |  |  |
| Observations           | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925               | 1,824               | 2,101               | 2,165                        | 1,760               |        |     |           |      |  |  |
| R <sup>2</sup>         | 0.205                   | 0.476               | 0.129               | 0.208               | 0.232               | 0.220               | 0.500               | 0.156               | 0.235                        | 0.262               |        |     |           |      |  |  |
| 1st Stage Incr. F-Stat | 48.23                   | 173.37              | 11.96               | 34.63               | 34.09               | 48.52               | 183.4               | 10.41               | 36.78                        | 34.52               |        |     |           |      |  |  |
| FE:                    |                         |                     |                     |                     |                     |                     |                     |                     |                              |                     |        |     |           |      |  |  |
| Brand                  | Y                       | Y                   | Y                   | Y                   | Y                   |                     |                     |                     |                              |                     |        |     |           |      |  |  |
| Price x Brand          |                         |                     |                     |                     |                     | Y                   | Y                   | Y                   | Y                            | Y                   |        |     |           |      |  |  |
| Step Order             | Y                       | Y                   | Y                   | Y                   | Y                   | Y                   | Y                   | Y                   | Y                            | Y                   |        |     |           |      |  |  |
| Country x Device       | Y                       | Y                   | Y                   | Y                   | Y                   | Y                   | Y                   | Y                   | Y                            | Y                   |        |     |           |      |  |  |
| Dem. Controls          | Y                       | Y                   | Y                   | Y                   | Y                   | Y                   | Y                   | Y                   | Y                            | Y                   |        |     |           |      |  |  |

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

- Strong first stage across all specifications

# Results: Effect on Recall and Purchase, IV

Table 5: Estimates of advertising effects on recall and purchase: Article Dwell IV

| Panel I                | Recall ( $\hat{\rho}$ ) |                     |                     |                     |                     | Purchase ( $\hat{\lambda}$ ) |                     |                     |                     |                     |           |     |     |     |     |     |     |      |
|------------------------|-------------------------|---------------------|---------------------|---------------------|---------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|-----------|-----|-----|-----|-----|-----|-----|------|
|                        | All                     |                     | Device              |                     | News Type           |                              | All                 |                     | Device              |                     | News Type |     |     |     |     |     |     |      |
|                        | Mobile                  | Desktop             | Hard                | Soft                | Mobile              | Desktop                      | Hard                | Soft                | (1)                 | (2)                 | (3)       | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Ad Visible             | 0.0003<br>(0.002)       | 0.008<br>(0.007)    | -0.001<br>(0.002)   | 0.001<br>(0.003)    | -0.0004<br>(0.003)  | 0.006***<br>(0.002)          | 0.013**<br>(0.006)  | 0.004*<br>(0.002)   | 0.007**<br>(0.003)  | 0.005*<br>(0.002)   |           |     |     |     |     |     |     |      |
| Observations           | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925                        | 1,824               | 2,101               | 2,165               | 1,760               |           |     |     |     |     |     |     |      |
| R <sup>2</sup>         | 0.105                   | 0.097               | 0.138               | 0.122               | 0.103               | 0.123                        | 0.128               | 0.146               | 0.148               | 0.149               |           |     |     |     |     |     |     |      |
| First Stage            |                         |                     |                     |                     |                     |                              |                     |                     |                     |                     |           |     |     |     |     |     |     |      |
| Article Dwell          | 0.058***<br>(0.007)     | 0.024***<br>(0.007) | 0.076***<br>(0.009) | 0.057***<br>(0.010) | 0.059***<br>(0.007) | 0.058***<br>(0.007)          | 0.026***<br>(0.007) | 0.075***<br>(0.008) | 0.057***<br>(0.010) | 0.059***<br>(0.007) |           |     |     |     |     |     |     |      |
| Observations           | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925                        | 1,824               | 2,101               | 2,165               | 1,760               |           |     |     |     |     |     |     |      |
| R <sup>2</sup>         | 0.459                   | 0.282               | 0.566               | 0.430               | 0.516               | 0.467                        | 0.307               | 0.582               | 0.447               | 0.531               |           |     |     |     |     |     |     |      |
| 1st Stage Incr. F-Stat | 75.85                   | 12.83               | 76.71               | 31.92               | 71.4                | 77.74                        | 14.53               | 79.01               | 33.5                | 70.79               |           |     |     |     |     |     |     |      |
| Panel II               |                         |                     |                     |                     |                     |                              |                     |                     |                     |                     |           |     |     |     |     |     |     |      |
| Ad Dwell               | 0.001<br>(0.010)        | 0.008<br>(0.007)    | -0.009<br>(0.032)   | 0.005<br>(0.014)    | -0.002<br>(0.013)   | 0.028**<br>(0.011)           | 0.015**<br>(0.007)  | 0.052<br>(0.037)    | 0.036**<br>(0.016)  | 0.025*<br>(0.013)   |           |     |     |     |     |     |     |      |
| Observations           | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925                        | 1,824               | 2,101               | 2,165               | 1,760               |           |     |     |     |     |     |     |      |
| R <sup>2</sup>         | 0.107                   | 0.122               | 0.117               | 0.130               | 0.100               | 0.119                        | 0.199               | 0.079               | 0.145               | 0.143               |           |     |     |     |     |     |     |      |
| First Stage            |                         |                     |                     |                     |                     |                              |                     |                     |                     |                     |           |     |     |     |     |     |     |      |
| Article Dwell          | 0.011***<br>(0.002)     | 0.022***<br>(0.002) | 0.005***<br>(0.002) | 0.011***<br>(0.002) | 0.011***<br>(0.002) | 0.011***<br>(0.002)          | 0.023***<br>(0.002) | 0.005***<br>(0.002) | 0.011***<br>(0.002) | 0.011***<br>(0.002) |           |     |     |     |     |     |     |      |
| Observations           | 3,925                   | 1,824               | 2,101               | 2,165               | 1,760               | 3,925                        | 1,824               | 2,101               | 2,165               | 1,760               |           |     |     |     |     |     |     |      |
| R <sup>2</sup>         | 0.205                   | 0.476               | 0.129               | 0.208               | 0.232               | 0.220                        | 0.500               | 0.156               | 0.235               | 0.262               |           |     |     |     |     |     |     |      |
| 1st Stage Incr. F-Stat | 48.23                   | 173.37              | 11.96               | 34.63               | 34.09               | 48.52                        | 183.4               | 10.41               | 36.78               | 34.52               |           |     |     |     |     |     |     |      |
| FE:                    |                         |                     |                     |                     |                     |                              |                     |                     |                     |                     |           |     |     |     |     |     |     |      |
| Brand                  | Y                       | Y                   | Y                   | Y                   | Y                   | Y                            | Y                   | Y                   | Y                   | Y                   |           |     |     |     |     |     |     |      |
| Price x Brand          |                         |                     |                     |                     |                     |                              |                     |                     |                     |                     |           |     |     |     |     |     |     |      |
| Step Order             | Y                       | Y                   | Y                   | Y                   | Y                   | Y                            | Y                   | Y                   | Y                   | Y                   |           |     |     |     |     |     |     |      |
| Country x Device       | Y                       | Y                   | Y                   | Y                   | Y                   | Y                            | Y                   | Y                   | Y                   | Y                   |           |     |     |     |     |     |     |      |
| Dem. Controls          | Y                       | Y                   | Y                   | Y                   | Y                   | Y                            | Y                   | Y                   | Y                   | Y                   |           |     |     |     |     |     |     |      |

