Direct-to-Consumer Advertising and Online Search

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Motivation

- The U.S. is one of only two countries that allow direct-to-consumer advertising (DTCA) of prescription drugs
- FDA clarified its policy regarding DTCA in 1997
- DTCA increased from $662 million in 1996 to $4.2 billion in 2010 (~$4.5B today)
- FDA aims for "fair and balanced disclosure"
- Existing research shows that DTCA affects patient visits, Rx choice, and patient compliance
- Use of the internet for health information is growing rapidly, and search engines are the gateway to online information
- A typical consumer has limited information about R_x drugs and that information may have multiple dimensions and come from multiple sources
- Little research on the link between DTCA and online search

Debate

Active debate on the merits of DTCA:

- DTCA informs consumers about the existence of a drug, may prompt consumers to do research on the drug or the conditions it treats, and eventually seek beneficial treatment
- DTCA is biased toward drug benefits versus risks, consumers do not directly choose their medication, and it may lead to over-prescribing

Research Questions

Our paper tries to shed light on both sides of the debate:

- Does DTCA encourage consumers to search for drug information on the internet?
- If it does, what type of information are consumers seeking?
- How do these effects vary by drug type and searcher demographics?

Data

Datasources

ComScore Search Planner click-through data

- September 2008 - September 2011
- 373 prescription drugs, five large search engines
- Monthly data on searches, clicks - organic and paid, overall and by entity
- Searcher demographics: age and household income

Kantar Media DTCA data

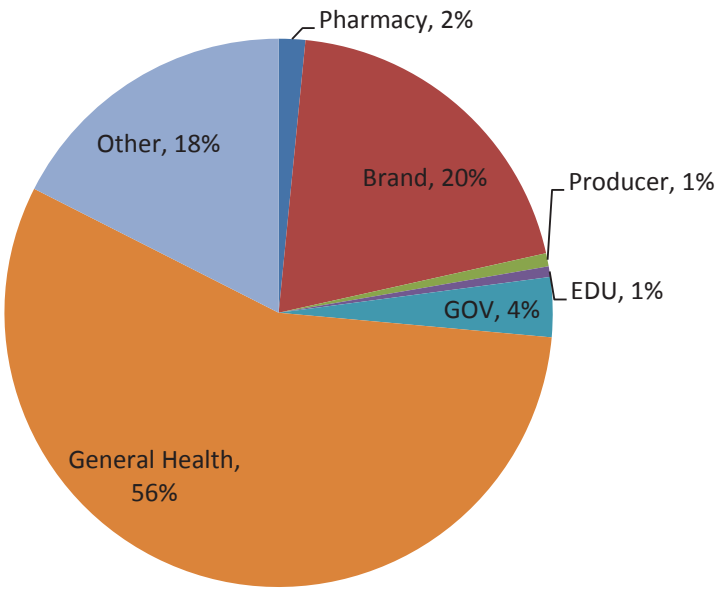
- Ad spending on Rx drugs
- Monthly data overall and by media (television, magazines, internet, etc.)

FDA Orange Book, National Drug Code directory and MEPS data

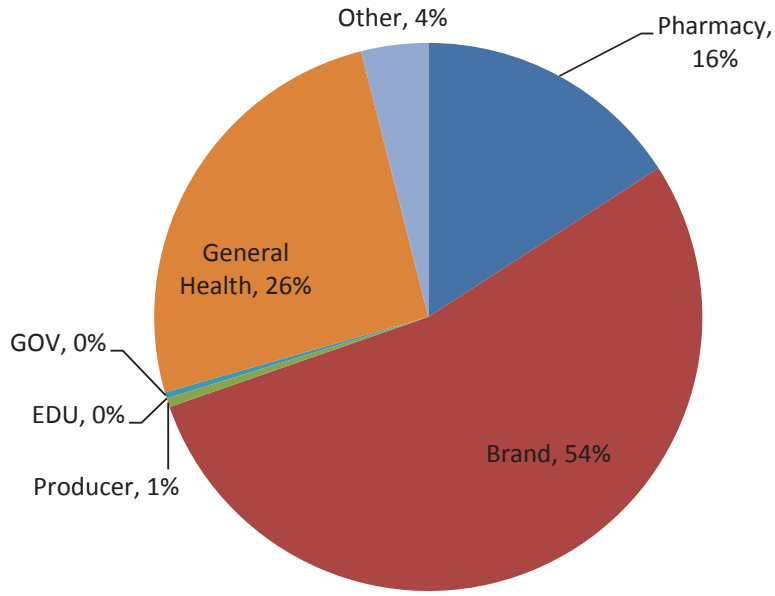
- Drug information: age, class, prescription rate, and insurance coverage

