

Privacy Regulation and Online Advertising

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Privacy Regulation is a new but important question.

- The Internet allows firms to collect large amounts of customer data
 - Increase in ability to target, tailor and optimize advertising
- Consumers are concerned about threats to their privacy
- Pressure for regulation in US

Do privacy regulations influence online ad effectiveness?

- Which websites and ads are most affected?
- Speculatively, how might this affect evolution of advertising-supported internet?

Setting

- Regulatory Setting
 - European Law become stricter 2003-4
 - Privacy regulation elsewhere has not changed since advent of commercial internet
 - Compare change in ad effectiveness in Europe relative to elsewhere.
- Data
 - Field tests of 9596 different online display ad campaigns across multiple countries
 - For each campaign, around 347 web users surveyed on purchase intention and ad recall. Half had seen the ad and half were in a control group
- Method: Diff-in-Diff-in-Diff
 - Difference between treatment and control groups in field studies
 - Difference before and after the regulation in Europe
 - Difference between Europe and elsewhere

Privacy Regulation affects performance of online ads

- Advertising effectiveness dropped 65% in the EU relative to the rest of the world
 - Drop is specific to European websites rather than European consumers
 - When EU consumers visited US websites they behaved like US visitors
- Not all websites were affected equally
 - Ads on general interest websites (e.g. yahoo.com, nytimes.com) were affected more than ads for targeted websites (e.g. cars.com, babycenter.com)
- Not all ads were affected equally
 - Unobtrusive ads were affected more than larger ads and multimedia ads

Implications

Regulation may affect the direction of innovation on the advertising-supported internet

- If ads are less effective, it will limit the scope of the ad-supported internet.
- If ads on general internet websites are particularly affected, such sites will be less able to support themselves through advertising.
 - They may become less prevalent or they may begin to support themselves by other means
 - If unobtrusive ads become less effective, advertisers may increase obtrusive multimedia advertising at the expense of subtle, well targeted ads

More Generally

We do not want to disrupt targeted advertising

Representative Boucher

- Currently, debate is conducted in empirical vacuum.
 - Empirical research is not shameful.
- There may be good reasons to regulate privacy but there are trade-offs
 - The potential reduction in the size of the ad-supported internet
 - The potential change in content on the ad-supported internet
 - The potential increase in the obtrusiveness of ads.

Outline

- 1 Introduction
- 2 Data and Institutional Background
 - Laws
 - Survey Data
 - Targeting and the Regulation
- 3 Initial Data Exploration
 - Raw Statistics
- 4 Econometric Analysis
 - Robustness Checks
 - Falsification Checks
- 5 Mechanism
 - Content
 - Ads
- 6 Implications
 - Implications
 - Appendix

Collected data on privacy laws in Europe

- 2002/58/EC: European Directive on Privacy and Electronic Communications 'E-Privacy Directive'
- Designed to “particularize and complement” the Data Protection Framework Directive (95/46/EC) for electronic communications
 - Enacted end of 2003 to mid 2004 in UK, Germany, Italy, Holland and France
- The scope of the regulations continued to evolve after 2004 through judicial precedent and some new laws

Legal Disclaimer

Focus on the discrete before/after interpretation

- Not all companies have interpreted the laws in the same way and the European courts are still deciding exactly what is allowed.
- Article 29 working party is currently clarifying their application to behavioral targeting.
- It is clear that the European 'prosecutors' view the EU law as more restrictive than their counterparts in the US. It is also clear that many EU firms view the EU law as stricter.

E-Privacy Directive affects data advertisers can use.

