

Tutorial: The Economics of *Entertainment* Digitization

Michael D. Smith
Carnegie Mellon University
mds@cmu.edu

EoD PhD Tutorial
February 28, 2018

How did I get here?

- 1986-1990: BSEE
- 1990-1996: GTE, Booz-Allen, MS Telecom Eng.
- 1996-2000: MIT Sloan (Erik)
- 2000-Present: CMU Heinz College
(Information Systems Management & Public Policy)

Have fun!

Have fun!

Do research you are
passionate about!

Have fun!

Do EoD research you are
passionate about!

What is EoD?

- “Research on the economics of digitization studies *whether and how digital technology changes markets.*”

— Goldfarb,
Greenstein, and Tucker
(2015)



What Changes?

- Digital technology reduces the cost of {replicating, transmitting, storing, processing, ...} information
- Some things become easier to do

What Changes?

- Digital technology reduces the cost of {replicating, transmitting, storing, processing, ...} information
 - Some things become easier to do
 - Some things become harder to do

What Changes?

- Digital technology reduces the cost of {replicating, transmitting, storing, processing, ...} information
 - Some things become easier to do
 - Some things become harder to do
 - Some things stay the same

Why is this fun? (Questions)

- New opportunities to test and build on established theories in new settings
- Digitization is driving change faster than {firms, markets, policies, institutions} can respond.
 - Opportunities to leverage academic-industry (academic-policymaker) partnerships
- Opportunities to work on questions at the sweet spot between rigor and relevance

Why is this fun? (Data)

- Digitization opens access to new datasets
 - Public data (learn how to scrape!)
 - Industry data (learn how to ask!)

Why is this fun? (Methods)

- Digitization gives rise to useful methodological approaches
 - Natural experiments (industry expertise)
 - Field experiments / RCTs (industry cooperation)

Musings on Industry Partnerships

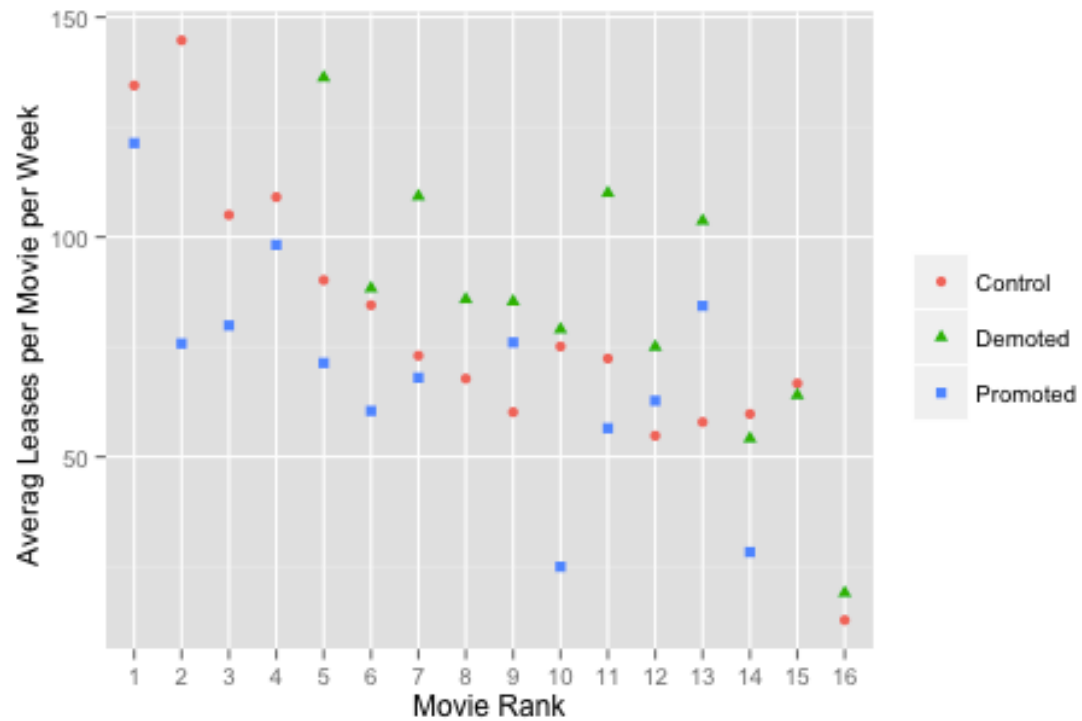
- Friends, alumni, guest speakers, industry conferences, trade press, ...
- “You have questions, I have tools/time...”
 - “I need to publish...but I’m happy to anonymize & share detailed results”
- Be respectful, honor your word
- Try to keep the lawyers out of the process

Sample research from industry partnership

- Firm's Question: How do consumers behave in our VOD menus? Help with experimental design.
- Academic Question: Herding behavior in online ratings?
- Approach: Randomized experiment, in real world marketplace with real customers/money/products
 - New menu: Movies shown in decreasing order of likes
 - Swap movies in menu in positions with “wrong” number of likes

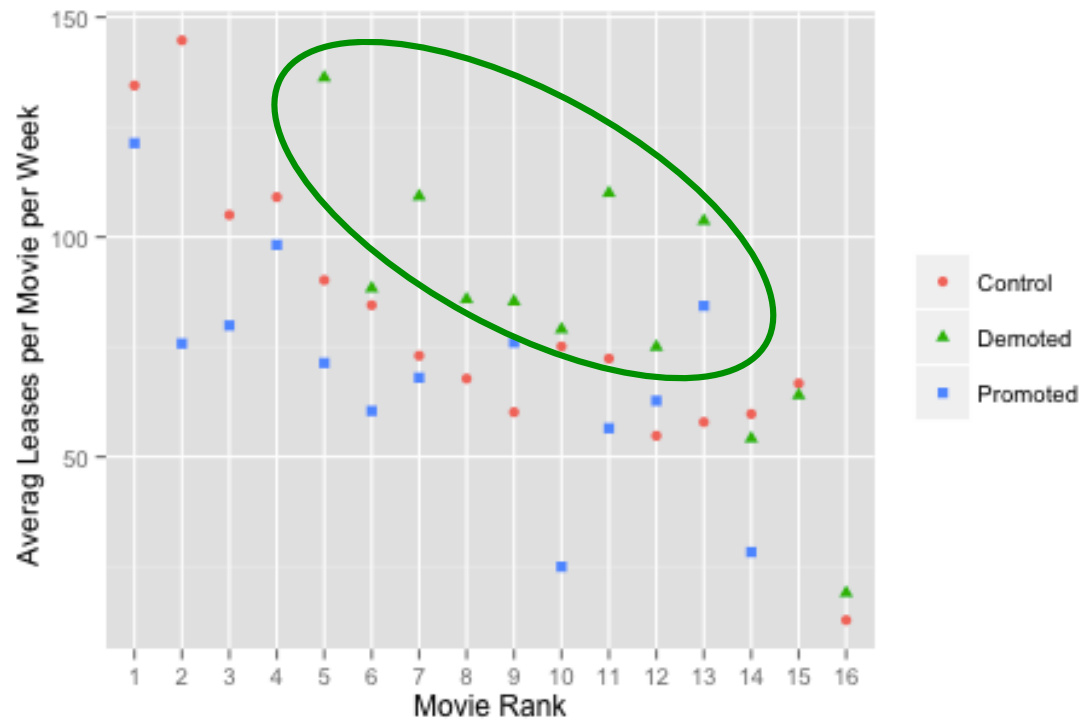
Results

- Demoted/promoted movies have more/fewer likes conditional on rank



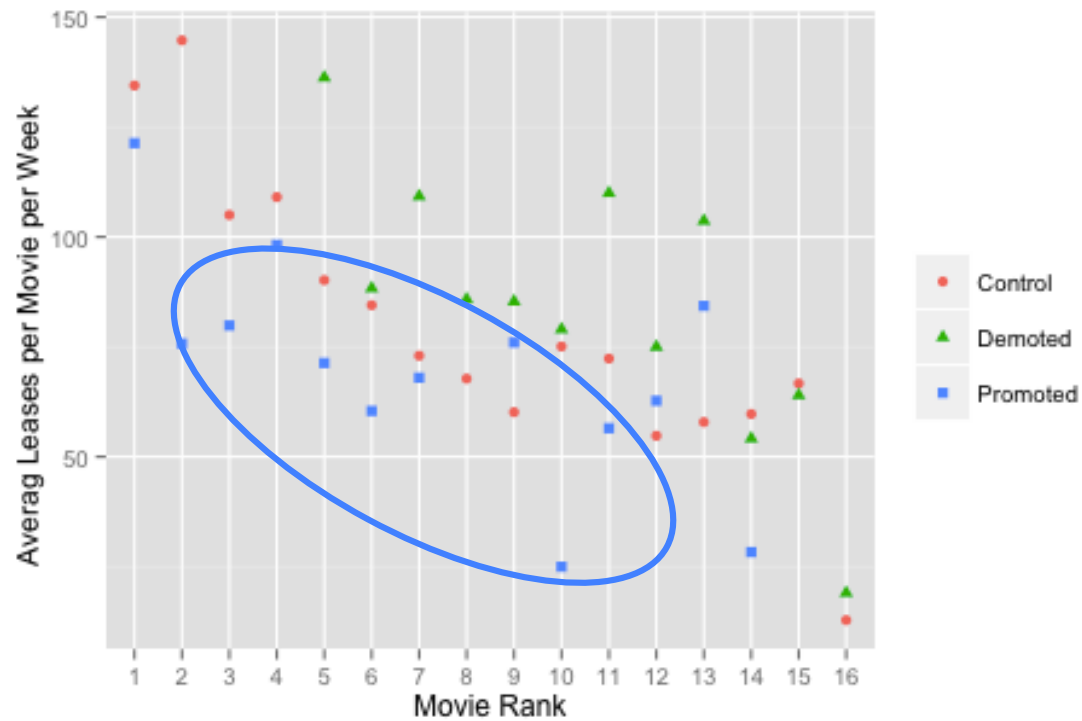
Results

- Demoted/promoted movies have more/fewer likes conditional on rank



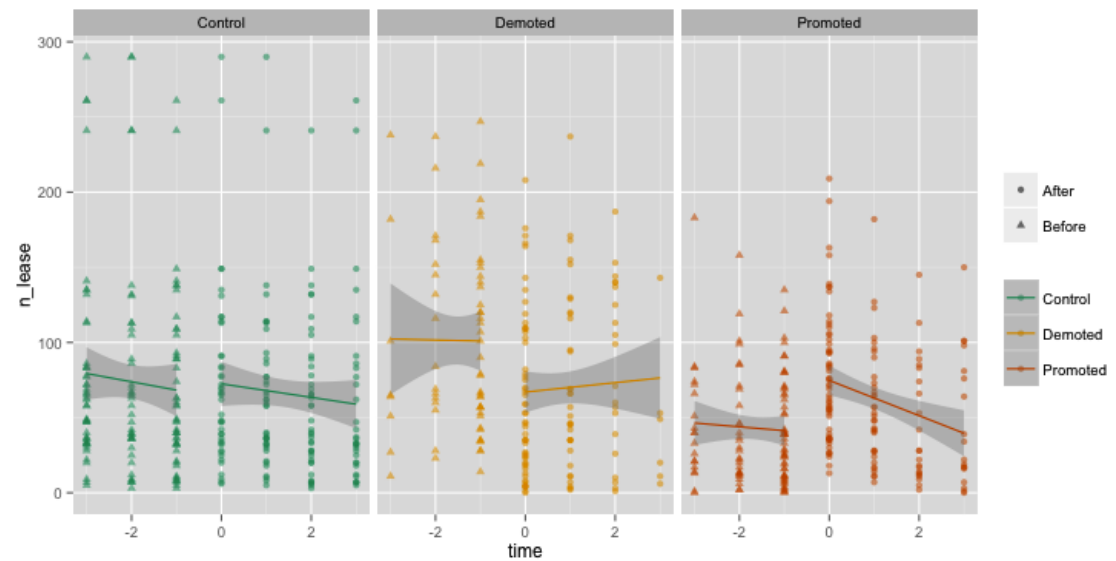
Results

- Demoted/promoted movies have more/fewer likes conditional on rank



Results

- Demoted/promoted movies have more/fewer likes conditional on rank
- Demoted/promoted movies return to *true* position



EoD of Markets for Entertainment

- Digital markets for physical entertainment products...

Predictions

“The Internet is a nearly perfect market because information is instantaneous and buyers can compare the offerings of sellers worldwide. The result is fierce price competition, dwindling product differentiation, and vanishing brand loyalty.”