Search

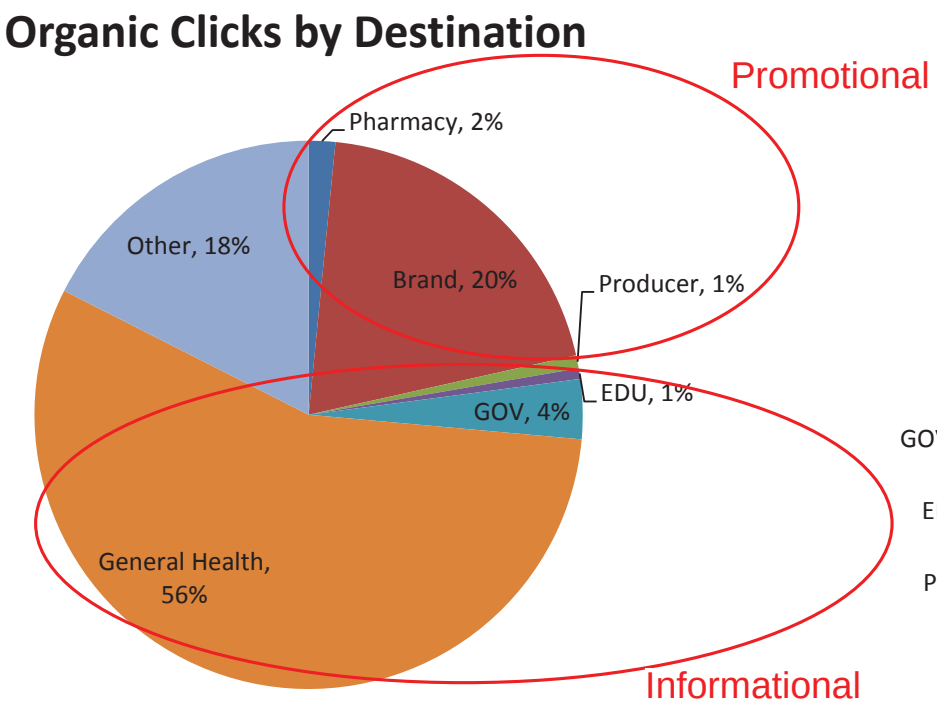
Organic Clicks by Destination

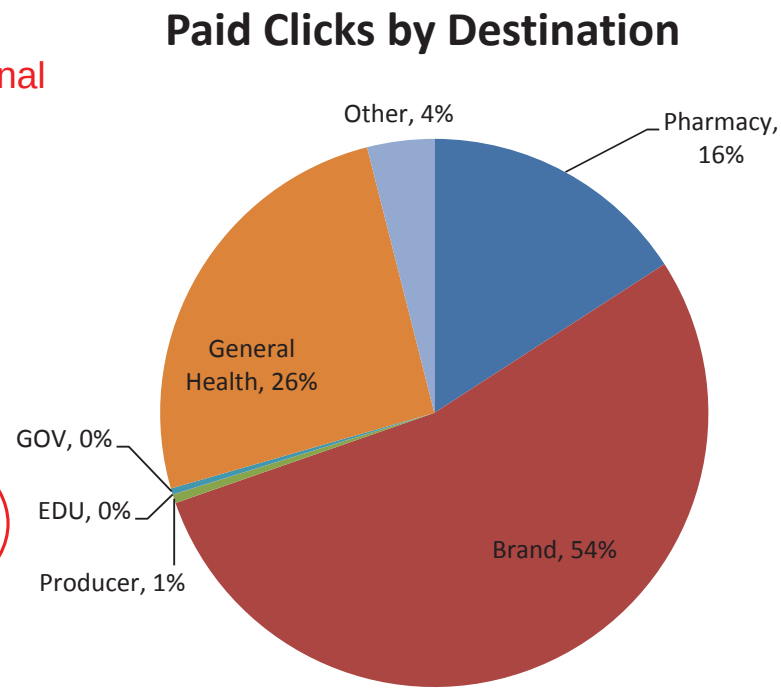


Paid Clicks by Destination