- 1 Web bugs (or 'beacons', 'action tags', 'clear GIFS', etc.)
 - Widely used, 1x1 pixel pieces of code that allow advertisers to track customers as they move within and across websites
 - Unlike cookies, they are invisible to the user and difficult to block.
 - (Rec 24) Web bugs (beacons) 'may seriously intrude upon the privacy of these users' 'only for legitimate purposes, with the knowledge of the users
 - User 'Consent' is necessary and consent means 'a freely given specific and informed indication of the users wishes, including by ticking a box' concerned.'
- 2 Cookies
 - (Rec 25) Need notification/opt-out for cookies
- 3 Click stream data retention is problematic if personal.
 - Health, sexuality, religion, trade-unions
 - Google investigated over retention of IP addresses in Germany

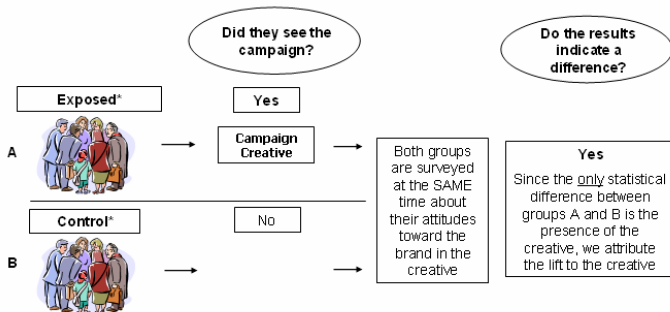
Use survey data from a panel of field tests

- Repeated cross-section survey data from 9,596 field tests of online banner ads in EU, US and rest of world.
- Collected by a media measurement agency to examine the effectiveness of different ad campaigns.
- Randomized exposed and control allocation.
 - Individuals browsing the website where the campaign is running are either exposed to the ads, or not, based on the randomized operation of the ad server.
 - Both exposed and non-exposed (control) respondents are recruited via an online survey invitation that appears after they have finished browsing the website.
 - Because of the random nature of the advertising allocation, both exposed and control groups have similar unobservable characteristics

What happens

- Advertiser initiates contract with marketing metrics company to evaluate banner ad performance beyond click-through rates
- Marketing metrics company integrates its services into existing advertising campaign practice
- Anonymized benchmarking data shared with other advertisers (this database is what we were given access to)

Methodology



* Both groups are random samples from the same population (they are statistically the same people)

Methodology

4. Ben Stapelman, 19, rock singer.

Ben Stapelman's band, Surefire (imagine early Tom Petty crossed with Coldplay), has built a rabid following on MySpace and now plays sold-out gigs at the Bowery Ballroom.

5. Abigail Dawn DeVille, 24, artist.

This FIT junior mixes many media—painting, sculpture, collage—on gargantuan ten-by-twelve-foot canvases. Last year she won the school's Frank Shapiro Award for excellence and a spot on gallerist Jeffrey Deitch's new reality show, *Art Star*.

6. Nico Muhly, 24, composer.

He's helped Philip Glass edit his movie scores, sessioned with Björk, and collaborated with Antony and the Johnsons. In March, he releases his first CD, *Speaks Volumes*, an album of chamber music with electronic instruments and sounds.

7. Alexander Mitchell, 13, actor.

The Lion King was Mitchell's introduction to Broadway. He's also played the parts of Travis in *A Raisin in the Sun* and Billy Ray in *On Golden Pond*. This month he takes a break from the stage for a guest spot on *The Sopranos*.

8. Kristjan Thorgeirsson, 25, theater director.

This fall, Thorgeirsson (and producing partner Joe) will produce a new production called *Learegardless*, which started at Columbia, then moved to the Public Theater in Chelsea. Now they're opening the Syrup Room, a theater space in Chelsea. The production will be a postmodern version of Chekhov's *The Cherry Orchard*.

9. Grace Bonney, 24, blogger.

Designsponge.blogspot.com keeps 10,000 design insiders informed on where to score the

10. The Catch

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TAKE A SURVEY

Research purposes only.