— Robert Kuttner, Business Week 1998

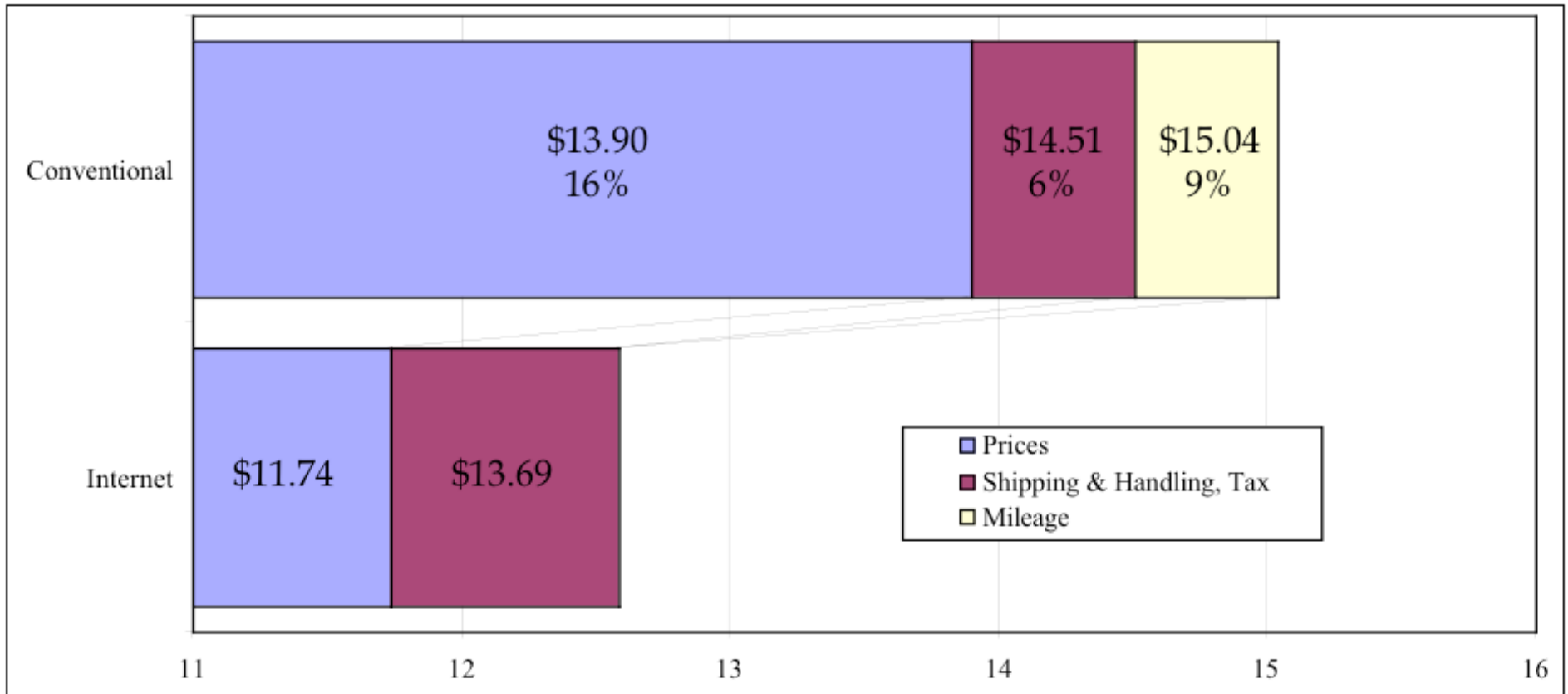
Predictions

- **Low Prices:** Low search costs drive prices toward MC
- **Low Menu Costs:** Retailers can make small price changes to respond to competitors
- **Low Dispersion:** Any retailer pricing above market price will lose significant sales

Methodology

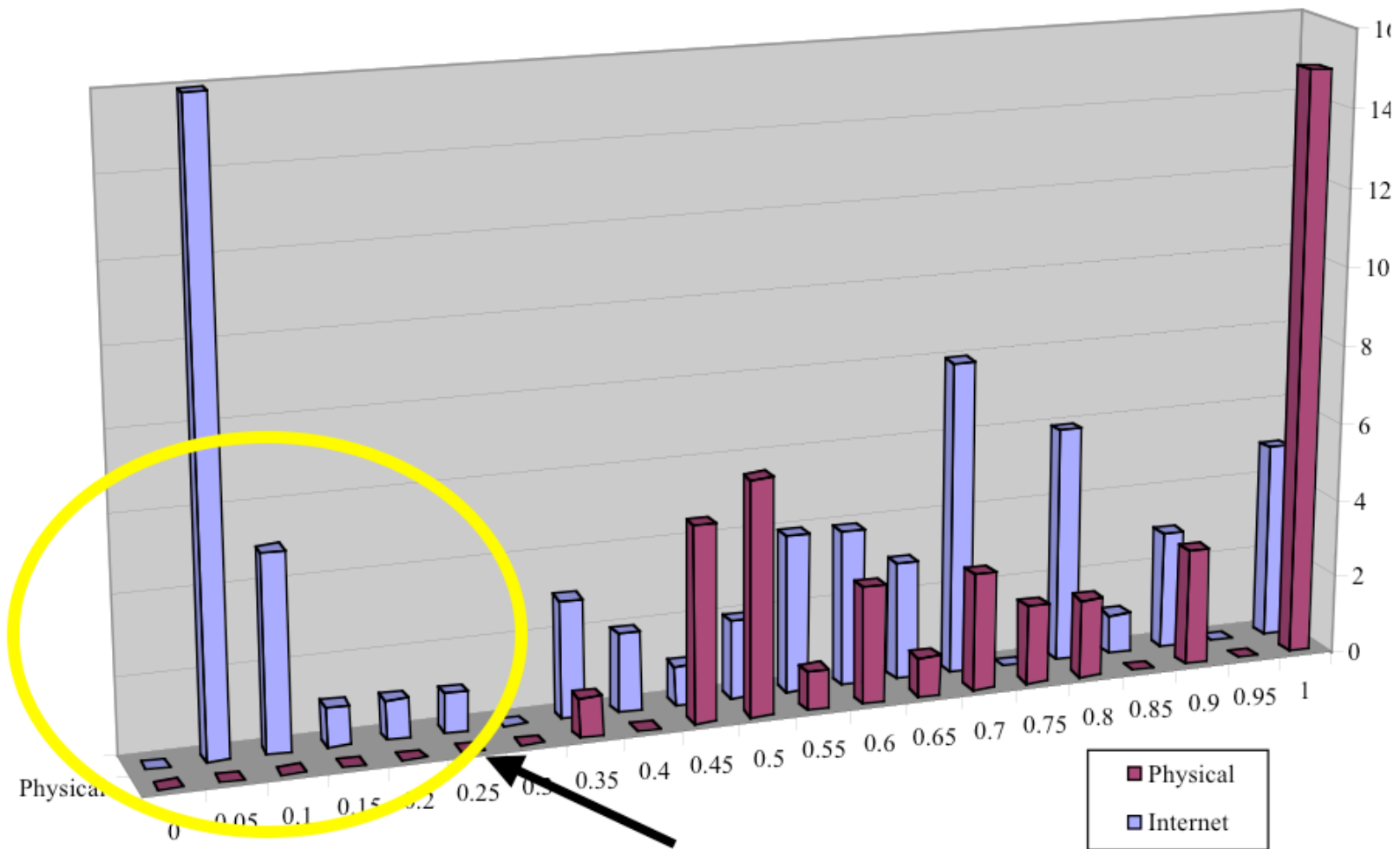
- Products: matched sample of 20 book and 20 CD titles, mix of popular and general selection titles
- Retailers: 16 Internet outlets, 16 conventional outlets (in 6 different states)
- Product data: prices, tax/shipping & handling, availability, delivery time
- Time frame: February 1998 – May 1999 (Monthly)
- Over 8,500 price observations

Price Levels — Books



- Book prices 6-16% lower on the Internet depending on what is included in price.

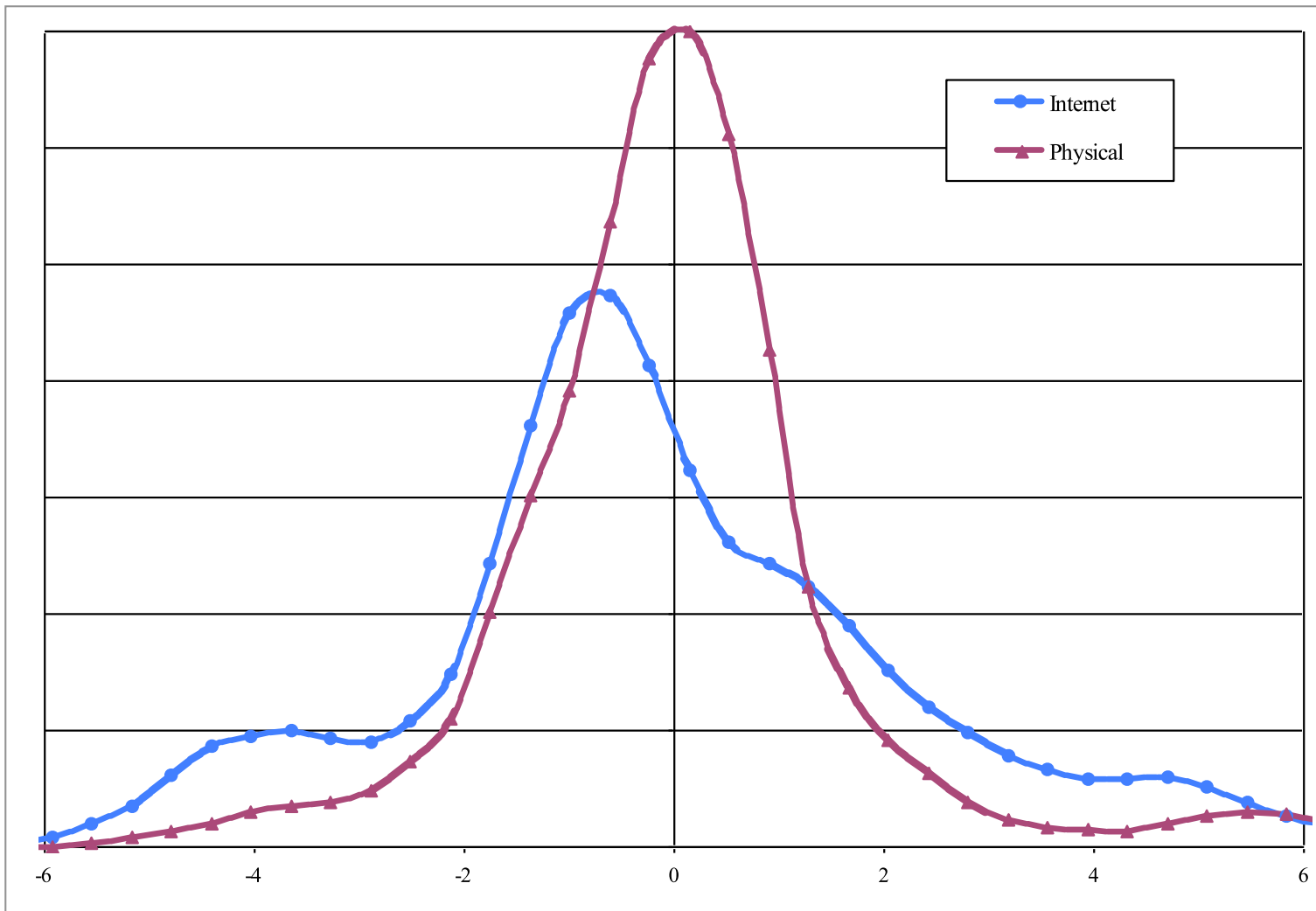
Price Changes — Books



Many Internet Price changes are as small as 5 cents

Price Dispersion

Kernel Density Plots on De-meaned Price Data — Books



Amazon.com

- 75-85% market share in books (dominant positions in CDs, videos, ...)
- Lowest price 2% of the time.
- Prices 40% higher than lowest market prices (DealTime.com)
- Nearly identical prices and services as BN.com and Borders.com. 10x market share.

Amazon.com

- 75-85% market share in books (dominant positions in CDs, videos, ...)
- Lowest price 2% of the time.
- Prices 40% higher than lowest market prices (DealTime.com)
- Nearly identical prices and services as BN.com and Borders.com. 10x market share.

Fierce price competition?
Vanishing brand loyalty?

Possible Explanation: Technological Solution

- As soon as customers start to use shopbots, dispersion will be driven to zero as expected...



Location: http://dealpilot5.dealpilot.com/dealpilotbin/nph-dealpilot8.cgi?type=1&aces_item=1558513027&list_price=39.95&idcode=8216968 What's Related

Click on one offer (1st column) to proceed to the respective shop!