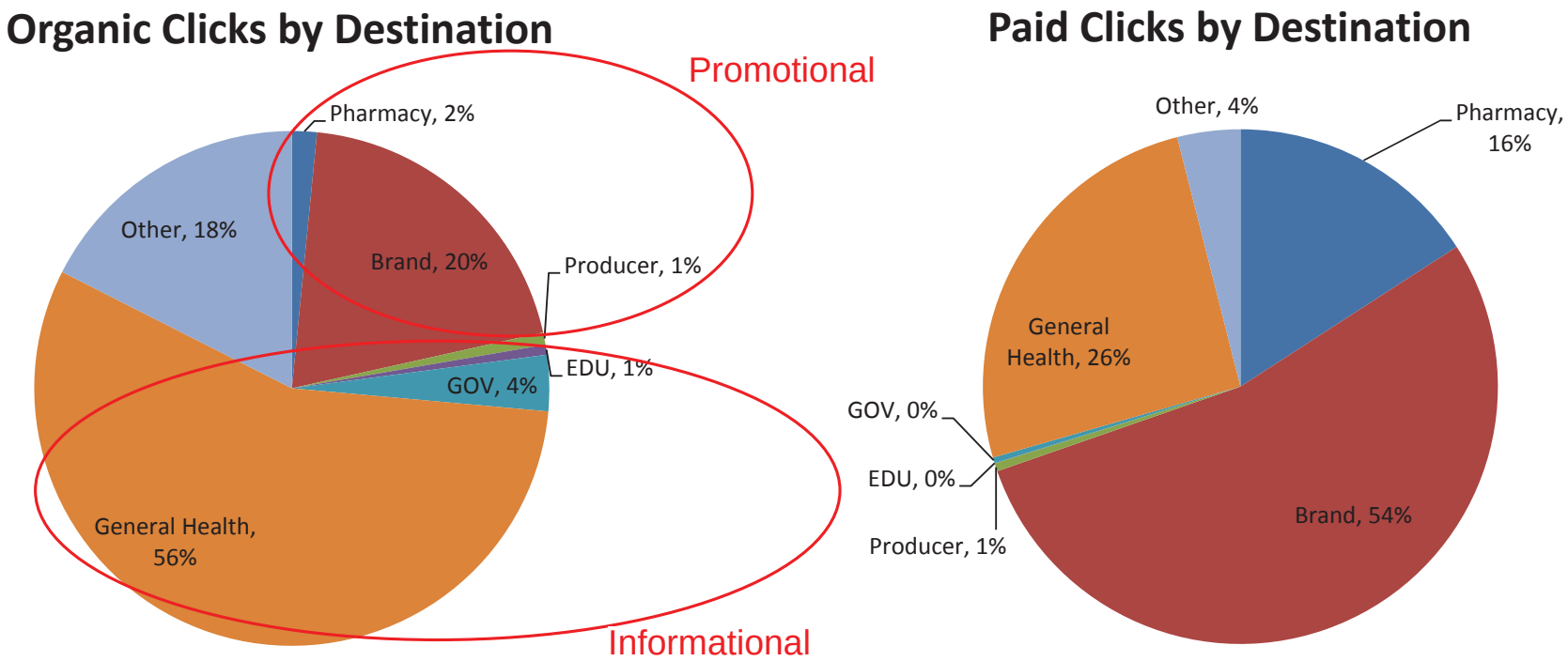


Search


Organic Clicks by Destination
Promotional
Pharmacy, 2%
Other, 18%
Brand, 20%
Producer, 1%
EDU, 1%
GOV, 4%
General Health, 56%
Informational