The survey focused on purchase intent

- Survey asked about
 - Purchase intent
 - Demographics and country
 - At end of survey, whether they recalled ad.
- Campaign information
 - Country campaign launched from
 - Media rich features and size of ad
- 400 categories of products, 40 categories of websites, 8 years (2001-2008)

There are two types of selection concerns

- The campaigns are non-random
 - Main data source for the industry
 - Comforting that campaign characteristics change little in the EU relative to elsewhere
 - Acknowledge that little can be said about different types of advertisers
- The respondents might not represent the general internet population
 - Do not know anything about response rates except that they are low.
 - Demographics look representative
 - Cost-effectiveness calculations look right
 - Effects are small (2-4 percentage points) but worthwhile if high purchase intent is worth about 42 cents.
 - Methodology was constant over time

This regulation affects advertisers in our field data via the group they can test ads on

Before

- Focus on visitors to yahoo.com
- Define target group as those who exhibited behavior relevant to the product 'visited allergy website'
- Randomly assign subset of target group to 'treatment' and 'control' groups
- Treatment group members see ad
- Control group members get a placebo ad
- Difference in intention to buy product between the two groups measured

After

- Focus on visitors to yahoo.com
- Less easy to define target group as less information on click-stream behavior
- Randomly assign subset of target group to 'treatment' and 'control' groups
- Treatment group members see (allergy med) ad
- Control group members get a placebo ad
- Difference in intention to buy product between the two groups measured

Dependent Variables

- Focus on 'purchase intention'
 - Response to how likely are you to purchase on a five point scale
 - This is weaker than actual purchase data (for example, use in Reiley & Lewis 2009)
 - But a study like Reiley & Lewis is not possible after the EU privacy directive due to the use of web bugs and the requirement of opt-in consent for sharing data across companies
 - Has the advantage of comparability (and scalability) across many categories as discussed in Clark, Doreszelski, and Draganska (2009)
- Robust to favorability and ad recall
 - Response to 'do you have a favorable opinion of the product' on a five point scale
- Discretization of Dependent Variable
 - Focus on whether the respondent reported the highest score on the scale (Likely or Very Likely to Make a Purchase”).
 - 37% of respondents are in this category.

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	Mean	Std Dev	Min	Max	Observations
Purchase Intent	0.37	0.48	0	1	3329632
Favorable Opinion	0.42	0.49	0	1	3180804
Ad Recall	0.26	0.44	0	1	3035292
Intent Scale	2.93	1.47	1	5	3329632
Opinion Scale	3.48	1.08	1	6	3180804
Exposed	0.56	0.50	0	1	3329632
EU	0.081	0.27	0	1	3329632
After EU Law	0.81	0.39	0	1	3329632
Female	0.54	0.50	0	1	3329632
Income (\$)	64912.4	56342.7	15000	250000	2551263
Age	42.2	15.5	10	100	3283997
Weekly Internet Hours	13.9	10.3	1	31	2606978

Table: Change in ad effectiveness in EU

	EU Difference	T-Test
Before Privacy Law	0.030	6.994
After European Privacy Law	0.002	1.188

Table: Change in ad effectiveness outside of EU

	EU Difference	T-Test	Not-EU Difference	T-Test
Before Privacy Law	0.030	6.994	0.016	11.766
After European Privacy Law	0.002	1.188	0.017	27.988

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Move to econometric analysis

- Use simple model to evaluate advertising effectiveness before and after the policy change in EU

For person i exposed to campaign j in country c at time t

$$Intent_{ijct} = \alpha Exposure_i + \beta Exposure_i \times Law_{ct} + \theta X_i + \gamma_{jct} + \epsilon_{ijct}$$

This is a difference-in-difference on treatment/control and before/after using the Within Europe data

- Focus on linear probability model.