Displaying Top Ten offers:

Total Price	Shop	Item Price	Discount	US Sales Tax	Shipping Costs	Shipping Time	Shipping Service	Delivery Time
US\$ 32.06	Kingbooks.com, USA, WA	US\$ 29.56	26%	US\$ 0.00	US\$ 2.50	14 days	USPS Book Rate	16 days
US\$ 33.51	Kingbooks.com, USA, WA	US\$ 29.56	26%	US\$ 0.00	US\$ 3.95	3-7 days	Standard Shipping	5-9 days
US\$ 35.96	1Bookstreet.com, USA, CA	US\$ 35.96	10%	US\$ 0.00	US\$ 0.00	3-14 days	USPS Parcel Post	6-21 days
US\$ 37.19	barnesandnoble.com, USA, NJ/NY/VA	US\$ 31.96	20%	US\$ 1.28	US\$ 3.95	3-6 days	U.S. Postal Service	5-9 days
US\$ 37.51	Kingbooks.com, USA, WA	US\$ 29.56	26%	US\$ 0.00	US\$ 7.95	2 days	2nd Day Air	4 days
US\$ 41.19	barnesandnoble.com, USA, NJ/NY/VA	US\$ 31.96	20%	US\$ 1.28	US\$ 7.95	2-3 days	FedEx Second Day	4-6 days
US\$ 41.91	1Bookstreet.com, USA, CA	US\$ 35.96	10%	US\$ 0.00	US\$ 5.95	4-6 days	UPS Ground	7-13 days
US\$ 42.91	1Bookstreet.com, USA, CA	US\$ 35.96	10%	US\$ 0.00	US\$ 6.95	2-3 days	Priority Mail	5-10 days
US\$ 43.75	Books.com, USA, OH	US\$ 39.90	0%	US\$ 0.00	US\$ 3.85	14-42 days	USPS Book Rate	16-45 days
US\$ 43.85	Borders.com, USA, MI/TN	US\$ 39.95	0%	US\$ 0.00	US\$ 3.90	3-7 days	Standard	5-10 days

Displaying offers 11 - 44:

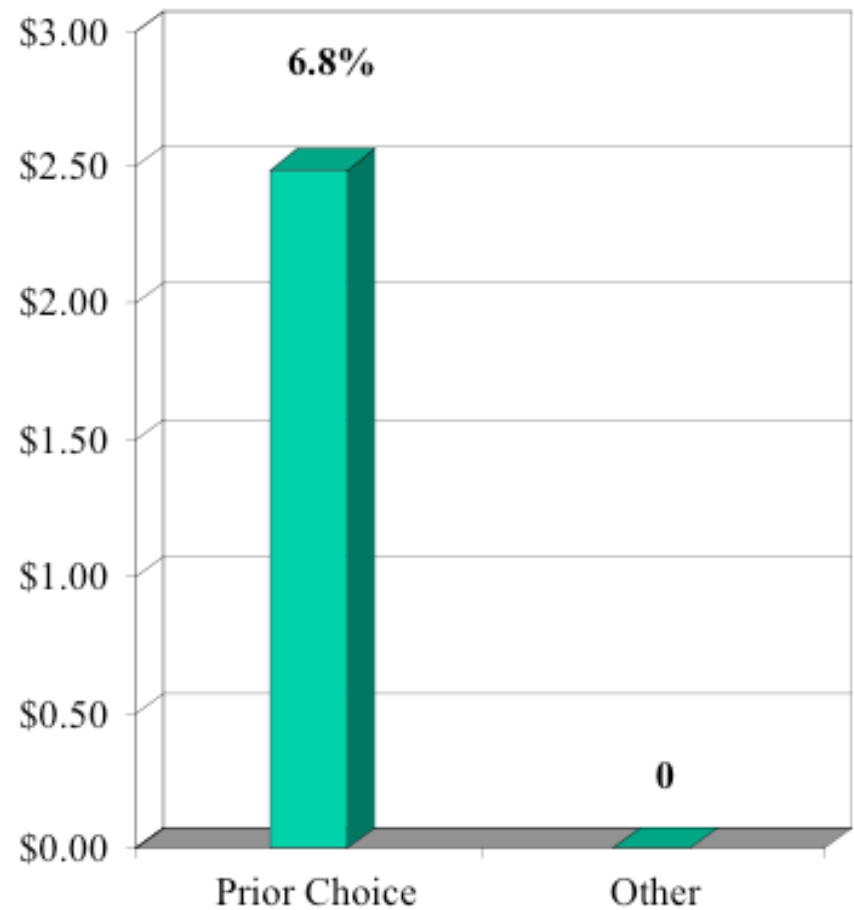
Total Price	Shop	Item Price	Discount	US Sales Tax	Shipping Costs	Shipping Time	Shipping Service	Delivery Time
US\$ 43.85	Shopping.com, USA, CA	US\$ 39.95	0%	US\$ 0.00	US\$ 3.90	3-5 days	Economy	6-10 days
US\$ 43.85	Books.com, USA, OH	US\$ 39.90	0%	US\$ 0.00	US\$ 3.95	2-10 days	UPS	4-13 days
US\$ 43.90	Fatbrain.com, USA, CA	US\$ 39.95	0%	US\$ 0.00	US\$ 3.95	3-7 days	UPS Ground	6-11 days
US\$ 43.90	Amazon.com, USA, WA/NV	US\$ 39.95	0%	US\$ 0.00	US\$ 3.95	3-7 days	USPS Priority Mail	5-10 days

Brand and Loyalty at Shopbots

Brand Value



Loyalty Value



What *doesn't* change?

- Search costs (prices, reputation, quality)!
 - Johnson et al (2004): Households that shop visit only 1.2 book, 1.3 CD, and 1.8 travel sites per month.
 - Hann and Terwiesch (2003): \$3-6 implied cost to re-bid in a NYOP auction
 - Bajari and Hortacsu (2003): \$3.20 implied cost of entering eBay auction
 - Brynjolfsson, Dick, and Smith (2004): \$6-7 implied cost of searching on shopbot

What Changes?

- Digital markets for physical entertainment products...
- Digital markets for *digital* entertainment products...

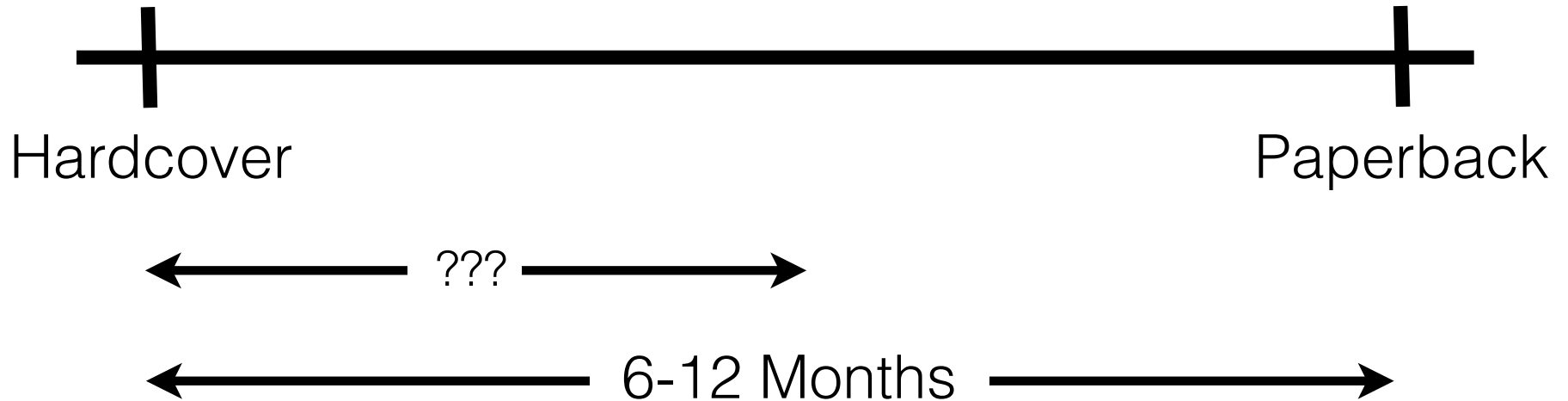
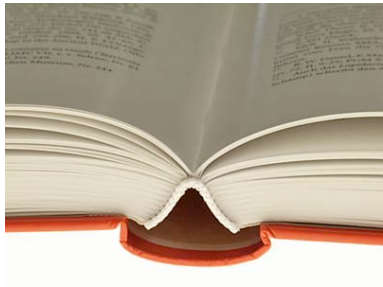
What Changes?

- Digital markets for physical entertainment products...
- Digital markets for *digital* entertainment products...
 - Pricing, windowing, channel conflict...
 - Piracy
 - Bundling
 - Market power

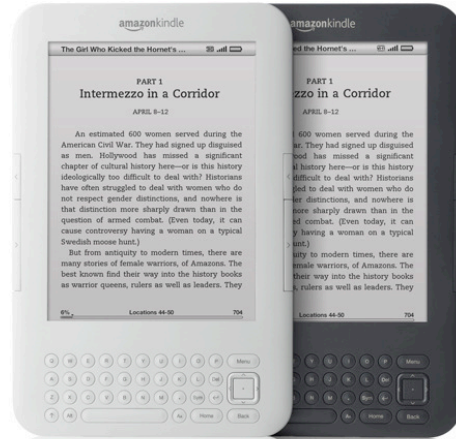
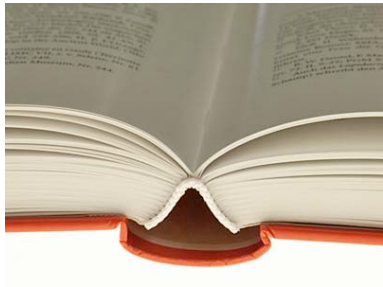
What Changes?

- Digital markets for physical entertainment products...
- Digital markets for *digital* entertainment products...
 - Pricing, windowing, channel conflict...
 - Piracy
 - Bundling
 - Market power

Release Windows



Release Windows

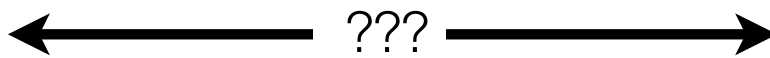


+

Hardcover

+

Paperback



Proposed Experiment

- Randomly assign books to multiple treatment groups
- Delay eBook release by varying amount of time within treatment groups
- Measure impact

Natural Experiment: *Publisher X* vs. Amazon

- Amazon and “*Publisher X*” dispute over prices
 - <April 1, 2010: Hardcover and Kindle released on same day
 - April 1, 2010: No new Kindle titles from publisher (print still released)
 - June 1, 2010: All Kindle titles return to Amazon

Natural Experiment

<i>Week(s)</i>	<i>Print Release</i>	<i>Kindle Release</i>	<i>Kindle Delay</i>
Before April 1	Print and Kindle titles released same day		0 weeks
Week of April 4	April 4	June 1	8 weeks
Week of April 11	April 11	June 1	7 weeks
Week of April 18	April 18	June 1	6 weeks
Week of April 25	April 25	June 1	5 weeks
Week of May 2	May 2	June 1	4 weeks
Week of May 9	May 9	June 1	3 weeks
Week of May 16	May 16	June 1	2 weeks
Week of May 23	May 23	June 1	1 week
After June 1	Print and Kindle titles released same day		0 weeks

Summary Statistics

		Mean	Std. Dev.	Min	Max	Median	Num. of Obs.
<i>“Control” Titles</i>	<i>Print Sales</i>	106.9	328.0	0	6,992.0	30.0	1,620
	<i>Kindle Sales</i>	109.9	342.2	0	3,884.0	19.0	1,620
	<i>Print Prices</i>	16.3	2.5	10.0	29.7	16.5	1,620
	<i>Kindle Prices</i>	12.5	2.3	6.3	30.0	13.0	1,620
<i>“Experiment” Titles</i>	<i>Print Sales</i>	132.5	364.3	0	5,573.0	34.0	1,980
	<i>Kindle Sales</i>	40.1	86.9	0	1,247.0	13.0	1,980
	<i>Print Prices</i>	15.3	2.9	8.6	25.1	16.4	1,980
	<i>Kindle Prices</i>	12.9	1.7	10.0	20.0	13.0	1,980

Sales totals for first 20 weeks after release *in each channel*

Summary Statistics

		Mean	Std. Dev.	Min	Max	Median	Num. of Obs.
<i>“Control” Titles</i>	<i>Print Sales</i>	106.9	328.0	0	6,992.0	30.0	1,620
	<i>Kindle Sales</i>	109.9	342.2	0	3,884.0	19.0	1,620
	<i>Print Prices</i>	16.3	2.5	10.0	29.7	16.5	1,620
	<i>Kindle Prices</i>	12.5	2.3	6.3	30.0	13.0	1,620
<i>“Experiment” Titles</i>	<i>Print Sales</i>	132.5	364.3	0	5,573.0	34.0	1,980
	<i>Kindle Sales</i>	40.1	86.9	0	1,247.0	13.0	1,980
	<i>Print Prices</i>	15.3	2.9	8.6	25.1	16.4	1,980
	<i>Kindle Prices</i>	12.9	1.7	10.0	20.0	13.0	1,980

Sales totals for first 20 weeks after release *in each channel*

Related Questions

- iTunes vs. DVD (channel conflict? windowing?)
- Netflix/sVOD vs. iTunes (cannibalization? information discovery?)
- Bundling vs. unbundling songs/albums
- iTunes pricing
- ...

What Changes?

- Digital markets for physical entertainment products...
- Digital markets for *digital* entertainment products...
 - Pricing, windowing, channel conflict...
 - Piracy
 - Bundling
 - Market power

(Anti-)Piracy Questions

1. Does piracy harm producers?
2. Does piracy harm consumers?
3. What can be done to mitigate harm?

Question #1:
Does piracy harm
producers?

Does Piracy Harm Sales?