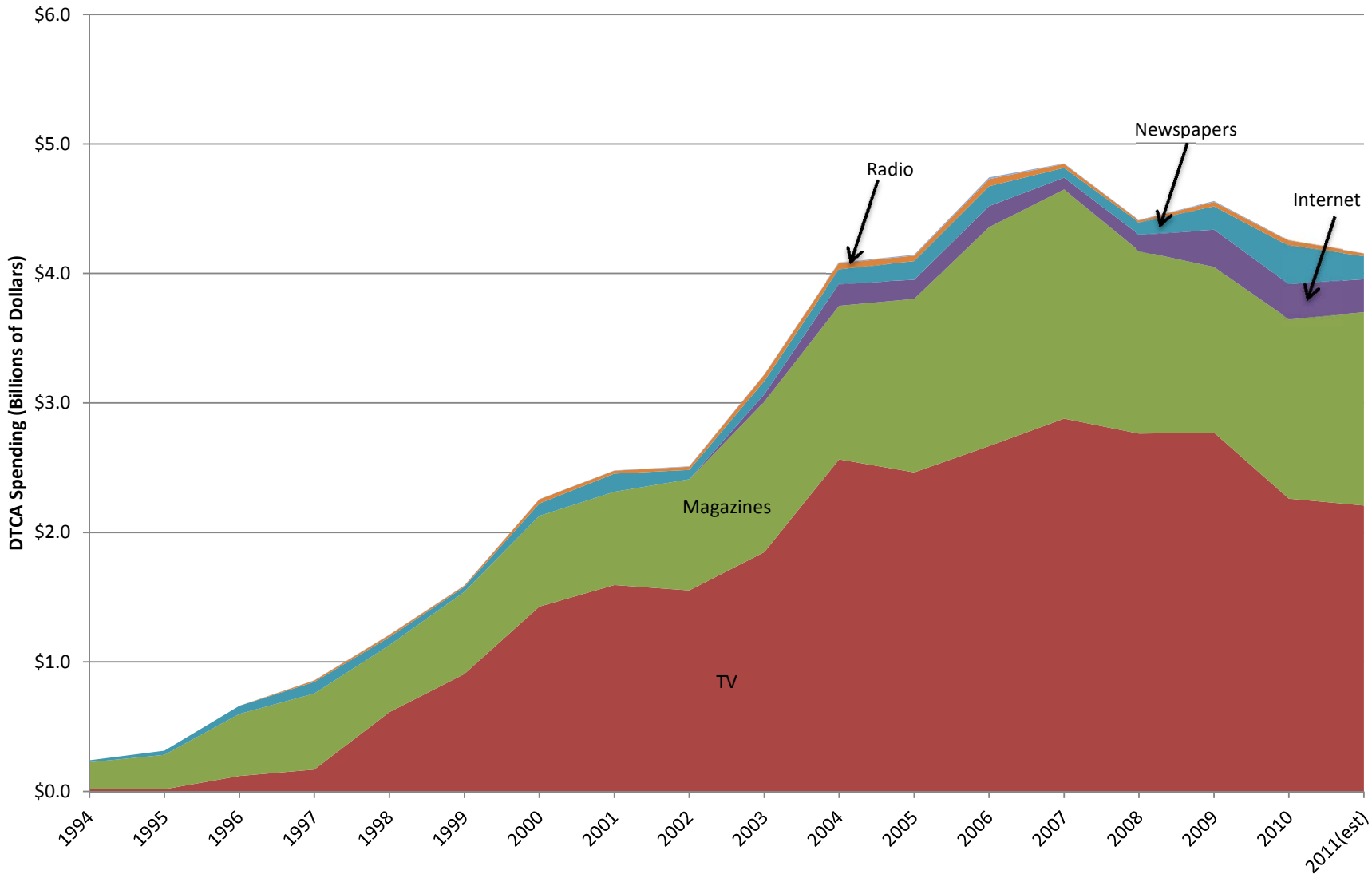

Paid Clicks by Destination
Other, 4%
Pharmacy, 16%
General Health, 26%
GOV, 0%
EDU, 0%
Producer, 1%
Brand, 54%

Search



- 91% of clicks are organic
- 96% of informational clicks are from organic links
- 25% of promotional clicks are from paid links
- Among all clicks: 32% are on informational websites, 16% on promotional websites

Advertising



Drug Attributes

Variable	Min	Mean	Median	Max	Std.Dev.
Drug Attributes					
Age (years)	0.00	7.25	5.80	26.68	6.12
Brand	0.00	0.93	1.00	1.00	0.25
Chronic	0.00	0.35	0.00	1.00	0.48
Insurance Coverage	0.00	0.76	0.81	1.00	0.19
Rx Per Year	1.00	4.02	4.06	12.38	1.96

Notes: The unit of observation is a drug-month based on data from September 2008 - September 2011 for the 373 drugs included in Table 1. Source: FDA Orange Book and MEPS. Statistics for age of drug based on the drug's age in the first month it appears in our sample. Insurance coverage measures the amount of the total payment paid for by third parties. Rx per year is the average number of prescriptions written for a patient in a given year.

Hist

Drug Attributes

Variable	Min	Mean	Median	Max	Std.Dev.
Drug Attributes					
Age (years)	0.00	7.25	5.80	26.68	6.12
Brand	0.00	0.93	1.00	1.00	0.25
Chronic	0.00	0.35	0.00	1.00	0.48
Insurance Coverage	0.00	0.76	0.81	1.00	0.19
Rx Per Year	1.00	4.02	4.06	12.38	1.96

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Statistics by Drug and Searcher Type

	Number of Drugs	Rx Per Year	Insurance Coverage	Drug Age	Searcher Age	Searcher Income	Searches	All Clicks	% Paid	% Promo	% Info	DTCA
Condition												
Acute	195	2.9	74%	7.7	47.8	$78,510	47,121	32,833	9%	16%	33%	$940,023
Chronic	102	6.0	83%	7.5	49.1	$82,802	42,258	31,438	9%	16%	33%	$1,447,154
Unknown	76			5.3	50.6	$91,096	15,707	9,724	8%	15%	30%	$104,767
Insurance												
High Coverage	174	4.4	87%	7.5	48.6	$81,802	34,568	25,075	9%	15%	34%	$1,143,919
Low Coverage	123	3.5	62%	7.9	47.8	$77,659	60,590	42,501	9%	16%	32%	$1,078,366
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Regression Results

Main Specification

Does DTCA encourage search?

$$\begin{aligned} \log(\text{search})_{dm} &= \alpha + \beta \cdot log(DTCA_{d,m-1}) + \delta \cdot log(DTCA_{c,m-1}) \\ &+ \mu_m + \mu_d + \epsilon_{dm} \end{aligned}$$

Drug d, month m, class c.
Dependent variable: searches, clicks, organic clicks, paid clicks.
First set of results is for clicks on all website types. We then look separately at clicks on informational and promotional websites.