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

- IV: larger  $\hat{\lambda}$  (purchase); smaller  $\hat{\rho}$  (recall)

## Results: Other

- ▶ Confirm effects on recall/purchase with another IV
  - ▶ instrument ad attention with average attention to article of other individuals
  - ▶ Weaker but significant first stage, second stage noisy
- ▶ Diminishing returns of ad attention on recall/purchase
- ▶ Robustness of eye-tracking data
  - ▶ Weight observations by quality of eye-tracking data (5 metrics)
  - ▶ Re-construct ad dwell by keeping only 50% of surface further away from text/in the interior of the ad
- ▶ Use the political (mis)match of news articles and participants' ideologies to instrument for ad attention
  - ▶ E.g. left-leaning participants are more likely to pay more attention to left-leaning news outlets/articles
  - ▶ More exposure to ads randomly matched to these articles
  - ▶ Enough power for ad visible but not for ad dwell

# Roadmap

1 The Experiment

2 Data Descriptives

3 Model

4 Results

5 Implications

# Implications

1. Positive attention spillovers from content to ads align incentives of publishers and advertisers
  - 1.1 investing in high-quality content → more attention to articles & ads → can charge more for ads
  - 1.2 “clickbait” is a bad strategy
2. The practice of block lists is too blunt/risk averse
  - 2.1 No difference in the effectiveness of ads next to hard and soft news articles (at least in the short term)
  - 2.2 Allows supporting high-quality journalism on important societal issues (e.g. climate change, wars)
3. We provide an alternative way to measure ad effectiveness
  - 3.1 Leverages the intensive margin of attention to ads (typically: experiments show/remove ads)

### Advertising block list issues resurface with war in Ukraine

[Advertising Initiative Blog](#) | 15 March 2022

- ▶ There have been stories of advertisers asking for a blanket ban (via block lists), of words such as “Putin,” “war,” “NATO,” etc. ... [while] the number of articles on the subject of Russia and Ukraine grew by a factor of seven the last week of February

Thank you!