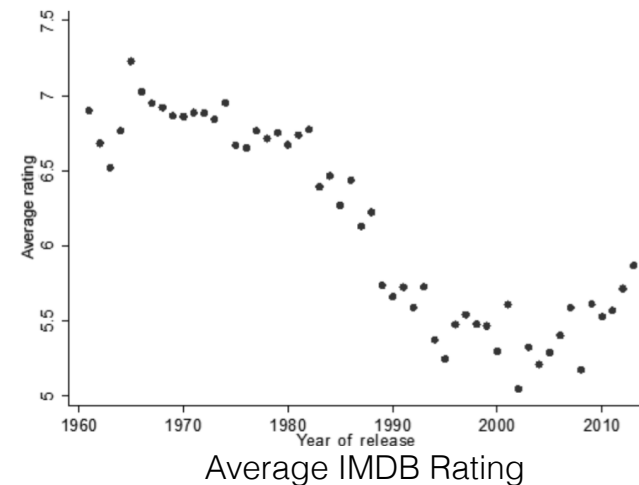
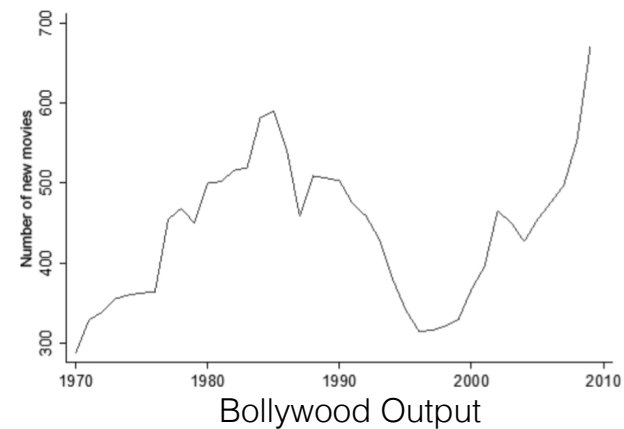
No (3)	Yes (23)	
<p>Oberholzer and Strumpf (2007, J. of Political Economy)</p> <p>Smith and Telang (2009, MIS Quarterly)</p> <p>Andersen and Frenz (2010, J. of Evolutionary Economics)</p>	<p>Hui & Png (2003, Contrib. to Economic Analysis & Policy)</p> <p>Peitz & Waelbroeck (2004, Rev. of Econ. Res. on Copyright)</p> <p>Zentner (2005, Topics in Econ. Analysis and Policy)</p> <p>Stevens and Sessions (2005, Journal of Consumer Policy)</p> <p>Bonnie et al. (2006, Rev. of Econ. Res. on Copyright)</p> <p>Michel (2006, Topics in Econ. Analysis and Policy)</p> <p>Rob and Waldfogel (2006, J. of Law and Economics)</p> <p>Zentner (2006, Journal of Law and Economics)</p> <p>Bhattacharjee et al. (2007, Management Science)</p> <p>DeVany and Walls (2007, Review of Industrial Organization)</p> <p>Hennig-Thurau, Henning, Sattler (2007, Marketing Science)</p> <p>Rob and Waldfogel (2007, J. of Industrial Economics)</p>	<p>Liebowitz (2008, Management Science)</p> <p>Bender and Wang (2009, Intl. Social Science Review)</p> <p>Danaher et al. (2010, Marketing Science)</p> <p>Waldfogel (2010, Information Econ. and Policy)</p> <p>Bai and Waldfogel (2012, Information Econ. and Policy)</p> <p>Danaher et al. (2013, J. of Industrial Economics)</p> <p>Hong (2013, J. of Applied Econometrics)</p> <p>Danaher and Smith (2014, Intl. J. of Industrial Organization)</p> <p>Ma et al. (2014, Information Systems Research)</p> <p>Adermon and Liang (2014, J. of Econ. Behavior & Organization)</p> <p>MkKenzie and Walls (2016, B.E. J. of Econ. Analysis and Policy)</p>

Peer-reviewed Publications

Question #2:
Does piracy harm
consumers?

Piracy and Bollywood

- Telang and Waldfogel (2017, *Information Economics and Policy*)
- Examine output in Bollywood after introduction of VCR in mid-1980s
- Significant drop in industry revenue, industry output, and average quality (IMDB ratings)



Question #3:
What can be done?

Question #3a:
What can be done?
(Rightsholders)

Make Content Available

Natural Experiments

Study	Channel	Product	Questions	Years
NBC-iTunes	EST	Television	Piracy? DVD?	2007-08
ABC-Hulu	Streaming	Television	Piracy? DVD?	2009

NBC v. Apple iTunes



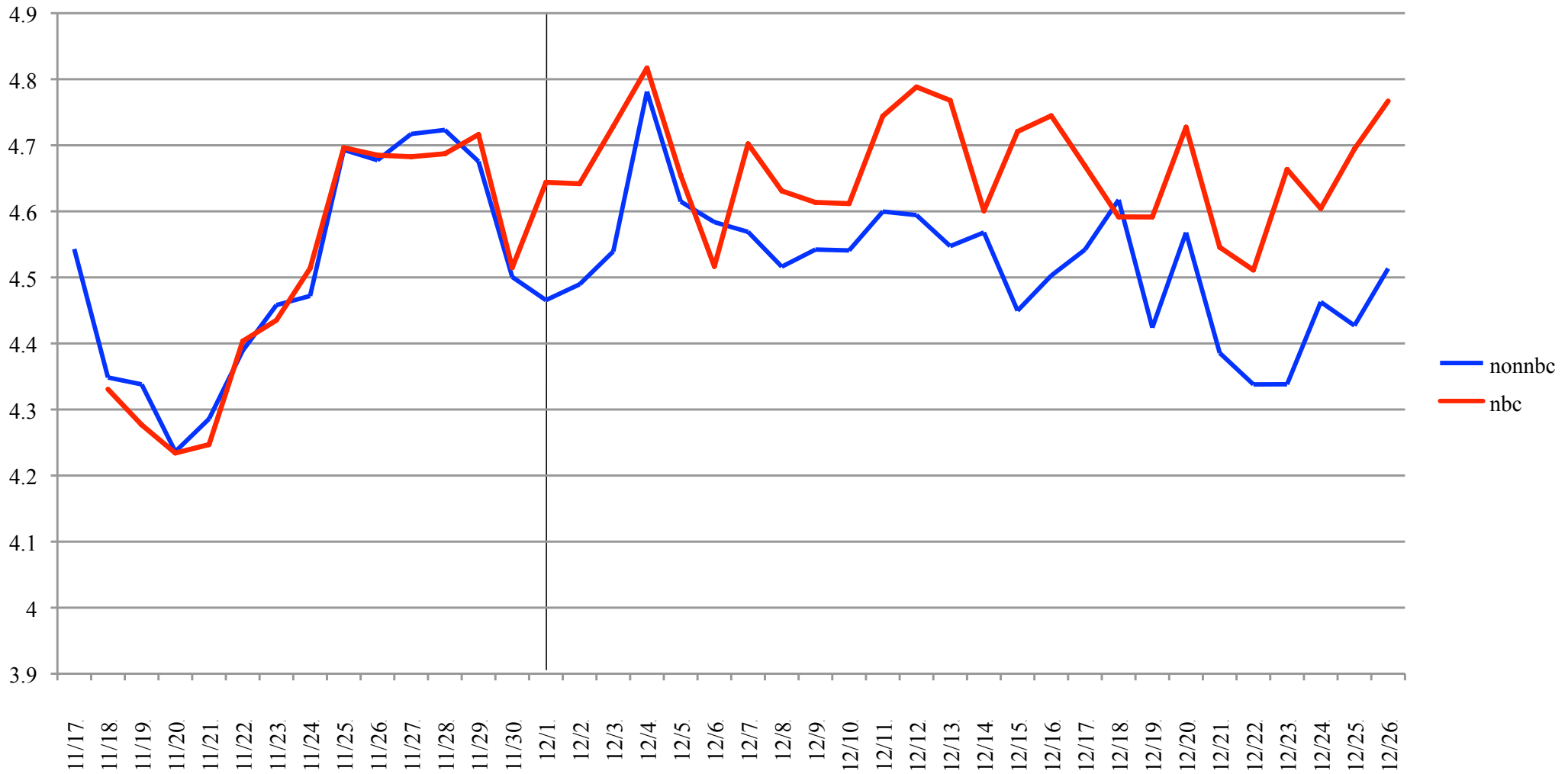
- NBC refuses to extend contract with iTunes August 2007. Apple refuses to sell new NBC seasons.
- NBC removes all content from iTunes on December 1, 2007
- NBC restores all content to iTunes on September 9, 2008

NBC v. Apple iTunes



- Extract (BitTorrent) piracy and (Amazon) DVD rank data for NBC vs. non-NBC (ABC, CBS, FOX) content
- 2 week window before and after each event
- 5,200 episodes (75 series)

Impact



Results: Impact of iTunes Removal on Piracy

$$\ln Downloads_{it} = \beta_0 + \beta_{1t} \Phi_t + \beta_{2t} NBC_i * \Phi_t + \mu_i + e$$

	2007	
	(i)	(ii)
After 12/1	0.058 [†] (0.049)	
After 12/1 * Removed	0.112 ^{**} (0.043)	0.113 ^{**} (0.043)
Constant	4.513 [*] (0.011)	4.314 [*] (0.027)
Date Fixed Effects	No	Yes
Observations	161,784	161,784
R ²	0.28	0.16

Results: Impact of iTunes Removal on Piracy

$$\ln Downloads_{it} = \beta_0 + \beta_{1t} \Phi_t + \beta_{2t} NBC_i * \Phi_t + \mu_i + e$$

	2007	
	(i)	(ii)
After 12/1	0.058 [†] (0.049)	
After 12/1 * Removed	0.112 ^{**} (0.043)	0.113 ^{**} (0.043)
Constant	4.513 [*] (0.011)	4.314 [*] (0.027)
Date Fixed Effects	No	Yes
Observations	161,784	161,784
R ²	0.28	0.16

NBC v. Apple iTunes



- 11% increase in NBC piracy versus ABC, CBS, and FOX.
- ABC, CBS, and FOX piracy also increases by 5%
- No change in NBC's DVD sales (vs. ABC, CBS, FOX)

NBC v. Apple iTunes



- 11% increase in NBC piracy versus ABC, CBS, and FOX.
- ABC, CBS, and FOX piracy also increases by 5%
- No change in NBC's DVD sales (vs. ABC, CBS, FOX)
- Smaller decrease in piracy when NBC returns to iTunes

ABC and Hulu



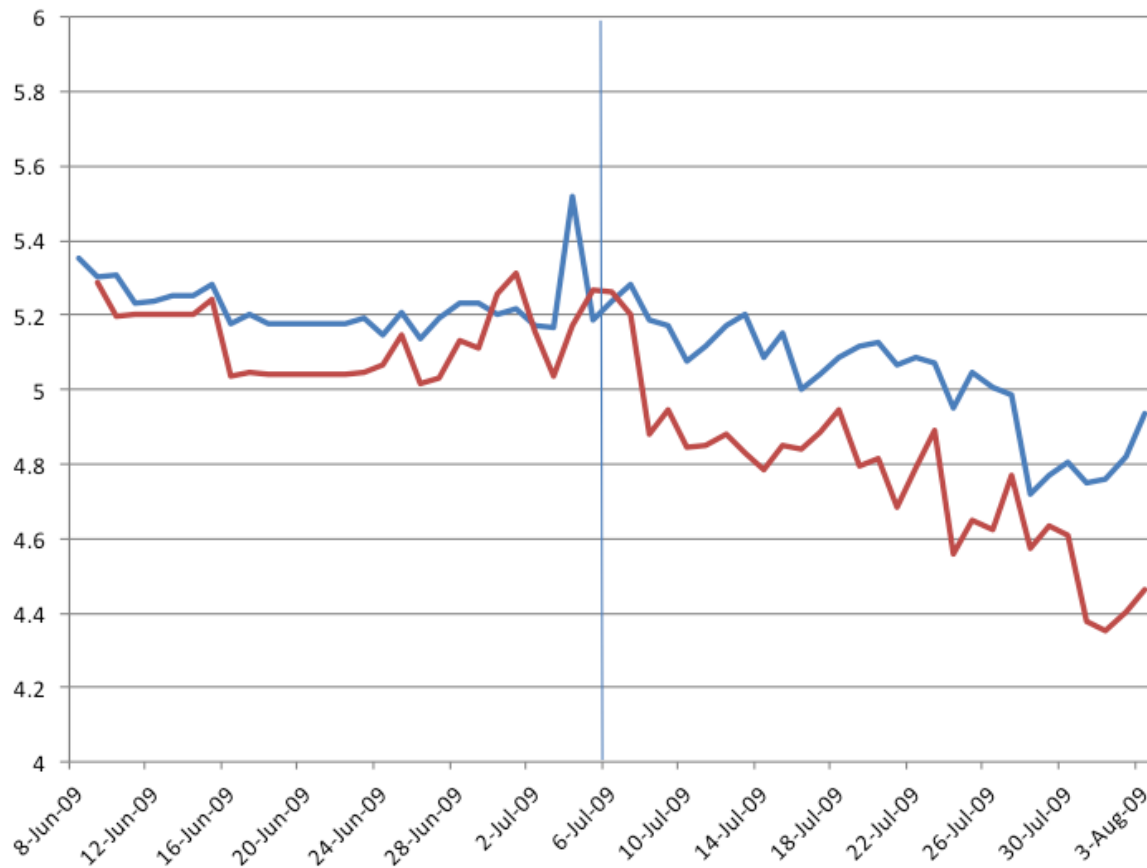
- May 1, 2009: ABC announces that they will add their content to Hulu
- July 6, 2009: ABC starts streaming TV shows on Hulu

ABC and Hulu



- Extract (BitTorrent) piracy and (Amazon) DVD sales data for ABC vs. non-ABC content
- 2 week window before and after July 6, 2009
- 71 series

Impact



- 18% decrease in ABC piracy (vs. control group)
- 7% decrease in control group piracy (relative to trend)
- No change in DVD sales

Question #3b:
What can be done?
(Governments / Industry)

Can anti-piracy efforts help?