Result 1 - Overall

VARIABLES	Log Searches	Log All Clicks	Log Organic Clicks	Log Paid Clicks
Log DTCA	0.027***	0.026***	0.021***	0.085***
	(5.036)	(5.011)	(3.880)	(14.491)
Log DTCA-Class	0.016	0.052**	0.053**	0.044*
	(0.705)	(2.363)	(2.412)	(1.791)
Constant	10.950***	9.759***	9.643***	6.516***
	(19.074)	(17.550)	(17.138)	(10.532)
Observations	12,985	12,985	12,985	12,985
R-squared	0.636	0.650	0.644	0.601
Year/Month FE	Yes	Yes	Yes	Yes
Query FE	Yes	Yes	Yes	Yes

Result 1 - Overall

VARIABLES	Log Searches	Log All Clicks	Log Organic Clicks	Log Paid Clicks
Log Broadcast	0.020**	0.028***	0.025***	0.071***
	(2.366)	(3.390)	(2.979)	(7.786)
Log Print	0.014**	0.010	0.008	0.027***
	(2.160)	(1.501)	(1.187)	(3.894)
Log Internet	0.017***	0.021***	0.015**	0.085***
	(2.580)	(3.367)	(2.393)	(12.239)
Log Broadcast-Class	0.001	0.001	0.006	0.005
	(0.152)	(0.143)	(0.854)	(0.586)
Log Print-Class	-0.005	-0.002	-0.009	0.008
	(-0.446)	(-0.228)	(-0.791)	(0.691)
Log Internet-Class	0.001	0.046**	0.037**	0.044**
	(0.062)	(2.467)	(1.963)	(2.128)
Constant	10.983***	9.617***	9.724***	5.262***
	(20.095)	(18.173)	(18.158)	(8.967)
Observations	12,985	12,985	12,985	12,985
R-squared	0.636	0.651	0.644	0.604
Year/Month FE	Yes	Yes	Yes	Yes
Query FE	Yes	Yes	Yes	Yes

Result 2 - Promotional/Informational

VARIABLES	Log All Promo. Clicks	Log Org. Promo. Clicks	Log Paid Promo. Clicks	Log All Info. Clicks	Log Org. Info. Clicks	Log Paid Info. Clicks
Log DTCA	0.058***	0.045***	0.079***	0.025***	0.022***	0.034***
	(9.457)	(7.609)	(15.528)	(4.352)	(3.846)	(8.212)
Log DTCA-Class	0.050*	0.034	0.034	0.033	0.034	0.036**
	(1.950)	(1.370)	(1.625)	(1.388)	(1.429)	(2.094)
Constant	7.702***	7.617***	5.010***	8.828***	8.820***	0.704
	(11.871)	(12.078)	(9.331)	(14.506)	(14.509)	(1.626)
Observations	12,985	12,985	12,985	12,985	12,985	12,985
R-squared	0.636	0.633	0.545	0.705	0.703	0.477
Year/Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Query FE	Yes	Yes	Yes	Yes	Yes	Yes

Heterogeneous Effects Specification

Does DTCA affect search differently for different types of drugs and different types of searchers?

$$\begin{aligned} \log(\text{search})_{dm} &= \alpha + \beta \cdot log(DTCA_{d,m-1}) + \delta \cdot log(DTCA_{c,m-1}) \\ &+ \gamma \cdot X_d \cdot log(DTCA_{d,m-1}) + \mu_m + \mu_d + \epsilon_{dm} \end{aligned}$$

X_d are drug attributes (age, condition treated, and insurance coverage). In a second set of specifications, we replace X_d with searcher demographics (age and income).

Result 3 - Heterogeneous Drug Effects

VARIABLES	Log All Clicks	Log All Promo. Clicks	Log All Info. Clicks
Log DTCA	0.029***	0.071***	0.030***
	(3.400)	(6.606)	(2.938)
Log DTCA-Class	0.006	0.028	0.017
	(0.259)	(0.910)	(0.590)
Drug Age*Log DTCA	-0.019***	-0.036***	-0.026***
	(-3.557)	(-5.385)	(-4.202)
Chronic*Log DTCA	-0.035***	-0.027*	-0.017
	(-3.192)	(-1.942)	(-1.274)
Low Insur.*Log DTCA	0.022**	0.033**	0.011
	(2.039)	(2.350)	(0.847)
Constant	11.020***	8.311***	9.045***
	(19.117)	(11.246)	(13.104)
Observations	9,989	9,989	9,989
R-squared	0.656	0.649	0.686
Year/Month FE	Yes	Yes	Yes
Query FE	Yes	Yes	Yes

