Digital Advertising and Market Structure: Implications for Privacy Regulation

Daniel Deisenroth Utsav Manjeer Zarak Sohail

Steven Tadelis Nils Wernerfelt

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Motivation

- Digital advertising has rapidly taken off and become important for firms
  - >75% of ad spend in the US is now digital (eMarketer, 2024)
  - >80% of US SMBs say digital advertising is 'crucial' for their business (Statista, 2023)
- Regulation is now catching up to the industry
  - Last ten years have seen several landmark privacy and consumer data protection laws (GDPR, LGDP in Brazil, DPDPA in India, DMA, DSA,...)
  - Dramatic growth of bills that mention 'privacy' in the US
- But still relatively little research to inform these policies, let alone their implications for firms and managers

Motivation

- One important question in this space: if digital advertising becomes less effective, will there be meaningful consequences for firms and consumers?
- We focus on one piece of the puzzle, and analyze a natural experiment to see how a negative shock to digital advertising effectiveness impacts market structure

Overview: What we do

- We exploit a natural experiment afforded by the introduction of iOS 14.5 (Apple's App Tracking Transparency)
  - Substantially decreased digital advertising effectiveness (Wernerfelt et al., 2024), but exposure varied across industries.

- Use on platform data from Meta and data from the BLS to study effects on
  - (i) Advertising behavior
  - (ii) Firm count
  - (iii) Prices

Main contributions

(1) We provide large-scale empirical evidence on the effects of digital advertising on market structure outcomes.

- Results are consistent with a market expansion role for digital advertising: decreases in digital advertising effectiveness reduce investments in advertising, decrease the number of firms, and increase prices.

(2) Our results also speak to the potentially large consequences of privacy protections.

- See Dubé et al. (2024) for recent discussion

Caveats

- "The evidence strongly suggests that no single view of advertising is valid in all settings." (Bagwell, 2007)
  - We analyze one natural experiment in one country

- We cannot make any statements about social welfare
  - Do not get into whether advertising is excessive, optimal privacy policies, etc.

Outline

- Background
- Study Design
- Data
- Main Results
- Conclude

Advertising Theory: Stealing vs. Expansion?

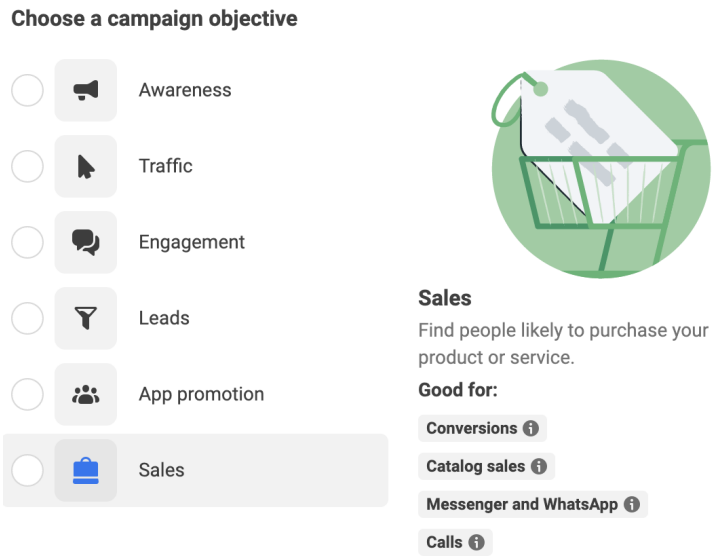
- **Business Stealing**
  - $\downarrow$ ad effectiveness $\implies$ each firm wastes less money on advertising, profits go up, invites entry and lower prices.
  - E.g., Dubois et al. (2018), Anderson et al. (2016)

- **Market Expansion**
  - $\downarrow$ ad effectiveness $\implies$ market size drops, fewer firms can survive, less competition and higher prices
  - E.g., Sass and Saurman (1995), Shapiro (2018)

- Ultimately, it's an empirical question which effect dominates in our context.
- In the paper we show how many of our findings can be explained by a model of market expansion.