	EU Data only (1)
Fixed Effects	
Exposed \times After EU Law \times EU	-0.0167** (-2.41)
Exposed	0.0256*** (4.00)
Female	0.0198*** (5.20)
Std. Internet Hours	0.00936*** (7.48)
Std. Income	-0.0118*** (-5.26)
Std. Age	-0.0319*** (-8.18)
Campaign Fixed Effects	Yes
Observations	271,207
R-Squared	0.160

We control for the time-trend

Use three-way differences in differences to control for time-trend by incorporating rest of the world data

$$\begin{aligned}
 Intent_{ijct} = & \alpha Exposure_i + \beta_1 Exposure_i \times AfterEULaw_{ct} \times EU_c + \\
 & \beta_2 Exposure_i \times BeforeEULaw_{ct} + \beta_3 Exposure_i \times NotEU_c + \\
 & \theta X_i + \gamma_{jct} + \epsilon_{ijct}
 \end{aligned}$$

	EU Data only (1) Fixed Effects	All Data (2) Time Trend
Exposed × After EU Law × EU	-0.0167** (-2.41)	-0.0171** (-2.40)
Exposed	0.0256*** (4.00)	0.0263*** (4.14)
Female	0.0198*** (5.20)	0.0154*** (10.32)
Std.Internet Hours	0.00936*** (7.48)	0.0122*** (35.93)
Std. Income	-0.0118*** (-5.26)	-0.00288*** (-6.00)
Std. Age	-0.0319*** (-8.18)	-0.0185*** (-27.05)
Exposed × After EU Law		-0.00109 (-0.56)
Exposed × Not-EU		-0.00979 (-1.49)
Campaign Fixed Effects	Yes	Yes
Observations	271207	3329632
R-Squared	0.160	0.172

The results are robust to

- Logit specification (no fixed effects)
- Using the full scale (i.e. treating scale as interval)
- Favorable opinion as the dependent variable
- No controls
- Exclusion of people who saw multiple ads
- Country-specific controls for the timing of the laws
- Dropping Latin America
- Country fixed effects
- The use of different dates to mark the beginning of the regulation

Selection Bias in campaigns in the data

After Law	Mean Non-EU	Mean EU	Difference	T-Test
Interactive	0.030	0.024	0.005	0.385
Video	0.125	0.098	0.027	1.021
Large Format	0.203	0.165	0.038	1.170

Before Law	Mean Non-EU	Mean EU	Difference	T-Test
Interactive	0.103	0.071	0.032	1.019
Video	0.035	0.009	0.026	1.459
Large Format	0.224	0.212	0.011	0.259

Selection Bias in respondent demographics

- 54% female (slightly more than general internet population of just under 50)
- Similar to general internet population in other dimensions (income, time spent online, age), compared to DiMaggio and Bonikowski 2008)
- We do not have the data to say more. Lower bound of interpretation is that that we are measuring accurately the measure that advertisers use to assess advertising.
- We can say that the change is specific to European websites and does not represent a change in preferences of European consumer

Ruling out changing European time-trend

- Next explore whether our results are a result of changing European attitudes to online advertising (rather than a change in what is happening on European websites)
- Exploit the fact that Europeans can browse US (and other) websites and that Americans can browse European websites
- If unexplained heterogeneity in terms of attitudes of EU citizens towards advertising drives the results, then we expect
 - To see a similar collapse in ad effectiveness when they visit websites based in the US
 - To see no collapse in ad effectiveness when Americans visit European websites

Table: EU Survey Takers on non-EU Websites

	Difference	T-Test
Before European Privacy Law	0.018	4.392
After European Privacy Law	0.030	19.372

Table: Non-EU Survey Takers on EU Websites

	Difference	T-Test
Before European Privacy Law	0.032	2.942
After European Privacy Law	0.006	0.458

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How easy is it to advertise without customer data on this site?

The screenshot shows the BT Yahoo! homepage. At the top left are the BT and Yahoo! logos. A search bar is on the top right. Below the logos is a navigation bar with 'Quicklinks' and tabs for 'My Front Page', 'New Page', 'The Best of My Yahoo! NEW', and 'New Tab'. A secondary bar contains 'Add Content', 'Change Appearance', and 'More Options'.