Result 4 - Heterogeneous Searcher Effects

VARIABLES	Log All Clicks	Log All Promo. Clicks	Log All Info. Clicks
Log DTCA	0.017***	0.061***	0.021***
	(3.621)	(8.335)	(3.302)
Log DTCA-Class	0.039*	0.061*	0.046
	(1.648)	(1.690)	(1.447)
Age*Log DTCA	0.001	0.024***	-0.012*
	(0.273)	(3.250)	(-1.790)
Income*Log DTCA	0.002	0.020***	-0.011*
	(0.524)	(2.872)	(-1.740)
Constant	10.271***	7.017***	9.041***
	(19.320)	(8.635)	(12.694)
Observations	9,178	9,178	9,178
R-squared	0.639	0.621	0.675
Year/Month FE	Yes	Yes	Yes
Query FE	Yes	Yes	Yes

Conclusions

DTCA is associated with more frequent online searches and subsequent clicks for both the advertised drug and other drugs in the same class. The effect is larger for:

- paid clicks relative to organic clicks
- broadcast and internet ads relative to print ads
- clicks on promotional websites compared to informational websites

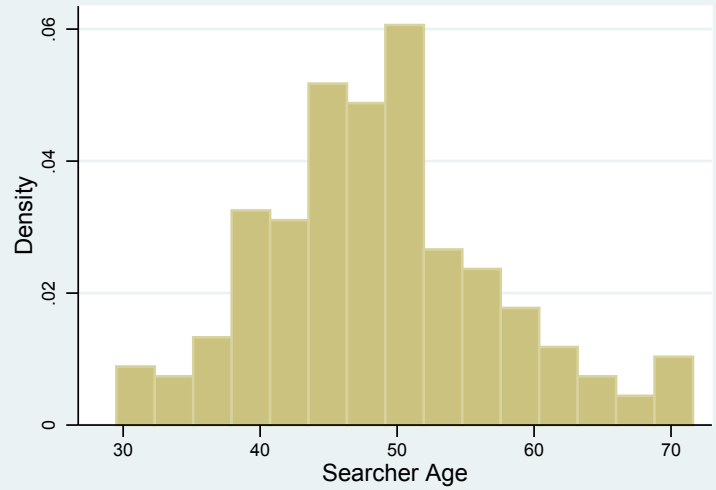
Heterogeneous effects regressions reveal the relationship between DTCA and clicks is stronger for:

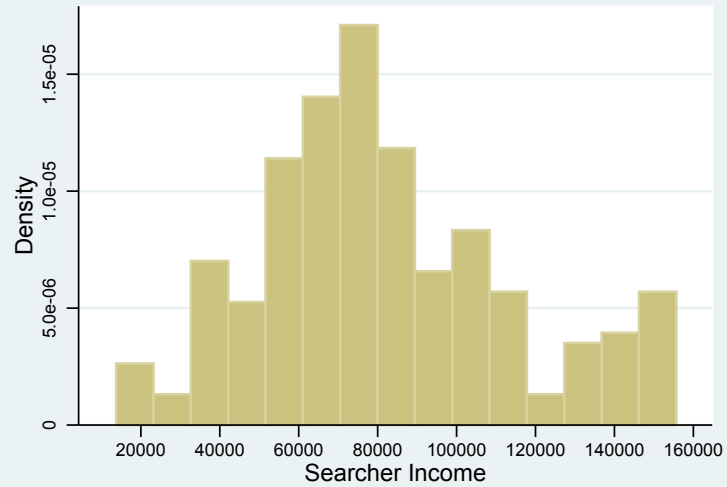
- younger drugs
- drugs treating acute conditions
- drugs with lower insurance coverage
- drugs searched by older populations
- drugs searched by populations with higher incomes

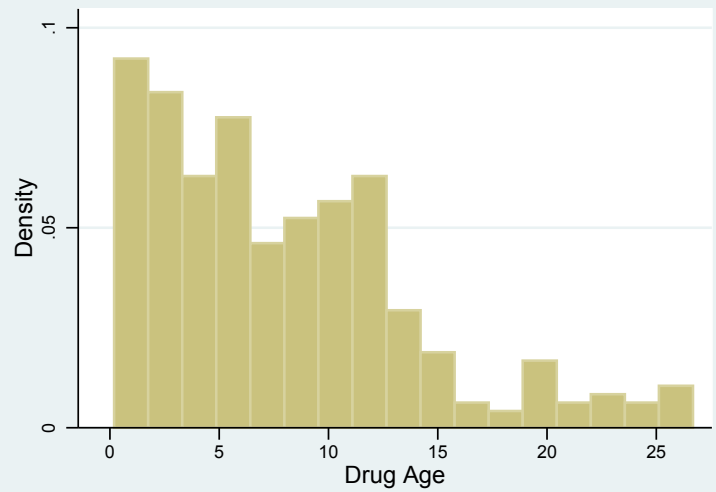
Thank you!