Background: Digital Advertising Context

- Every ad campaign on Meta asks advertisers what their objective is. Why?
  - Example with Page likes
  - Referred to as delivery 'optimization'

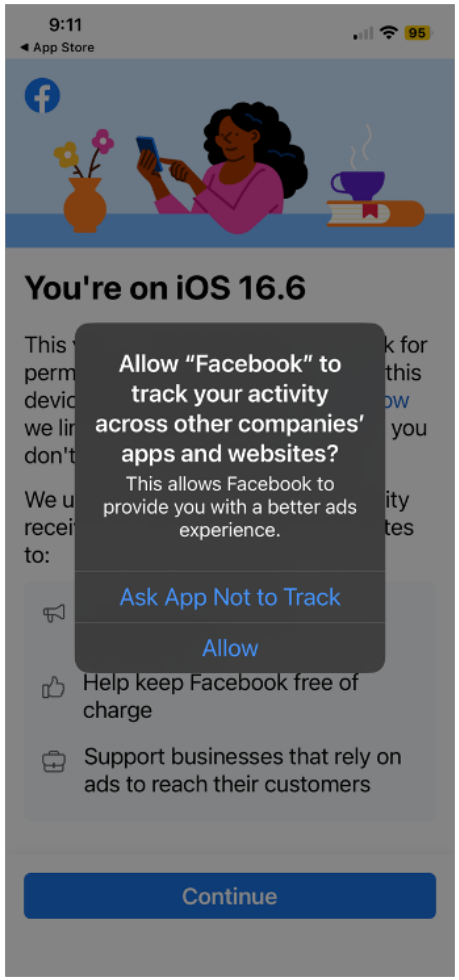


Optimization and Offsite data

- What if you care about sales?
  - Vast majority of sales happen *offsite* (e.g., Safari, Chrome)
  - This is where tracking pixels, 3rd party cookies enter
- Note: Such optimization is very hard (if not infeasible) with TV, radio, print, etc. – arguably a major upside of digital
- Apple's App Tracking Transparency framework (described next) caused major ad platforms to lose a large share of their offsite data.

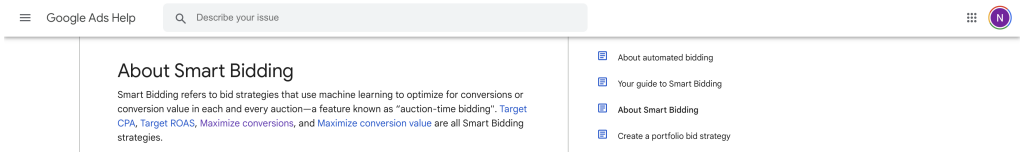
Apple's App Tracking Transparency Framework

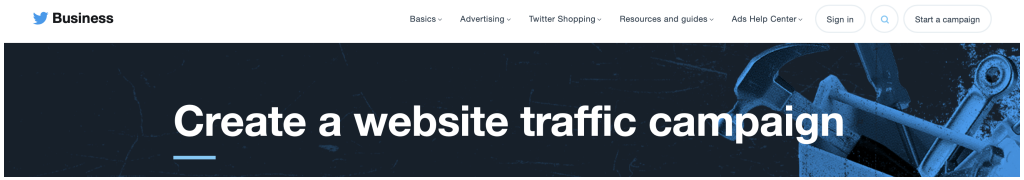
- In April 2021, Apple launched iOS 14.5, that included their App Tracking Transparency (ATT) framework
- iOS users now get a prompt, enabling them to easily opt out of being tracked offsite
- Wernerfelt et al. (2024) show experimentally loss of this data greatly reduces advertising effectiveness (cost per incremental customer)

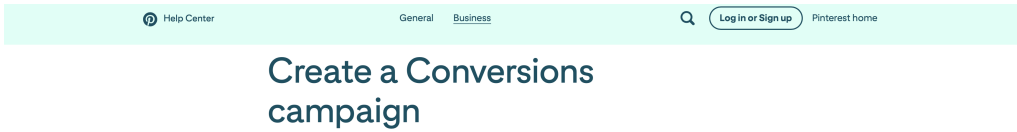


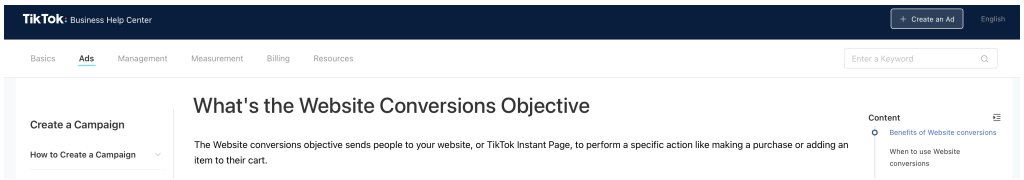
This was a major hit across the industry