The main content area is divided into two columns. The left column features a 'Personal Assistant' section with widgets for Mail (37 New), Horoscope, Finance, Digital Vault, and Sports. Below this is an advertisement for 'ancestry.co.uk' with a large green 'MISSING' banner and a photo of a man in a military helmet. The ad text includes '14 DAY FREE TRIAL' and 'FIND US'. The right column contains a 'BT Yahoo! Mail Preview' section, followed by news feeds from Reuters and ZDnet. A message states 'There is currently no content in this feed.' Below the news feeds is a 'Currency Converter' widget with a table for conversion rates.

ADVERTISEMENT

MISSING

14 DAY FREE TRIAL
ancestry.co.uk
FIND US

Franklin
Officers'
to the men,
Fusilier had
curious things.
General
but also a
man-Can dancers
and even a baboon.
He was last seen heading

Convert 1 British Pound (GBP) ir

Currency	Euro
1 Euro =	1

How easy is it to advertise without customer data on this site?



Your favourites

- Top destinations
- All our articles
- Your stage
- Photo galleries
- Horoscopes


Community

- Join us!
- Meet our members
- Your birth club
- Write a journal
- Photo clubs

Useful tools

- Baby naming
- Pregnancy calendar

Search



Welcome to BabyCentre!

Planning a pregnancy? Expecting? New parent? We're here for you.

BabyCentre is all about creating a personal experience for you. Start by answering a few simple questions and you'll see the site change to reflect your stage. [Start here!](#)

This week's hot topics

	(1)	(2)
	General Content	Product-Specific Content
Exposed \times After EU Law \times EU	-0.0589*** (0.0195)	-0.00906 (0.00772)
Exposed	0.0576*** (0.0191)	0.0219*** (0.00697)
Exposed \times Before EU Law	0.000524 (0.00421)	0.00117 (0.00221)
Exposed \times Not-EU	-0.0414** (0.0190)	-0.00683 (0.00690)
Campaign Fixed Effects	Yes	Yes
Demographic controls	Yes	Yes
Observations	1037597	2292035
Log-Likelihood	-619959.7	-1374665.6

We then explore how ad format changed effect of law

Today on CNET

Top categories

- Editors' Choice
- Blogs
- Camcorders
- Car tech
- Cell phones
- Desktops
- Digital cameras
- E-book readers
- Forums
- Games and gear
- GPS
- Home audio
- Home video
- Internet security
- Laptops
- MP3 players

Logitech Harmony 700

The Logitech Harmony 700 delivers the bulk of the Harmony One's excellent features and ergonomics at a lower price point.

[Read the full review](#)



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[EA closes Pandemic Studios unit](#)

Popular topics

- | | |
|------------------------------------|-----------------------------------|
| Motorola Droid | Windows 7 |
| New iPods | HTC Droid Eris |
| BlackBerry Storm 2 | Sony PS3 |
| AVG Anti-Virus | Must-have gadgets |
| iPhone 3.0 | LED TVs |

[Ad Feedback](#)

Kindle 2 Has Arrived

Sleeker design.
More storage.
Longer battery.

[Learn More](#) [Buy now](#)

amazon.com.

	(1)	(2)	(3)	(4)
	Media Rich Ads	Plain Banners	Large Format Ads	Small Format Ads
Exposed × After EU Law × EU	-0.0148 (0.0159)	-0.0184** (0.00771)	0.00109 (0.0113)	-0.0235** (0.0105)
Exposed	0.0302** (0.0146)	0.0245*** (0.00682)	0.0231*** (0.00871)	0.0320*** (0.00973)
Exposed × After EU Law	0.000342 (0.00338)	-0.00197 (0.00242)	-0.00292 (0.00366)	-0.00227 (0.00278)
Exposed × Not-EU	-0.0144 (0.0150)	-0.00775 (0.00714)	-0.00703 (0.00907)	-0.0142 (0.0101)
Campaign Fixed Effects	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes
Observations	1098047	2231585	613804	2715828
R-Squared	0.163	0.178	0.156	0.176

There are of course limitations

- 1 Our data consist of firms that enlisted a particular marketing research company to test their advertising.
- 2 The ads in our data were all run through the firm rather than through an ad network.
- 3 Ad networks would likely have been more directly affected but they may also have dedicated more resources to mitigating the effect of the regulation through alternative strategies
- 4 We do not know if the change in effectiveness led to a change in revenues
- 5 We rely on stated expressions of purchase intent and not actual purchase data.