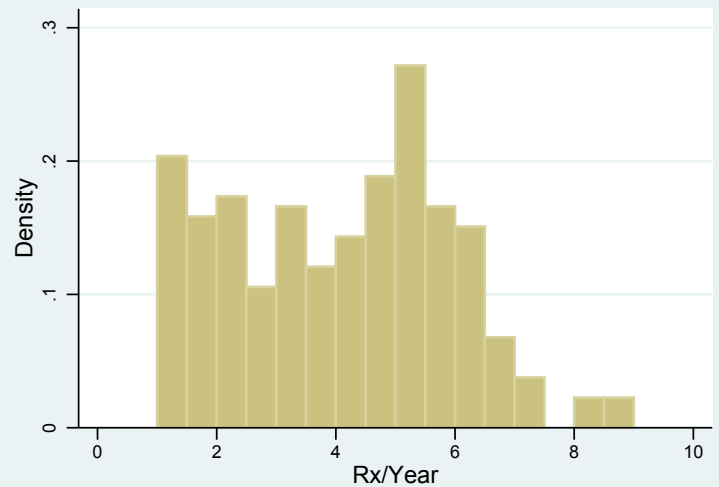
Extra Slides

Searcher and Drug Characteristics









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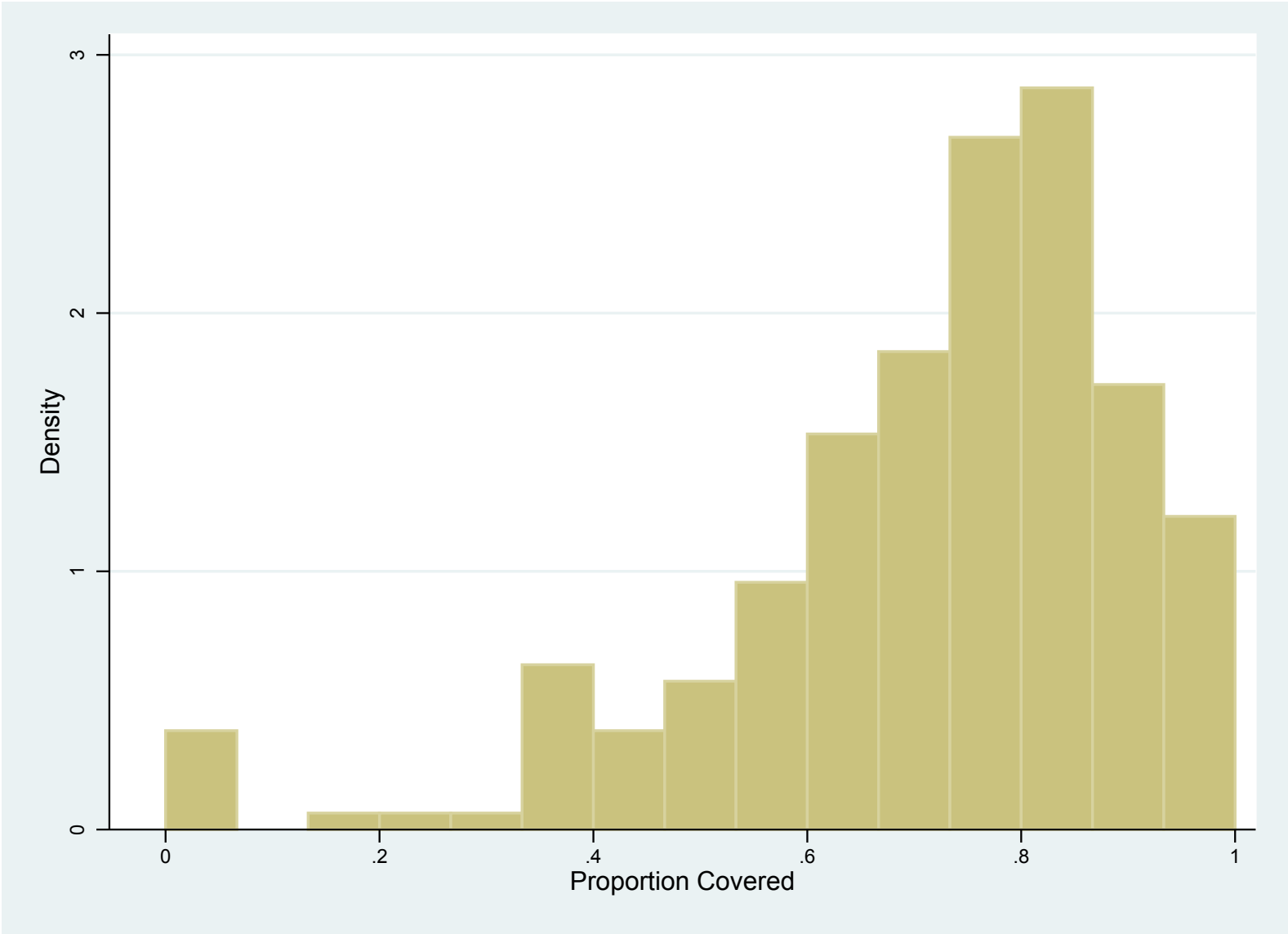
Insurance Coverage