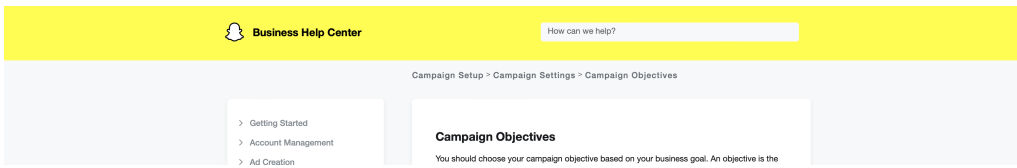
- Google
- Twitter
- Pinterest
- TikTok
- Snapchat
- LinkedIn
- ...

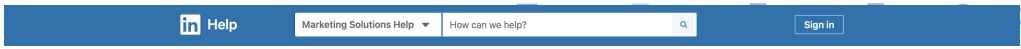












Background: Recap

- There are theories that could predict N^* and p^* going either way
- Our empirical strategy is to use the introduction of Apple's ATT framework as a natural experiment for a negative shock to advertising effectiveness
  - This caused large ad platforms to lose some of their most valuable data for ad targeting
- We will use the differential exposure across advertisers and firms as our main source of variation

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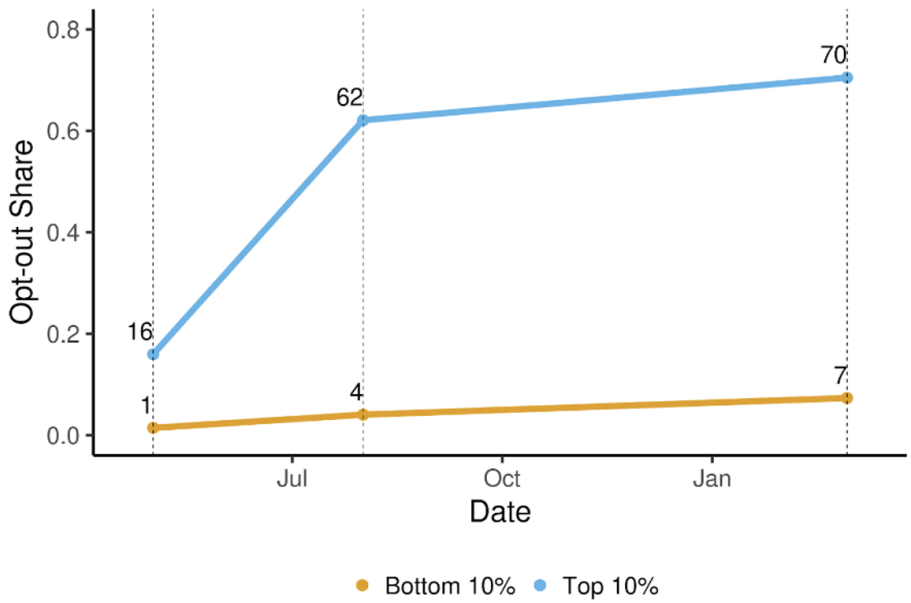
Study Design: Measure of Exposure

- We first come up with a measure of 'exposure' to ATT:
  - For every US advertiser on Meta, we observe how much of their ad spend on the platform pre-ATT went to users who would eventually opt out
  - Can aggregate up to industry-level exposure, letting us merge with off platform data at that level

Least Impacted Industries		**Most Impacted Industries**	
Industry	**Impacted Share**	**Industry**	**Impacted Share**
Gaming - eSports	0.305	Retail - Apparel & Accessories	0.654
Telecom - Telephone Services	0.312	CPG - Apparel & Accessories	0.632
Govt - Govt Owned Media	0.34	CPG - Baby	0.628
Orgs and Assoc - Religious	0.347	Orgs and Assocs - Arts, Heritage, & Edu	0.625
B2B - File Storage, Cloud, & Data	0.366	Retail - Sporting	0.622
Travel - Ride Sharing & Taxi	0.367	Restaurants - Coffee	0.611

Study Design: Exposure across industries

- To illustrate the variation, across advertisers there was a quite large difference in exposure from the most vs. least impacted. (Due not only to opt out rates by share of Android users)
- We measured the users' opt out behavior at two different points post-ATT launch, classifications of advertisers and industries were pretty stable.
- Main point is that there is sizable variation we're working with.