The New York Times

Sunday Review | The Opinion Pages

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE

NEWS ANALYSIS

Internet Pirates Will Always Win

By NICK BILTON

Published: August 4, 2012

STOPPING online piracy is like playing the world's largest game of Whac-A-Mole.

In the arcade version of Whac-A-Mole, the game eventually ends — often when the player loses. In the piracy arms-race version, there doesn't seem to be a conclusion. Sooner or later, the people who still believe they can hit the moles with their slow mallets might realize that their time would be better spent playing an entirely different game.

Anti-Piracy Options

	Demand-Side	Supply-Side
Government/ Mandated		
Industry/ Voluntary		

Anti-Piracy Options

Demand-Side

Supply-Side

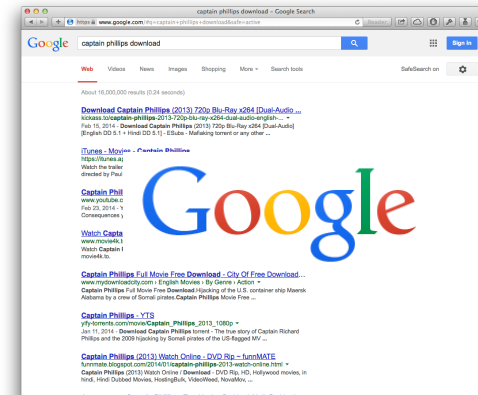
Government/
Mandated



Digital Economy Act 2010

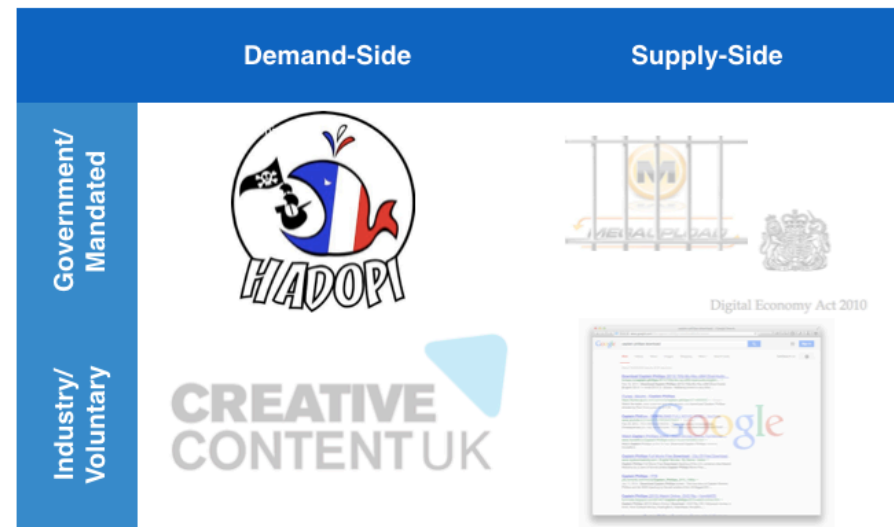
Industry/
Voluntary

**CREATIVE
CONTENT UK**

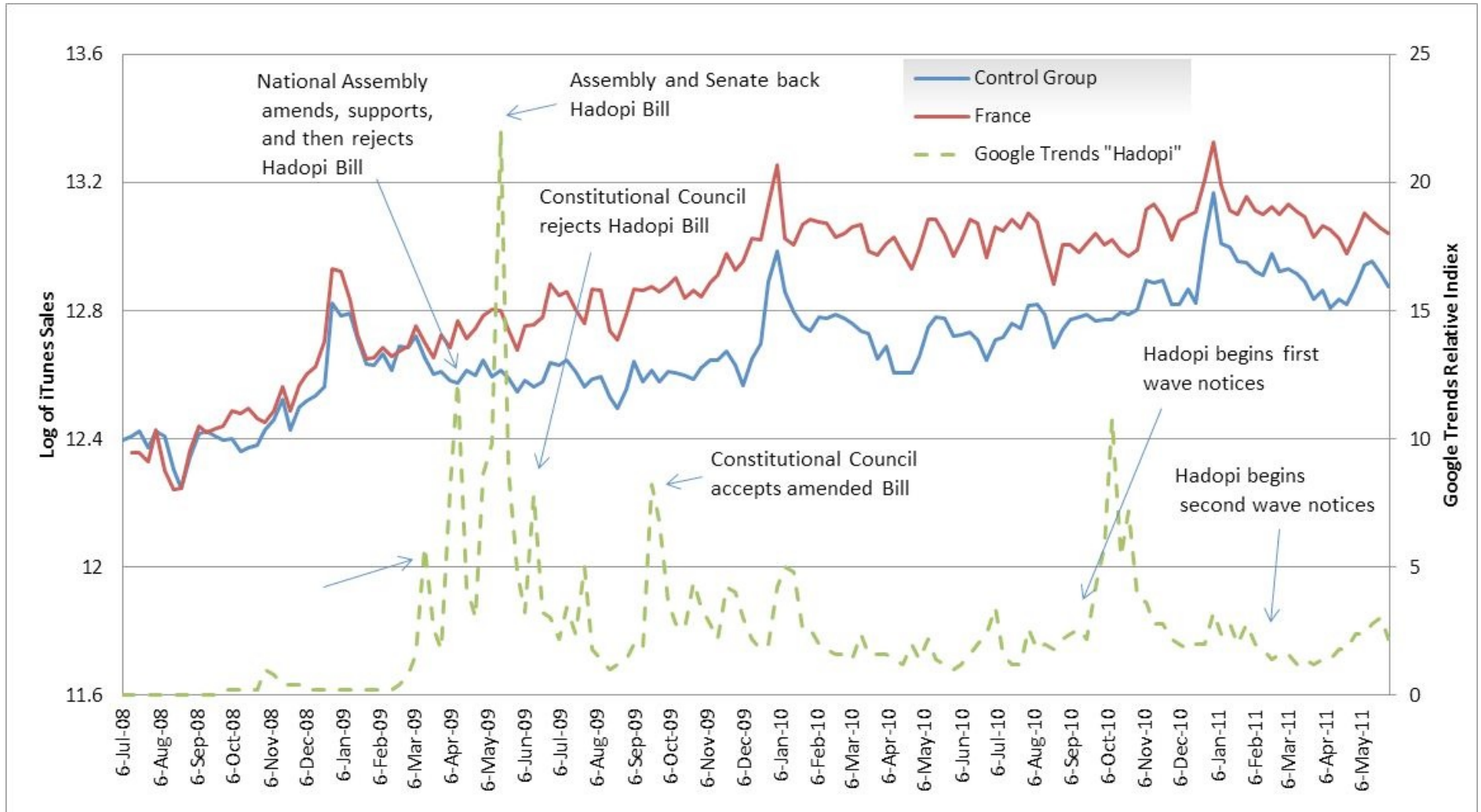


HADOPI

- Question: Did the French “HADOPI” graduated response law affect digital music sales?
- Data: iTunes music sales, July 2008 to May 2011 (EMI, Sony, Universal, Warner)
- France and Control Group (UK, Italy, Spain, Germany, Belgium)



HADOPI Results



* Total iTunes track sales units for the four majors

Estimation

	(i)	(ii)
	All Tracks	All Albums
After Hadopi	0.228* (0.037)	0.351* (0.033)
After Hadopi * France	0.203** (0.037) [0.031]	0.223** (0.033) [0.040]
Constant	12.520* (0.023)	10.168* (0.020)
Observations	918	918
# of Countries	6	6
R-squared	0.361	0.417

Robust standard errors clustered at country level appear in parentheses

Two-tailed P-values derived from permutation test appear in square brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

March 30, 2009 is counted as the beginning of Hadopi

Differencing by Genre

- EMI Music interviews 8,173 French customers in Oct-Nov 2010
- Piracy demand varies by genre
 - Highest: Rap/Hip-Hop
 - Average: Rock, Pop
 - Lowest: Christian, Classical, Folk, Jazz

Estimation

	(i)	(ii)	(iii)
	All Tracks	All Albums	Classical / Folk / Modern Christian / Jazz
After Hadopi	0.228* (0.037)	0.351* (0.033)	-0.042 (0.072)
After Hadopi * France	0.203** (0.037) [0.031]	0.223** (0.033) [0.040]	0.068 (0.072) [0.628]
Constant	12.520* (0.023)	10.168* (0.020)	7.715* (0.044)
Observations	918	918	912
# of Countries	6	6	6
R-squared	0.361	0.417	0.082

Robust standard errors clustered at country level appear in parentheses

Two-tailed P-values derived from permutation test appear in square brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

March 30, 2009 is counted as the beginning of Hadopi

Estimation

	(i)	(ii)	(iii)	(iv)
	All Tracks	All Albums	Classical / Folk / Modern Christian / Jazz	Rock / Pop
After Hadopi	0.228* (0.037)	0.351* (0.033)	-0.042 (0.072)	0.142 (0.068)
After Hadopi * France	0.203** (0.037) [0.031]	0.223** (0.033) [0.040]	0.068 (0.072) [0.628]	0.158+ (0.068) [0.092]
Constant	12.520* (0.023)	10.168* (0.020)	7.715* (0.044)	11.411* (0.042)
Observations	918	918	912	912
# of Countries	6	6	6	6
R-squared	0.361	0.417	0.082	0.103

Robust standard errors clustered at country level appear in parentheses

Two-tailed P-values derived from permutation test appear in square brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

March 30, 2009 is counted as the beginning of Hadopi

Estimation

	(i)	(ii)	(iii)	(iv)	(v)
	All Tracks	All Albums	Classical / Folk / Modern Christian / Jazz	Rock / Pop	Rap / Hip Hop
After Hadopi	0.228* (0.037)	0.351* (0.033)	-0.042 (0.072)	0.142 (0.068)	0.846* (0.205)
After Hadopi * France	0.203** (0.037) [0.031]	0.223** (0.033) [0.040]	0.068 (0.072) [0.628]	0.158+ (0.068) [0.092]	0.260 (0.205) [0.531]
Constant	12.520* (0.023)	10.168* (0.020)	7.715* (0.044)	11.411* (0.042)	8.731* (0.127)
Observations	918	918	912	912	912
# of Countries	6	6	6	6	6
R-squared	0.361	0.417	0.082	0.103	0.42

Robust standard errors clustered at country level appear in parentheses

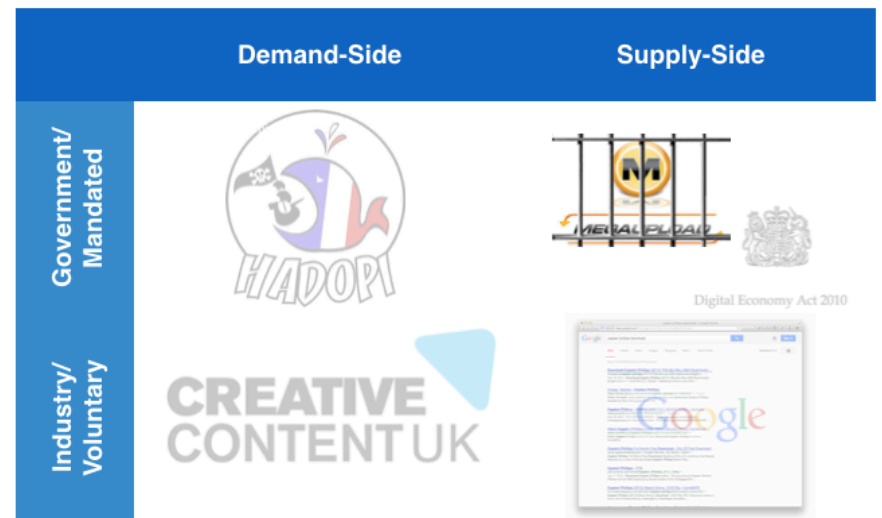
Two-tailed P-values derived from permutation test appear in square brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

