How Does the Use of Trademarks by Third-Party Sellers Affect Online Search?: Further Data Analysis

Lesley Chiou[*] and Catherine Tucker[†]

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Abstract

This is a technical appendix that provides supplementary results that support the robustness of the findings reported in 'How Does the Use of Trademarks by Third-Party Sellers Affect Online Search?'

[*]Economics Department, Occidental College, CA
[†]MIT Sloan School of Management, MIT, Cambridge, MA.

1 Additional Summary Statistics

Table 1: Summary for full data

	Mean	Std. Dev.
Search Term Level		
Monthly Average Paid Clicks for Search Term	25472.0	39378.5
Monthly Average Non-Paid Clicks for Search Term	109799.6	197655.6
Observation: Search Engine-Search Term-Website-Month		
Paid Clicks	865.1	5675.8
Non-Paid Clicks	3729.0	24858.5
Google Search Engine	0.50	0.50
Trademark Holder Website	0.10	0.30
Number of Paid Ads associated with Search Term	4.11	4.58
Number of Third-Party Ads associated with Search Term	2.67	3.71

Notes: 11,130 Observations. Summary statistics for all months including April 2009-October 2009.

2   Heterogeneity in Size of the Spillover Effects

The hotels differ in size, meaning that the effect size is likely to differ too. To investigate this, we measured how the size of the effect varied with the trademark strength as proxied by the number of rooms that a hotel chain controls. Table 2 summarizes the results. For readability, we measure number of rooms in the tens of thousands. The results for non-paid clicks in Column (1) suggest that the considerable size of the positive effect for non-paid clicks is driven by the hotels that had the largest number of rooms. As stated before, a large correlation exists between the number of rooms for a hotel chain and the number of clicks it potentially receives. We interpret this as suggesting that the effect is largest for trademarks that are the strongest; these trademarks have the largest audience and therefore are likely to receive the most clicks. This helps explain why the average treatment effect that we measure is so large. Interestingly, as shown in Column (2), when we add an interaction for brand strength as proxied by the number of rooms, we obtain more precise estimates for the effect on paid clicks than in the results presented in the paper. The effect of the policy change on paid clicks was most negative and significant for trademarked brands that had the most rooms and therefore might be most at risk of being diluted.

Table 2: The size of the spillover effects depend upon the size of the trademark's holdings

	(1) Non-Paid Clicks	(2) Paid Clicks	(3) Total Clicks
PostChange × Google × TMHolder × # Rooms	1703.7***	-855.8***	847.9***
	(174.7)	(70.09)	(180.7)
PostChange × Google × TMHolder	2242.3	2349.7***	4592.0***
	(1614.4)	(647.5)	(1669.3)
PostChange × Google × # Rooms	-4.460	1.425	-3.035
	(46.22)	(18.54)	(47.79)
PostChange	38.22	-16.56	21.66
	(401.1)	(160.9)	(414.8)
PostChange × Google	35.93	5.833	41.76
	(542.3)	(217.5)	(560.7)
PostChange × # Rooms	12.37	3.474	15.84
	(32.68)	(13.11)	(33.79)
PostChange × TMHolder	-2250.1**	-937.0**	-3187.1***
	(1141.5)	(457.9)	(1180.3)
PostChange × TMHolder × # Rooms	278.2**	155.3***	433.5***
	(123.6)	(49.56)	(127.8)
May Indicator	6.184	-34.46	-28.28
	(235.6)	(94.50)	(243.6)
Search Engine-Search Term-Website Controls	Yes	Yes	Yes
Observations	6360	6360	6360
R-Squared	0.285	0.169	0.292

Notes: Ordinary Least Squares estimates. An observation is the number of clicks for a website in a month for searches using a specific trademarked term on a specific search engine. April, May, July, August, September, October 2009 data. *# Rooms* measured in tens of thousands. Pre-policy months are April and May 2009. Long-term effect captures the incremental change in *PostChange* in September and October 2009. *Google × TMHolder, Google, TMHolder, #Rooms, Google × TMHolder × #Rooms, TMHolder × #Rooms, Google × #Rooms* are dropped due to their collinearity with the Search Engine-Search Term-Website fixed effects. Standard errors clustered at search-term level.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Log specification: The spillover effects decreased in the long run