Study Design: Main specification

- We compare outcomes for the industries who were more versus less impacted
  - We focus on the top 10% vs. bottom 10% ($\text{Treat}_i = 1$, 0 resp.)

- Diff-in-diff comparing outcomes between "treated" (more impacted) and "control" (less impacted) industries i before and after the launch of ATT at time t

$$y_{it} = \beta_0 + \beta_1(\text{Treat}_i \times \text{Post}_t) + \theta_t + \lambda_i + \varepsilon_{it}$$

where y_{it} is our outcome variable of interest (e.g., # firms in industry i at time t).

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Outcome Data

- **Advertising data**: Advertiser spend, activity status, campaign details, and demographics from 1.4m US advertisers on Facebook and Instagram.
- **Prices**: BLS' Producer Price Index (PPI). PPI measures the average change over time in the selling prices for all US domestic producers of goods and services. Available at 6 digit NAICS code-month level.
- **Firm count**: BLS' Quarterly Census of Employment and Wages (QCEW). Comprehensive data based on firms eligible for state unemployment insurance. We use the 6 digit NAICS industry codes at the state-quarter level.

Note: needed to match Meta's internal industry definition with that from the BLS (done manually with audits, see paper).

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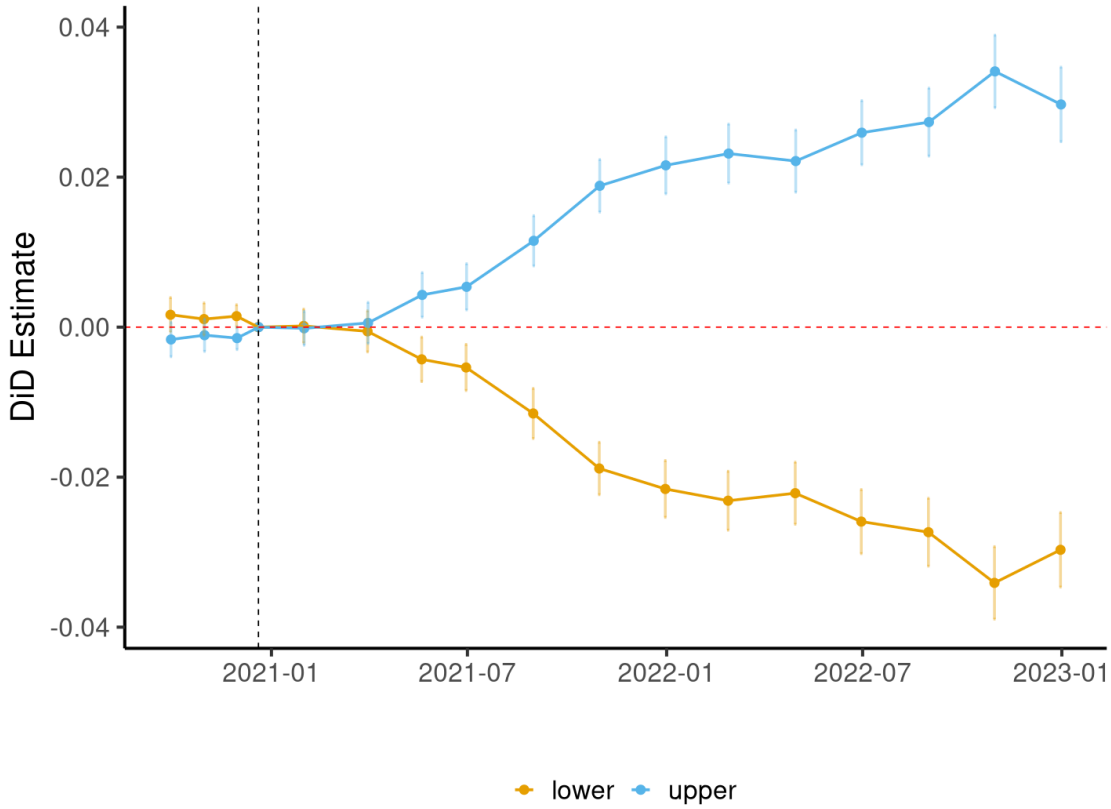
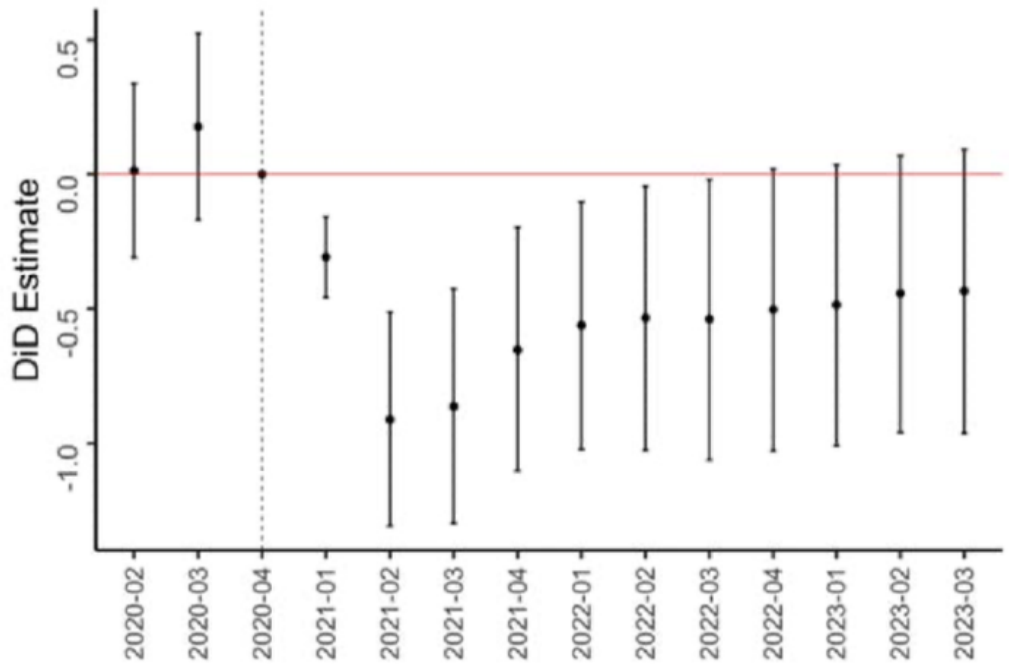
Main Results: Sanity Check

- Did ATT elicit a response from advertisers? ATT made lower funnel (not upper funnel) advertising less effective: do we see a response?
  - 1.4pp reduction in lower funnel campaigns (see also Aridor et al. (2024))