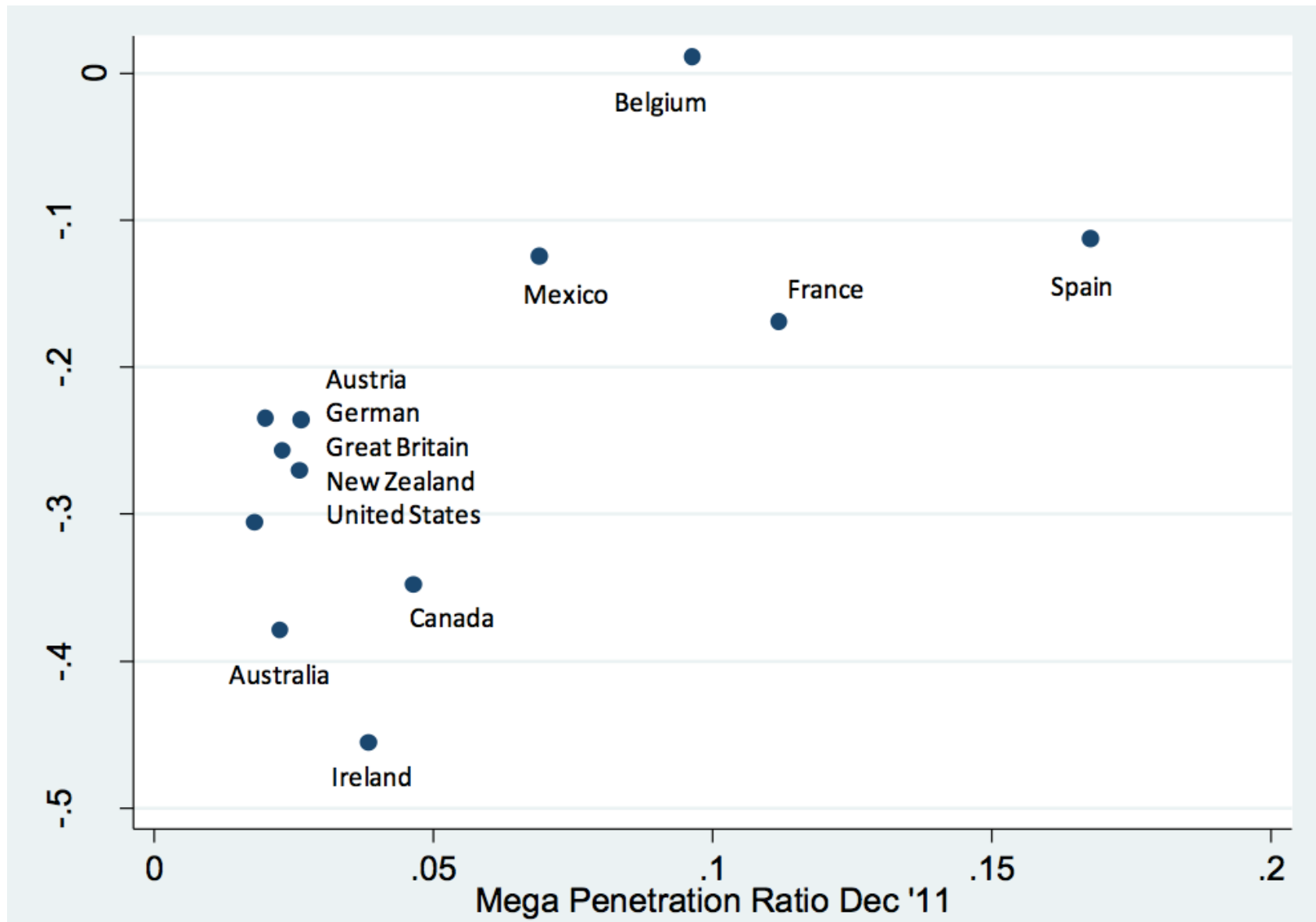
March 30, 2009 is counted as the beginning of Hadopi

Megaupload

- Question: Did the shutdown of Megaupload change digital movie sales?
- Data:
 - Movie digital sales & rentals 9/11-5/12
 - Country-Level Megaupload Penetration Ratio (MPR)

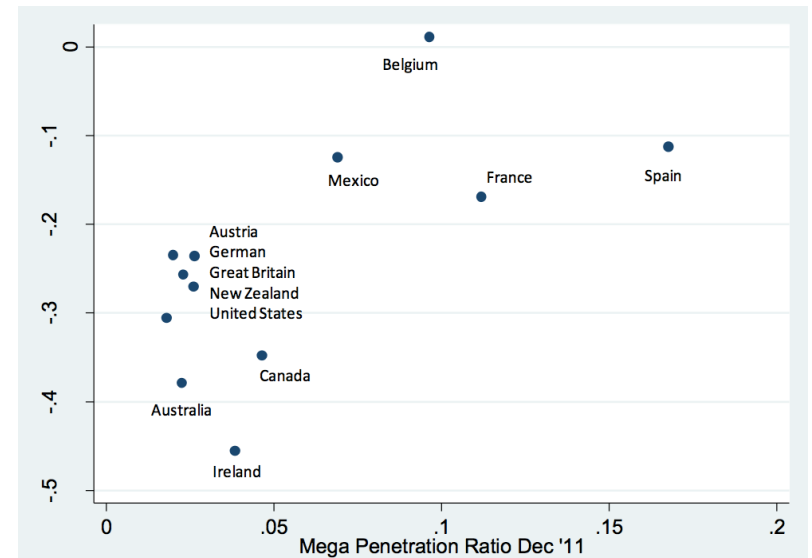


Δ Sales v MPR



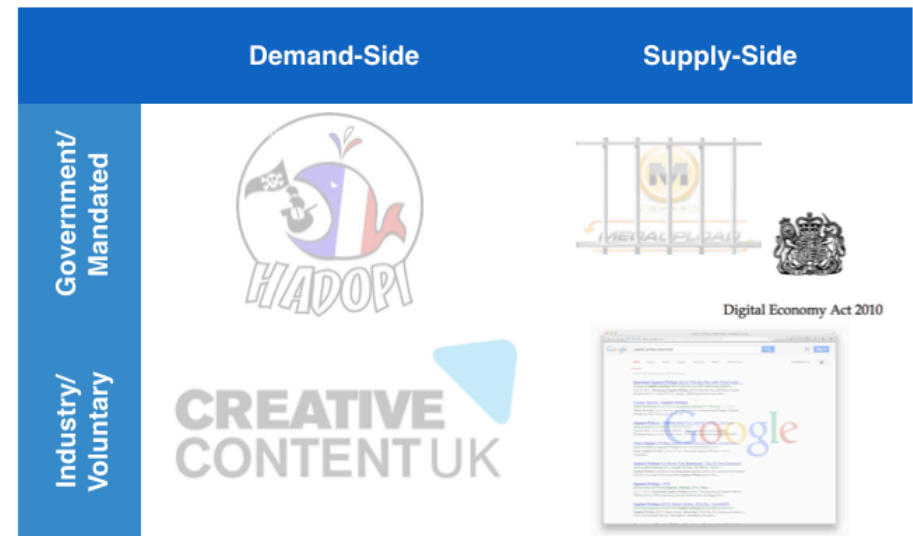
Megaupload Results

- Danaher and Smith (2014, *International Journal of Industrial Organization*)
- No correlation between MPR and sales changes before shutdown
- Aggregate 7-9% increase in revenue
 - Higher for sales than rentals



UK Site Blocking

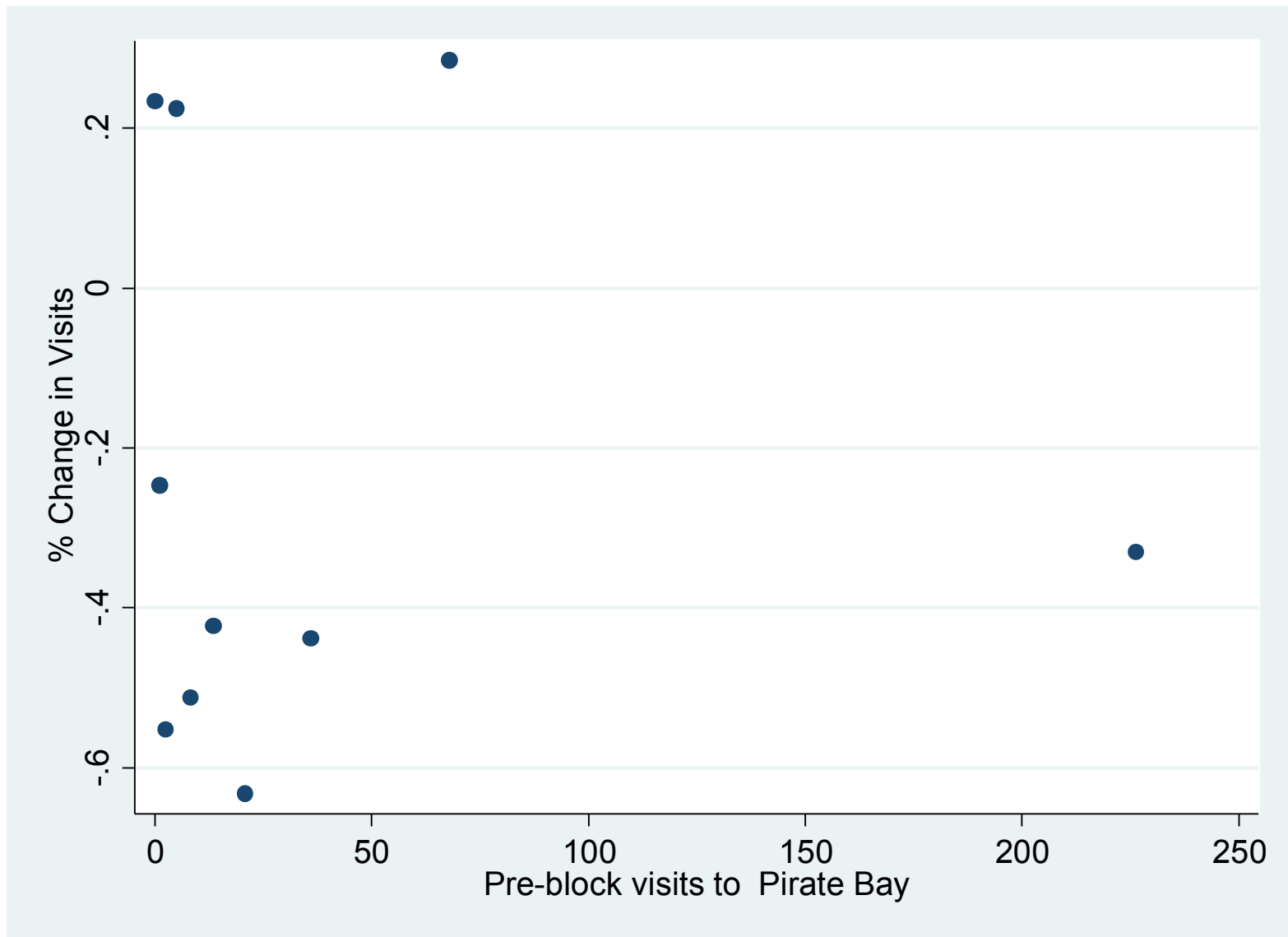
- Question: Does blocking access to piracy enabling sites change user behavior?
- Setting: UK Digital Economy Act 2010
 - Piratebay blocked (May 2012)
 - 19 popular sites blocked (Oct-Nov 2013)
 - 53 popular sites blocked (November 2014)



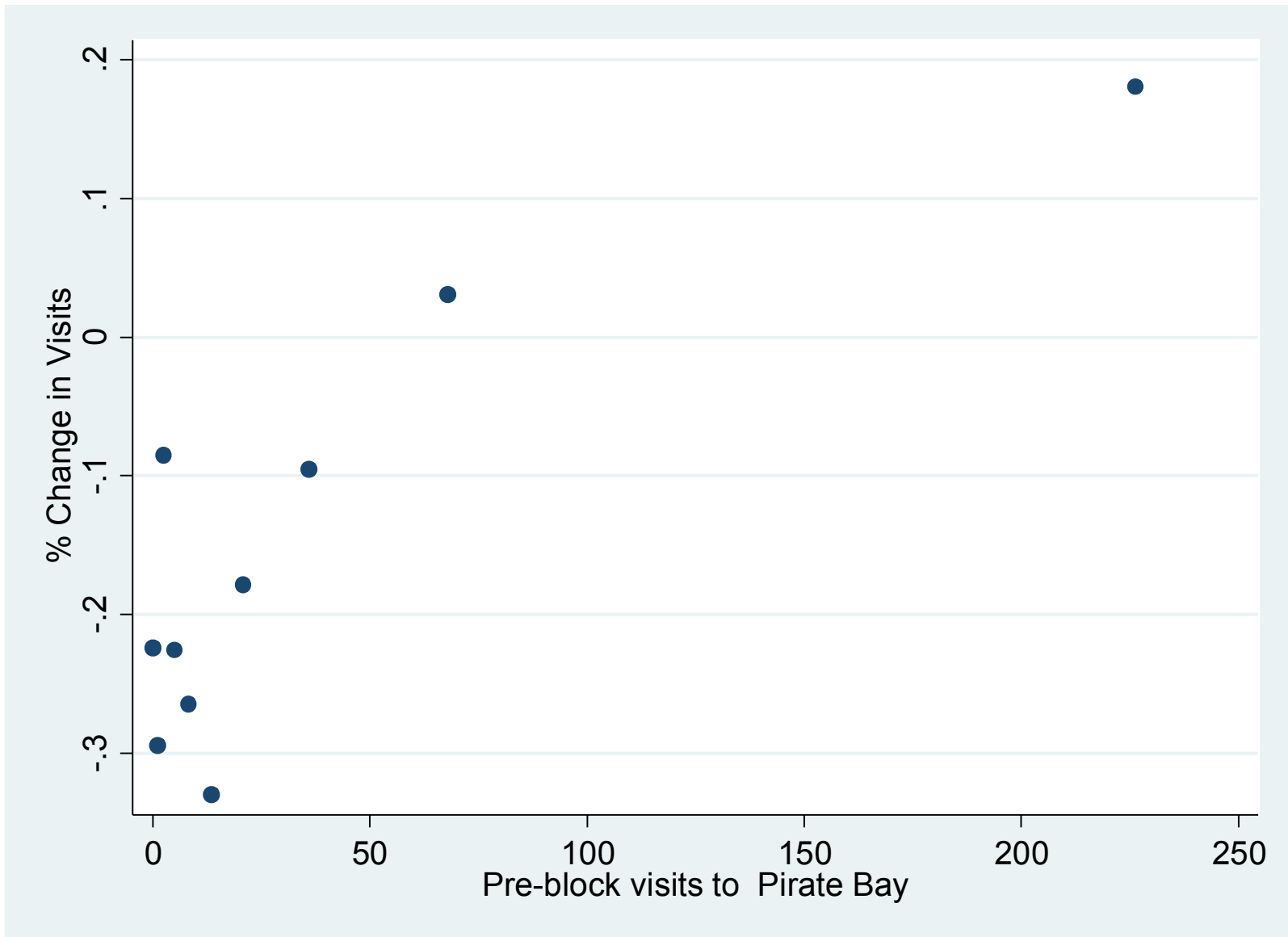
Data

- Data obtained from company who tracks (with permission) site-level visits by a panel of users
 - Split customers into 10 groups based on usage of blocked sites in the month prior to the blocks
 - Observe before/after visits to
 - Blocked sites
 - Unblocked piracy sites
 - Legal sites
 - VPN sites