First study of how privacy regulation affects ad performance

- We find that privacy laws in Europe are associated with reduced ad effectiveness
 - It is not associated with a drop in the effect of ads on American websites to EU-based web surfers
- This drop is not neutral across website types and ad types.
 - May affect ability of 'broad-brush' websites to provide free content
 - May lead to more intrusive advertising
- This suggests that privacy regulation will likely play an important role in shaping future economic activity on the internet.
- Enacting privacy legislation, while potentially worthwhile, does involve trade-offs

Other Findings on Banner Advertising and Privacy

- 1 Advertising effectiveness (Forthcoming discussion paper in Marketing Science)
 - We show that obtrusive ads work and that targeted ads work, but that obtrusive AND targeted ads are not particularly effective
 - This appears to be related to privacy concerns and might explain the bifurcation of online ads into subtle targeted ads (e.g. AdSense) and obtrusive ads
 - Back-of-the-envelope calculations suggest online advertising is worthwhile (on average) if switching a prospective customer to high purchase intent is worth 42 cents.
- 2 Social Network and Privacy Control
 - Giving users control over their privacy settings can increase ad-effectiveness

	Logit (1)	Scale (2)	Opinion (3)	Recall (4)
	Purchase Intent	Intent Scale	Favorable Opinion	Ad Recall
main				
Exposed × After EU Law × EU	-0.117** (0.0487)	-0.0275** (0.0136)	-0.0205*** (0.00686)	-0.0312*** (0.0105)
Exposed	0.128*** (0.0430)	0.0547*** (0.0118)	0.0257*** (0.00592)	0.103*** (0.00944)
After EU Law × EU	-0.0757 (0.110)			
Exposed × Not-EU	-0.0567 (0.0418)	-0.00921 (0.0124)	-0.00917 (0.00620)	-0.0259*** (0.00997)
Exposed × Before EU Law	-0.00178 (0.0266)			
Before EU Law	-0.117*** (0.0340)			
Not EU	-0.104 (0.0880)			
Constant	-0.559*** (0.0902)			
Exposed × After EU Law		-0.00647 (0.00410)	0.00187 (0.00199)	-0.0267*** (0.00342)
Campaign Fixed Effects	No	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes
Observations	3329632	3329632	3180804	3035292
R-Squared		0.200	0.185	0.121
Log-Likelihood	-2190792.7	-5640801.1	-1941938.0	-1624937.8

	Exposed 1x (1) Purchase Intent	Date Controls (2) Purchase Intent	No Latin-America (3) Purchase Intent	Country Controls (4) Purchase Intent
Exposed × After EU Law × EU	-0.0206*** (0.00719)	-0.0166** (0.00743)	-0.0171** (0.00714)	-0.0162** (0.00715)
Exposed	0.0268*** (0.00633)	0.0249*** (0.00686)	0.0263*** (0.00635)	0.0263*** (0.00635)
Exposed × After EU Law	-0.000163 (0.00209)		-0.00115 (0.00194)	-0.00186 (0.00194)
Exposed × Not-EU	-0.0138** (0.00660)	-0.00902 (0.00681)	-0.00975 (0.00658)	-0.00982 (0.00658)
Exposed × Before UK law		0.0141* (0.00784)		
Exposed × Before Italy law		-0.0136* (0.00796)		
Exposed × Before France law		0.00593 (0.00603)		
Exposed × Before Germany law		-0.00103 (0.00859)		
Exposed × Before Netherlands law		-0.00477 (0.00972)		
Exposed × Before Spain law		0.00493 (0.00512)		
Campaign Fixed Effects	Yes	Yes	Yes	Yes
Demographic controls	Yes	No	Yes	Yes