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Specific Entity Analysis

	Promotional			Informational			Other	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Log Pharm. Clicks	Log Brand Clicks	Log Producer Clicks	Log Dot-EDU clicks	Log Dot-GOV Clicks	Log Gen. Health Clicks	Log Giant Clicks	Log Non-Health Clicks
Log DTCA	0.015***	0.058***	-0.003	0.002	0.002	0.023***	0.019***	0.007**
	(3.807)	(10.074)	(-1.203)	(0.882)	(0.430)	(4.045)	(3.707)	(2.536)
Log DTCA-Class	0.005	0.036	0.007	0.003	-0.070***	0.050**	-0.009	0.010
	(0.305)	(1.487)	(0.592)	(0.426)	(-3.689)	(2.082)	(-0.413)	(0.808)
Constant	3.488***	7.961***	0.008	0.176	5.148***	8.490***	9.247***	2.428***
	(8.232)	(12.946)	(0.029)	(0.925)	(10.693)	(13.992)	(17.216)	(7.898)
Observations	12,985	12,985	12,985	12,985	12,985	12,985	12,985	12,985
R-squared	0.460	0.663	0.356	0.554	0.435	0.704	0.684	0.476
Year/Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Query FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Match-all-forms comScore data. Advertising variables lagged one month.

Out-of-pocket Drug Costs

VARIABLES	(1) Log All Clicks	(2) Log Org. Clicks	(3) Log Paid Clicks	(4) Log All Promo. Clicks	(5) Log Org. Promo. Clicks	(6) Log Paid Promo. Clicks	(7) Log All Info. Clicks	(8) Log Org. Info. Clicks	(9) Log Paid Info. Clicks
Log DTCA	0.024***	0.019**	0.126***	0.072***	0.060***	0.105***	0.025**	0.021*	0.046***
	(2.816)	(2.132)	(11.042)	(6.255)	(5.309)	(10.133)	(2.287)	(1.932)	(5.429)
Log DTCA-Class	-0.004	0.003	0.034	0.057*	0.040	0.034	0.020	0.027	0.045*
	(-0.137)	(0.100)	(0.979)	(1.650)	(1.197)	(1.100)	(0.622)	(0.823)	(1.773)
Drug Age*Log DTCA	-0.015***	-0.014**	-0.010	-0.036***	-0.033***	-0.014**	-0.024***	-0.024***	0.011**
	(-2.733)	(-2.540)	(-1.386)	(-5.058)	(-4.710)	(-2.160)	(-3.621)	(-3.588)	(2.056)
Chronic*Log DTCA	-0.037***	-0.035***	-0.074***	-0.024	-0.022	-0.030**	-0.016	-0.013	-0.032***
	(-3.274)	(-3.073)	(-5.006)	(-1.604)	(-1.502)	(-2.210)	(-1.124)	(-0.938)	(-2.895)
Low Insur.*Log DTCA	0.020*	0.020*	0.005	0.027*	0.013	0.013	0.007	0.007	0.016
	(1.815)	(1.855)	(0.350)	(1.889)	(0.928)	(1.027)	(0.541)	(0.550)	(1.518)
Out of Pocket*Log DTCA	0.007	0.007	0.015**	0.002	0.001	0.009	0.005	0.003	0.008
	(1.321)	(1.366)	(2.156)	(0.262)	(0.208)	(1.480)	(0.753)	(0.505)	(1.588)
Constant	11.345***	11.130***	6.989***	7.752***	7.604***	4.980***	9.076***	8.973***	0.759
	(19.013)	(18.425)	(8.897)	(9.782)	(9.820)	(6.987)	(12.290)	(12.139)	(1.312)
Observations	9,099	9,099	9,099	9,099	9,099	9,099	9,099	9,099	9,099
R-squared	0.657	0.652	0.590	0.658	0.654	0.548	0.682	0.680	0.443
Year/Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Query FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Match-all-forms comScore data. Advertising variables lagged one month. Drug age is standardized based on the age of the drug in the first month the drug appears in the data. Chronic and low insurance indicators constant across all months for each drug. Promotional clicks are those on pharmacy, brand and producer websites. Informational clicks are those on dot-edu, dot-gov, and other general health information websites. Out-of-pocket drugs costs are standardized.