

# 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,  $\tilde{347}$  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)
  - Ads on health websites (which were more strictly regulated) were especially affected
- 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
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# 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

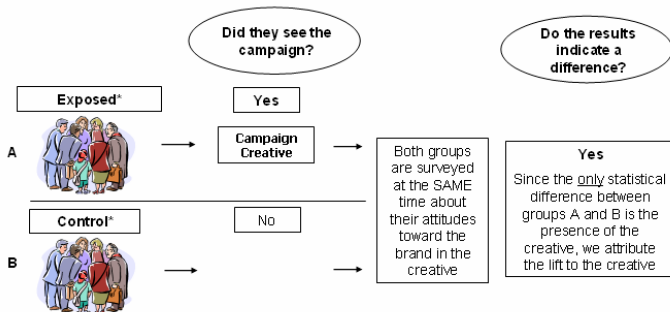
## Use survey data from a panel of field tests

- 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 musical 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. Their next 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

#### THE CURR

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Research purposes only.

# The survey focused on purchase intent

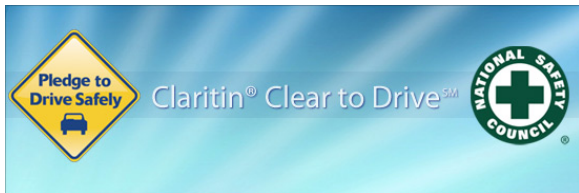
- Survey asked about
  - Purchase intent
  - Demographics and country
  - At end of survey, whether they recalled ad.
- Campaign information
  - Country campaign launched from
  - Media rich features and size of ad
- 400 categories of products, 40 categories of websites, 8 years (2001-2008)

## 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



# Who should see this ad?



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

- Prior to field test, the advertisers decide which group of people they wish to show ad to
  - Do not know for certain which tactics were used in the campaigns in the data.
  - Do know that these are large advertisers on the leading edge of technology
- Yahoo! can identify who visited 'allergy relief advice' when deciding whom to serve allergy ads to on Yahoo! News.
- Change in regulation could lead advertisers to do less well at identifying people who might be influenced by the ad

# 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

	<b>EU Difference</b>	<b>T-Test</b>
Before Privacy Law	<b>-0.030</b>	-6.994
After European Privacy Law	<b>-0.002</b>	-1.188

Table: Change in ad effectiveness outside of EU

	<b>EU Difference</b>	T-Test	<b>Not-EU Difference</b>	T-Test
Before Privacy Law	<b>-0.030</b>	-6.994	<b>-0.016</b>	-11.766
After European Privacy Law	<b>-0.002</b>	-1.188	<b>-0.017</b>	-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

<b>After Law</b>	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

<b>Before Law</b>	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

	<b>Difference</b>	<b>T-Test</b>
Before European Privacy Law	<b>-0.018</b>	-4.392
After European Privacy Law	<b>-0.030</b>	-19.372

Table: Non-EU Survey Takers on EU Websites

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	<b>Difference</b>	<b>T-Test</b>
Before European Privacy Law	<b>-0.032</b>	-2.942
After European Privacy Law	<b>0.006</b>	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 located at 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 several sections:

- Personal Assistant:** Includes widgets for Mail (37 New), Horoscope, Finance, Digital Vault, and Sports.
- BT Yahoo! Mail Preview:** A section for email notifications.
- Politics News from Reuters:** A news feed section.
- Yahoo! News: ZDnet Technology News:** A news feed section with the message: "There is currently no content in this feed."
- Advertisement:** A large advertisement for ancestry.co.uk featuring a 'MISSING' sign and a photo of a man. The ad text includes: "14 DAY FREE TRIAL", "ancestry.co.uk", and "FIND US".
- Yahoo! News: World - Reuters News Headlines | World:** A news feed section with headlines:
  - U.S. top court to hear Guantanamo Uighurs appeal - 2 hours ago
  - Obama troop plan hangs in balance as Afghan vote set - 2 hours
  - Faltering Iran talks to resume, deal possible - IAEA - 3 hours ago
- Currency Converter:** A tool to convert currencies. It shows "Convert 1" and "British Pound (GBP)". Below it is a table:
 

Currency	Euro
1 Euro =	

# 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)	(3)	(4)
	General Content	Product-Specific Content	Health Site	Parenting Site
Exposed × After EU Law × EU	-0.0589*** (0.0195)	-0.00906 (0.00772)	-0.281*** (0.0552)	-0.00377 (0.0170)
Exposed	0.0576*** (0.0191)	0.0219*** (0.00697)	0.116*** (0.00874)	0.0199* (0.0117)
Exposed × Before EU Law	0.000524 (0.00421)	0.00117 (0.00221)	-0.00452 (0.00873)	-0.00246 (0.00633)
Exposed × Not-EU	-0.0414** (0.0190)	-0.00683 (0.00690)	-0.0905*** (0.00801)	-0.00202 (0.0112)
Campaign Fixed Effects	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes
Observations	1037597	2292035	128956	213894
Log-Likelihood	-619959.7	-1374665.6	-77998.3	-135829.9

# 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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[A tale of two Diggs](#)

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[EA closes Pandemic Studios unit](#)

### Popular topics

- |                                    |                                   |
|------------------------------------|-----------------------------------|
| <a href="#">Motorola Droid</a>     | <a href="#">Windows 7</a>         |
| <a href="#">New iPods</a>          | <a href="#">HTC Droid Eris</a>    |
| <a href="#">BlackBerry Storm 2</a> | <a href="#">Sony PS3</a>          |
| <a href="#">AVG Anti-Virus</a>     | <a href="#">Must-have gadgets</a> |
| <a href="#">iPhone 3.0</a>         | <a href="#">LED TVs</a>           |

[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