TPB Block: Treatment Intensity vs. Change in Visits to Paid Legal Streaming



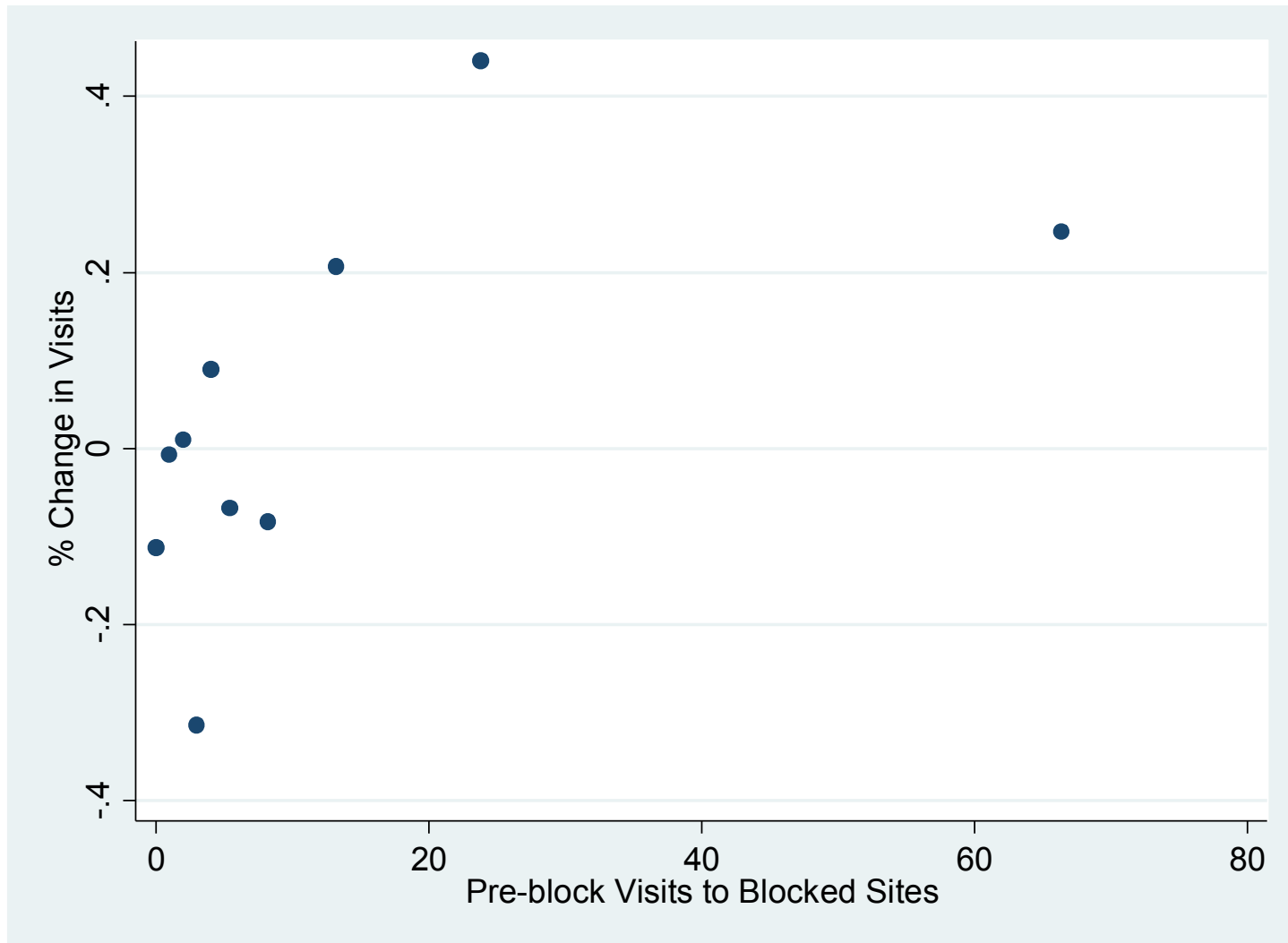
TPB Block: Treatment Intensity vs. Change in Visits to Other Torrent Sites



Results

- 5/12 Piratebay block: Very little change in visits to legal sites (significant increase in VPN usage and in visits to other pirate sites)

19-Site Block: Treatment Intensity vs. Change in Visits to Paid *Legal Streaming*

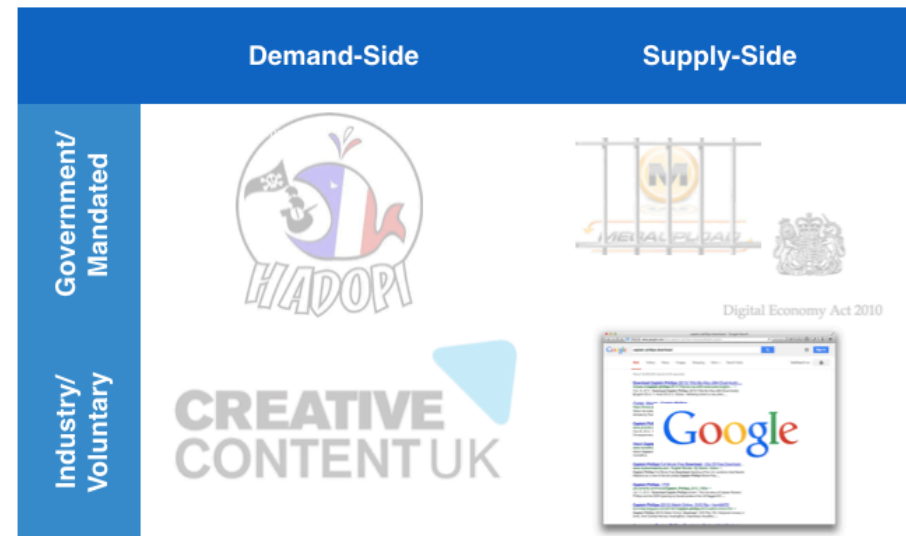


Results

- 5/12 Piratebay block: Very little change in visits to legal sites (significant increase in VPN usage and in visits to other pirate sites)
- 10/13 19-site block: 12% increase in visits to paid legal streaming sites.
- 11/14 53-site block: 6% increase in visits to paid legal sites, 10% increase in ad-supported sites

Search and Piracy

- Question: Does search rank impact choice between pirated and legal content?
- Does this apply to users who state a preference for pirated or legal content in their search terms?



Google Search

captain phillips download - Google Search

https://www.google.com/#q=captain+phillips+download&safe=active

Google captain phillips download Sign in

Web Videos News Images Shopping More Search tools SafeSearch on

About 16,000,000 results (0.24 seconds)

Download Captain Phillips (2013) 720p Blu-Ray x264 [Dual-Audio ...]
kickass.to/captain-phillips-2013-720p-blu-ray-x264-dual-audio-english-...
Feb 15, 2014 - Download Captain Phillips (2013) 720p Blu-Ray x264 [Dual-Audio]
[English DD 5.1 + Hindi DD 5.1] - ESubs - Mafiaking torrent or any other ...

iTunes - Movies - Captain Phillips
https://itunes.apple.com/us/movie/captain-phillips/id714858093
Watch the trailer, read customer and critic reviews, and download Captain Phillips
directed by Paul Greengrass for \$17.99.

Captain Phillips - DOWNLOAD FULL MOVIE HERE! - YouTube
www.youtube.com/watch?v=NN3kACflaK4
Feb 23, 2014 - YOU SHOULD KNOW... Piracy has serious consequences.
Consequences you may not anticipate. Think before you download! SUBSCRIBE: ...

Watch Captain Phillips online - Watch Movies Online, Full Movies ...
www.movie4k.to/Captain-Phillips-watch-movie-4240683.html
Watch Captain Phillips online for free. Download Captain Phillips movie at
movie4k.to.

Captain Phillips Full Movie Free Download - City Of Free Download...
www.mydownloadcity.com > English Movies > By Genre > Action
Captain Phillips Full Movie Free Download. Hijacking of the U.S. container ship Maersk
Alabama by a crew of Somali pirates. Captain Phillips Movie Free ...

Captain Phillips - YTS
yify-torrents.com/movie/Captain_Phillips_2013_1080p
Jan 11, 2014 - Download Captain Phillips torrent - The true story of Captain Richard
Phillips and the 2009 hijacking by Somali pirates of the US-flagged MV ...

Captain Phillips (2013) Watch Online - DVD Rip ~ funnMATE
funnmate.blogspot.com/2014/01/captain-phillips-2013-watch-online.html
Captain Phillips (2013) Watch Online / Download - DVD Rip, HD, Hollywood movies, in
hindi, Hindi Dubbed Movies, HostingBulk, VideoWeed, NovaMov, ...

Google Search

The screenshot shows a Google search interface with the following elements:

- Browser Tab:** captain phillips download - Google Search
- Address Bar:** https://www.google.com/#q=captain+phillips+download&safe=active
- Search Bar:** captain phillips download
- Navigation:** Web, Videos, News, Images, Shopping, More, Search tools
- Results:**
 - Download Captain Phillips (2013) 720p Blu-Ray x264 [Dual-Audio ...]**
kickass.to/captain-phillips-2013-720p-blu-ray-x264-dual-audio-english-...
Feb 15, 2014 - Download Captain Phillips (2013) 720p Blu-Ray x264 [Dual-Audio] [English DD 5.1 + Hindi DD 5.1] - ESubs - Mafiaking torrent or any other ...
 - iTunes - Movies - Captain Phillips**
https://itunes.apple.com/us/movie/captain-phillips/id714858093
Watch the trailer, read customer and critic reviews, and download Captain Phillips directed by Paul Greengrass for \$17.99.
 - Captain Phillips - DOWNLOAD FULL MOVIE HERE! - YouTube**
www.youtube.com/watch?v=NN3kACflaK4
Feb 23, 2014 - YOU SHOULD KNOW... Piracy has serious consequences. Consequences you may not anticipate. Think before you download! SUBSCRIBE: ...
 - Watch Captain Phillips online - Watch Movies Online, Full Movies ...**
www.movie4k.to/Captain-Phillips-watch-movie-4240683.html
Watch Captain Phillips online for free. Download Captain Phillips movie at movie4k.to.
 - Captain Phillips Full Movie Free Download - City Of Free Download...**
www.mydownloadcity.com > English Movies > By Genre > Action
Captain Phillips Full Movie Free Download. Hijacking of the U.S. container ship Maersk Alabama by a crew of Somali pirates. Captain Phillips Movie Free ...
 - Captain Phillips - YTS**
yify-torrents.com/movie/Captain_Phillips_2013_1080p
Jan 11, 2014 - Download Captain Phillips torrent - The true story of Captain Richard Phillips and the 2009 hijacking by Somali pirates of the US-flagged MV ...
 - Captain Phillips (2013) Watch Online - DVD Rip ~ funnMATE**
funnmate.blogspot.com/2014/01/captain-phillips-2013-watch-online.html
Captain Phillips (2013) Watch Online / Download - DVD Rip, HD, Hollywood movies, in hindi, Hindi Dubbed Movies, HostingBulk, VideoWeed, NovaMov, ...

Google Search

The image shows a browser window with the Google search engine. The search query is "captain phillips download". The results page displays several links to streaming and download services for the movie "Captain Phillips".

captain phillips download - Google Search
https://www.google.com/#q=captain+phillips+download&safe=active

Google captain phillips download Sign in

Web Videos News Images Shopping More Search tools SafeSearch on

About 16,000,000 results (0.24 seconds)

Captain Phillips - Movies & TV on Google Play
https://play.google.com/store/movies/.../Captain_Phillips?id... Google Play
★★★★★ Rating: 4.4 - 854 votes
Captain Phillips is a multi-layered examination of the 2009 hijacking of the U.S. container ship Maersk Alabama by a crew of Somali pirates. It is — through ...

iTunes - Movies - Captain Phillips
<https://itunes.apple.com/us/movie/captain-phillips/id714858093> iTunes
Watch the trailer, read customer and critic reviews, and **download Captain Phillips** directed by Paul Greengrass for \$17.99.

VUDU - Captain Phillips
www.vudu.com/movies/#overview/478735/Captain-Phillips Vudu
Watch **Captain Phillips** instantly on **VUDU**. **Captain Phillips** is a multi-layered examination of the 2009 hijacking of the U.S. container ship Maersk Alabama by a ...

Watch Captain Phillips online - Watch Movies Online, Full Movies ...
www.movie4k.to/Captain-Phillips-watch-movie-4240683.html
Watch **Captain Phillips** online for free. **Download Captain Phillips** movie at movie4k.to.