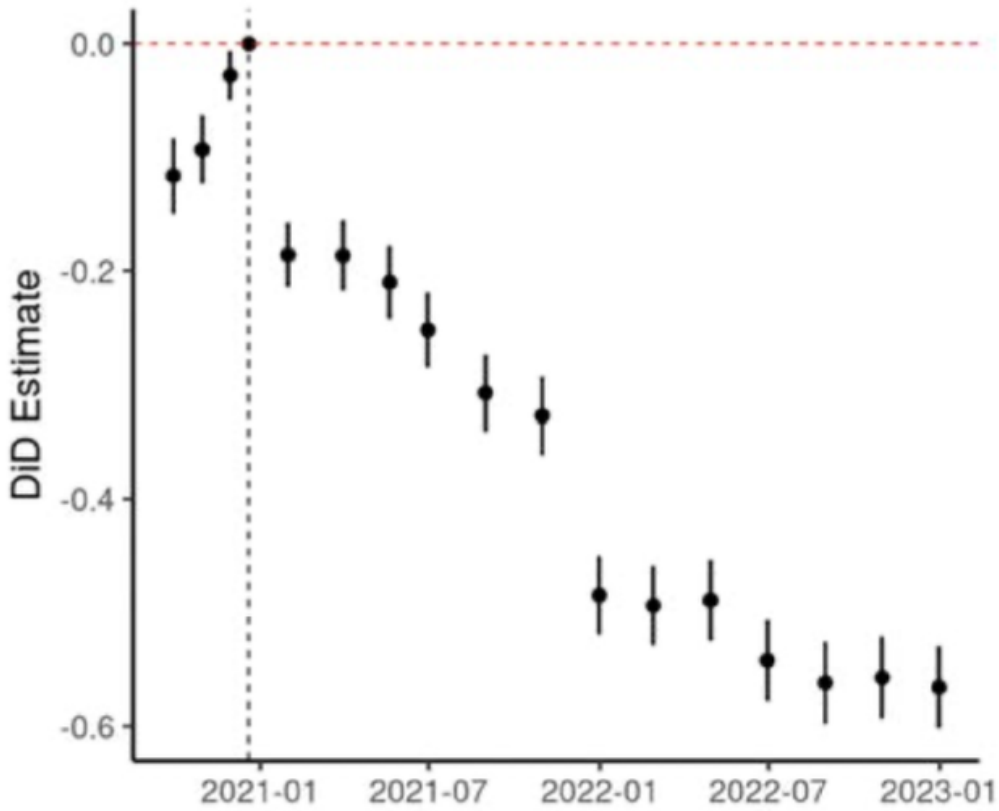
Main Results: Advertising Exit

- Net exit from advertising on Meta increased by about 50%



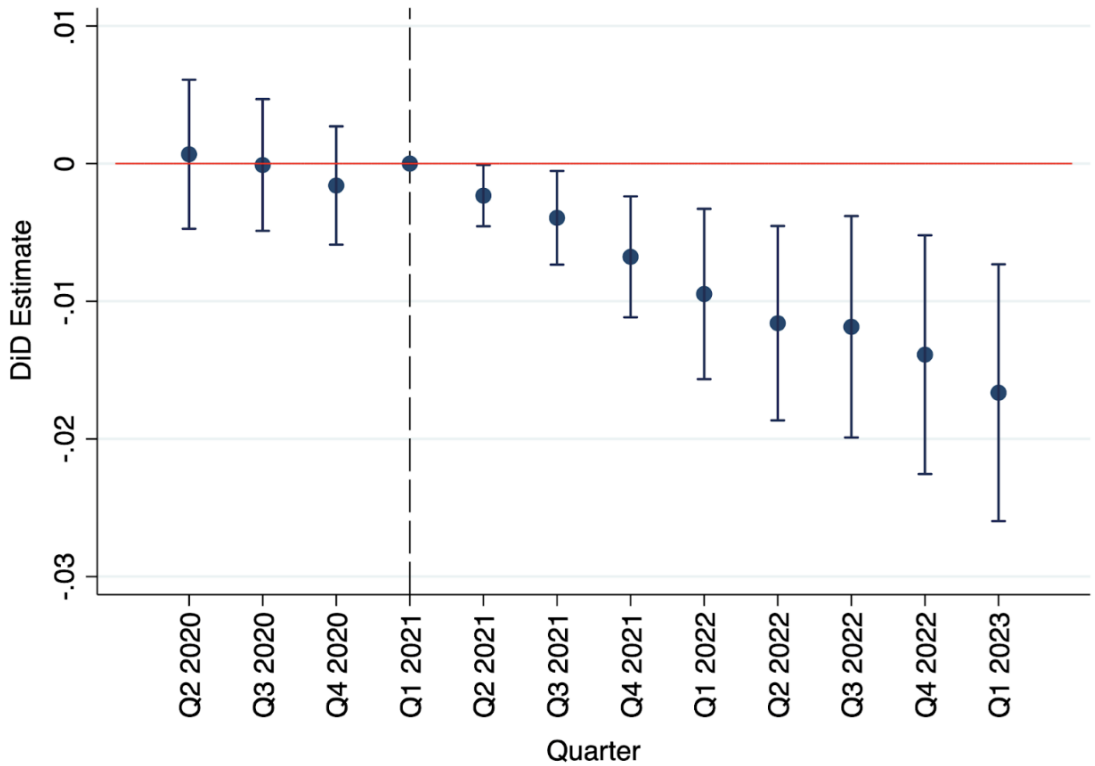
Main Results: Advertising Spend

- Advertising spend decreased by about 28%



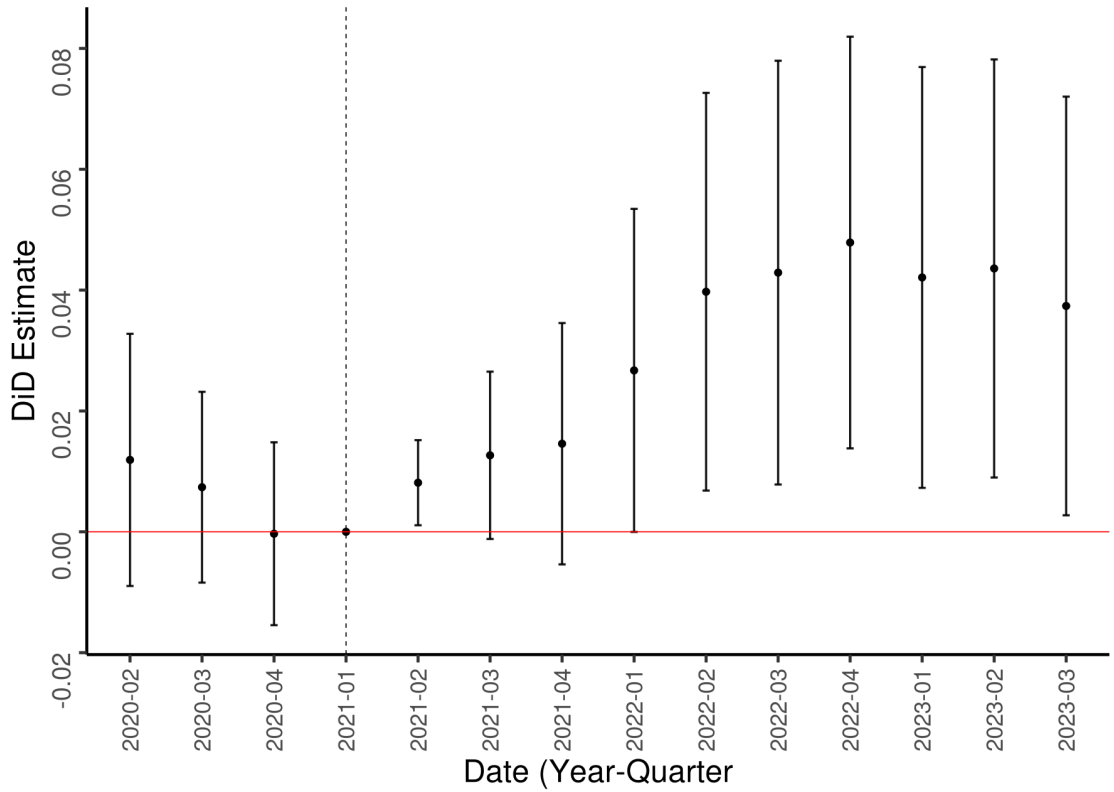
Main Results: Firm exit

- 1% decline in the total number of business establishments



Main Results: Prices

- 2.9% increase in the prices



Main Results: Recap

- We find evidence that industries that experienced greater negative shocks to digital advertising effectiveness saw *decreases in investments in advertising on Meta, reduced firm counts, and higher prices.*

- This is broadly consistent with a market expansion story ('informative' vs. 'persuasive')

Heterogeneity: 'Large' vs. 'Small' advertisers

- We define 'large' as the very big players (roughly >$500,000/year ad spend) and small as everyone else
- Consistent with past findings, the small guys get hurt more (below: Overall, Small, Large)

Panel B- Advertiser Level Analysis			
Share Lower Funnel Ad Campaigns	-0.014***	-0.010***	-0.061***
	(0.001)	(0.001)	(0.007)
Pr(Active)	-0.034***	-0.035***	0.056***
	(0.003)	(0.004)	(0.007)
Ad Spend	-0.337***	-0.339***	0.850***
	(0.050)	(0.048)	(0.150)

Conclusion

- We provide evidence consistent with a market expansion role for digital advertising
  - The magnitudes are further economically meaningful
- Similarly, we find privacy protections can have sizable unintended consequences
  - Important for regulators to weigh tradeoffs