Captain Phillips Full Movie Free Download - City Of Free Download...
www.mydownloadcity.com English Movies By Genre Action
Captain Phillips Full Movie Free Download. Hijacking of the U.S. container ship Maersk Alabama by a crew of Somali pirates. **Captain Phillips** Movie Free ...

Captain Phillips - YTS
yify-torrents.com/movie/Captain_Phillips_2013_1080p
Jan 11, 2014 - **Download Captain Phillips** torrent - The true story of Captain Richard Phillips and the 2009 hijacking by Somali pirates of the US-flagged MV ...

Captain Phillips (2013) Watch Online - DVD Rip ~ funnMATE
funnmate.blogspot.com/2014/01/captain-phillips-2013-watch-online.html
Captain Phillips (2013) Watch Online / **Download** - DVD Rip, HD, Hollywood movies, in hindi, Hindi Dubbed Movies, HostingBulk, VideoWeed, NovaMov, ...

Randomized Field
Experiment
(3 phases)




Screening Phase



In order to determine if you qualify to participate in this experiment, you are asked to answer the following screening question.

Out of the following list of movies, is there a movie you wish to watch and have not watched yet (and do not currently own, physically or digitally)? If your answer is 'Yes', choose the movie you wish to watch the most. If your answer is 'No' Choose the last option ('None of the above').

* The data in the following table are taken from IMDB.com

Movie	Genres	Storyline	Average Rating	Release Date
<input type="radio"/> 1. The heat 	Action Comedy Crime	Sarah Ashburn, an FBI agent, is extremely ambitious and has her eye on a promotion, but she doesn't get along with her co-workers. She is sent to Boston to uncover the identity of an elusive drug lord, Mr. Larkin, by tracking down his proxy, Rojas, and is told that she'll have a good shot at the promotion if she finds Larkin. When she arrives in Boston, she learns that Larkin has been eliminating his competition and taking over their operations. She learns that Rojas is in Boston PD custody and goes to see him to ask him what he knows about Larkin, but is warned that the cop who arrested Rojas, Shannon Mullins, is very territorial, and she is not exactly sociable. When the two meet they don't get along. When Mullins learns why Ashburn is in Boston, she decides to find Larkin herself. Ashburn is told by her boss to work with Mullins, but it won't be easy because Ashburn does things by the book while Mullins does things her way.	6.6/10	28 June 2013
<input type="radio"/> 2. The internship 	Comedy	Billy (Vince Vaughn) and Nick (Owen Wilson) are salesmen whose careers have been torpedoed by the digital world. Trying to prove they are not obsolete, they defy the odds by talking their way into a coveted internship at Google, along with a battalion of brilliant college students. But, gaining entrance to this utopia is only half the battle. Now they must compete with a group of the nation's most elite, tech-savvy geniuses to prove that necessity really is the mother of re-invention.	6.3/10	7 June 2013
<input type="radio"/> 3. Pacific rim 	Action Adventure Sci-Fi	When monstrous creatures, known as Kaiju, started rising from the sea, a war began that would take millions of lives and consume humanity's resources for years on end. To combat the giant Kaiju, a special type of weapon was devised: massive robots, called Jaegers, which are controlled simultaneously	7.2/10	12 July 2013

Search Engine

Re
Search

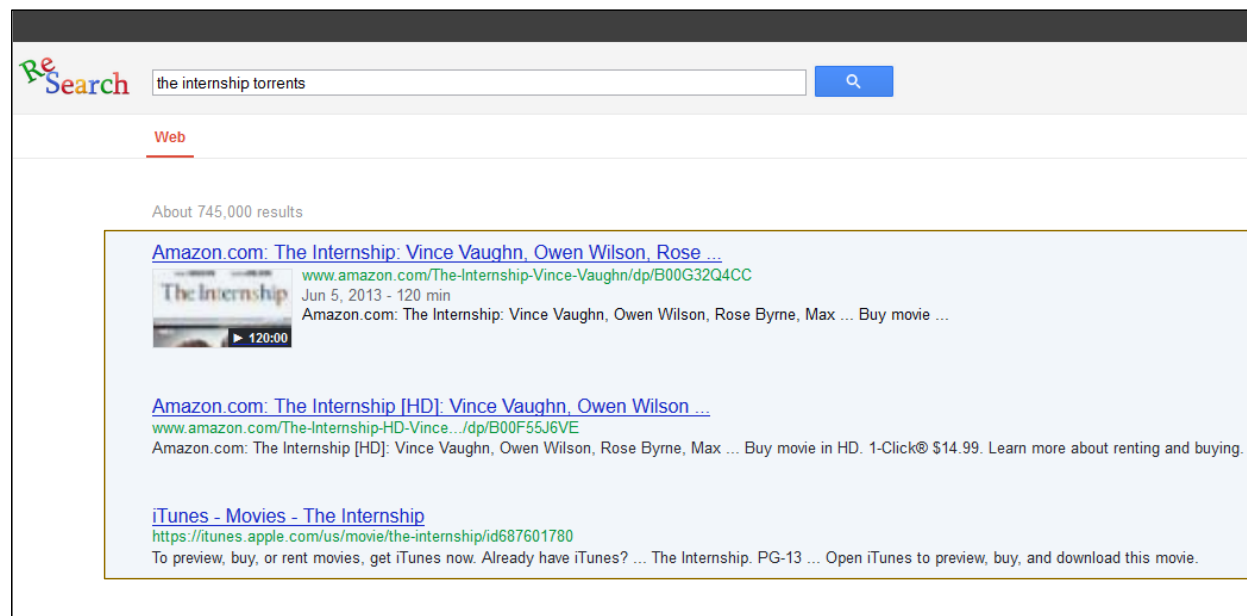
Search

Condition 1: Control

- No manipulation of results from original searches
- 10 pages, 10 results/page

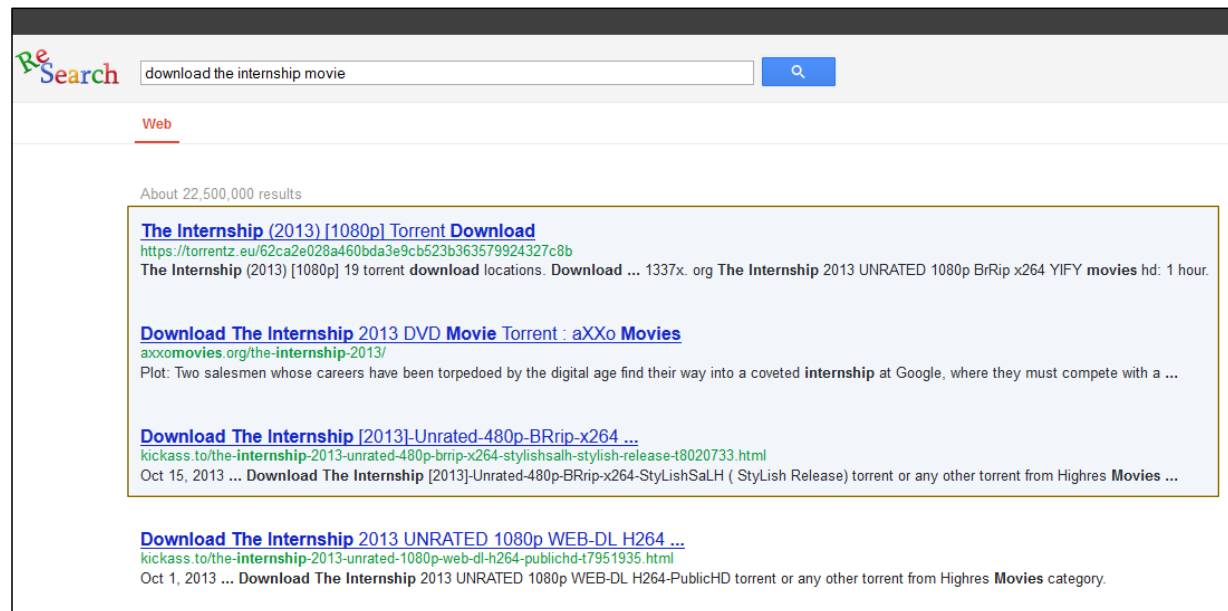
Condition 2: Legal Content Manipulation

- First 3 results on each of the 10 pages replaced (if necessary) with legal options.
- Infringing links in positions 4-10 on first page replaced with legal options (e.g., Amazon, iTunes).



Condition 3: Piracy Content Manipulation

- First 3 results on each of the 10 pages replaced (if necessary) with piracy options.
- Legal links in positions 4-10 on first page replaced with piracy options (e.g., piratebay, torrentz).



Results: Between Conditions

	n	# Legal option	% Legal option
Condition 1: No manipulation	60	48	80.0%
Condition 2: Legal content manipulation	71	67	94.4%
Condition 3: Infringing content manipulation	65	37	56.9%

Stated Preference?



“The RIAA might not like it, but the simple fact is that **when people are searching for [artist] [track] mp3 and [artist] [track] download, chances are they're not looking to buy**, but to download for free. ...

Even if Google magically did show them Apple, Amazon and Emusic as the top results ... the people doing those searches wouldn't go there.” (emphasis added)

Results:

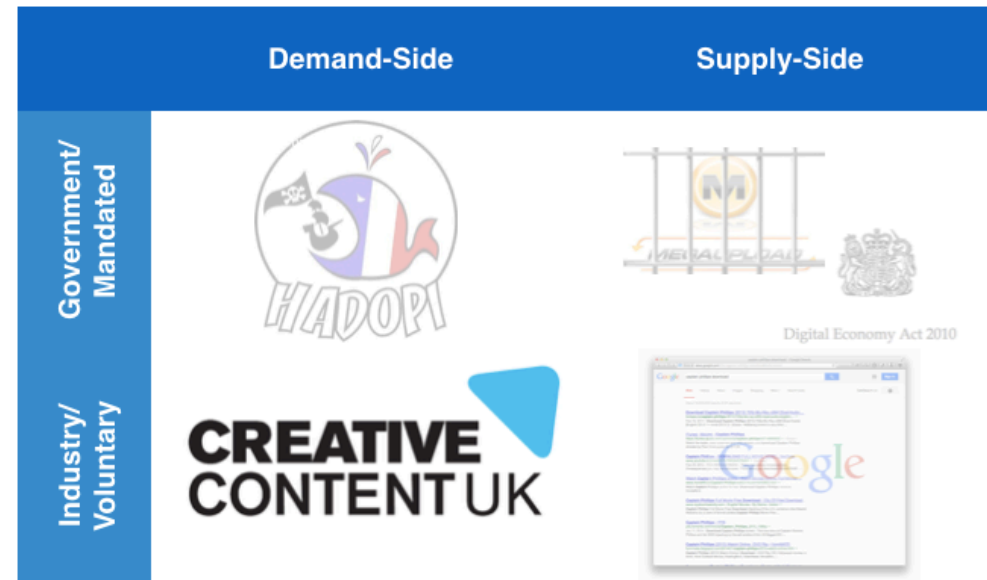
Expressed Intent

First search term	Control group	Legal content manipulation	Infringing content manipulation
Legal intent	31/31 (100%)	22/23 (96%)	24/33 (73%)
Infringing intent	4/12 (33%)	15/17 (88%)	5/11 (45%)

Number (%) of users who purchased legally after using search terms expressing “legal intent” (legal domain, buy, rent) or “infringing intent” (pirate, torrent, free).

Notice Sending

- Question: Are notices effective at changing user behavior?
- Real-world randomized experiment of copyright policy



Background

- Rightsholders and ISPs partner in UK on a 2 prong IP-protection program
 - Public education campaign of dangers/harm from piracy and availability of legal alternatives (started Jan. 2016)
 - Notice sending program to households observed sharing copyrighted material (started Jan. 2017)

Anti-Piracy Impact

Demand-Side

Supply-Side

Government/
Mandated

20-25% increase in French digital music sales (Danaher et al, *Journal of Industrial Economics*, 2014)

Industry/
Voluntary

“Stay Tuned”

7-9% increase in digital movie sales (Danaher and Smith, *IJIO*, 2014)

Increase in legal consumption after large number of blocks (Danaher et al. 2017)

Changes in search rank cause significant changes in consumption of piracy (Sivan et al. 2016)



What Changes?

- Digital markets for physical entertainment products...
- Digital markets for *digital* entertainment products...
 - Pricing, windowing, channel conflict...
 - Piracy
 - Bundling
 - Market power

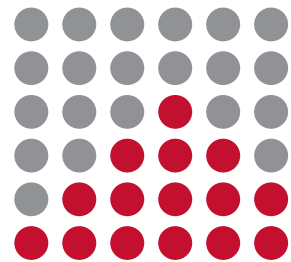
Closing Thoughts...

- Have fun. Find a question you are passionate about!
 - Enormous research opportunities in EoD
(pace of change, great questions, novel data, experimentation, ...)
 - Enormous industry partnership opportunities in EoD
- Rigor and Relevance: Use right methods for right questions
- Don't assume your audience is automatically as passionate as you are.
 - Motivation: Why is this interesting? Why should they care?
 - Results: 80/20 rule:
 - Can you present your core results in a single chart/table? (Goolsbee-technique)
 - Then focus on detailed methodology/results

Thank You

mds@cmu.edu

Carnegie Mellon University



IDEA

**Initiative for Digital
Entertainment Analytics**