	(1) Non-Paid Clicks	(2) Paid Clicks	(3) Total Clicks
PostChange × Google × TMHolder	0.672***	-0.780*	0.501**
	(0.214)	(0.400)	(0.195)
Long-Term × Google × TMHolder	-0.195	-0.165	-0.225
	(0.208)	(0.422)	(0.182)
PostChange	0.653***	0.440**	0.603***
	(0.149)	(0.197)	(0.128)
PostChange × Google	-0.521***	0.503	-0.424***
	(0.178)	(0.328)	(0.159)
PostChange × TMHolder	-0.401**	-0.142	-0.337**
	(0.183)	(0.244)	(0.160)
Long-Term	-0.480***	-0.469**	-0.472***
	(0.131)	(0.205)	(0.113)
Long-Term × Google	0.322*	0.0790	0.305**
	(0.168)	(0.380)	(0.152)
Long-Term × TMHolder	0.155	0.188	0.162
	(0.171)	(0.254)	(0.142)
May Indicator	-0.0598	-0.0483	-0.0574
	(0.0411)	(0.0761)	(0.0398)
Search Engine-Search Term-Website Controls	Yes	Yes	Yes
Observations	11130	11130	11130
R-Squared	0.170	0.162	0.178

Notes: Log-Linear estimates. An observation is the number of clicks for a website in a month for searches using a specific trademarked term on a specific search engine. April, May, July, August, September, October 2009 data. Pre-policy months are April and May 2009. Long-term effect captures the incremental change in *PostChange* in September and October 2009. The Generalized Estimating Equation estimates implying population-averaged effects rather than standard fixed effects. *Google × TMHolder, Google, TMHolder* are dropped due to their collinearity with the Search Engine-Search Term-Website fixed effects. Standard errors clustered at search-term level.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3 Log Results

Table 4: Log specification: The size of the spillover effects depend upon the size of the trademark's holdings

	(1) Non-Paid Clicks	(2) Paid Clicks	(3) Total Clicks
PostChange × Google × TMHolder × # Rooms	0.143**	-0.0411	0.0885
	(0.0687)	(0.228)	(0.0635)
PostChange × Google × TMHolder	-0.698	-0.445	-0.443
	(0.567)	(1.690)	(0.521)
PostChange × Google × # Rooms	-0.105*	-0.0799	-0.0970*
	(0.0543)	(0.209)	(0.0551)
PostChange	0.0111	0.145	0.0413
	(0.314)	(0.726)	(0.293)
PostChange × Google	0.719	0.996	0.693
	(0.466)	(1.508)	(0.461)
PostChange × # Rooms	0.0298	0.00908	0.0252
	(0.0363)	(0.0954)	(0.0348)
PostChange × TMHolder	0.105	-0.852	-0.206
	(0.433)	(0.997)	(0.363)
PostChange × TMHolder × # Rooms	-0.0469	0.0871	-0.00379
	(0.0534)	(0.122)	(0.0447)
Search Engine-Search Term-Website Controls	Yes	Yes	Yes
Observations	6360	6360	6360
R-Squared	0.275	0.263	0.289

Notes: Ordinary Least Squares estimates. An observation is the number of clicks for a website in a month for searches using a specific trademarked term on a specific search engine. April, May, July, August, September, October 2009 data. *# Rooms* measured in tens of thousands. Pre-policy months are April and May 2009. Long-term effect captures the incremental change in *PostChange* in September and October 2009. *Google × TMHolder, Google, TMHolder, #Rooms, Google × TMHolder × #Rooms, TMHolder × #Rooms,* and *Google × #Rooms* are dropped due to their collinearity with the Search Engine-Search Term-Website fixed effects. Standard errors clustered at search-term level.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Log specification: Comparison between trademark name searches and generic searches on Google only after change in policy

	(1) Non-Paid Clicks	(2) Paid Clicks	(3) Total Clicks
PostChange × Holder × Trademark Search	0.456***	-1.642	0.224*
	(0.113)	(1.041)	(0.122)
PostChange	-0.130	0.484	-0.156
	(0.144)	(0.952)	(0.156)
Search Term-Website Controls	Yes	Yes	Yes
Month Controls	Yes	Yes	Yes
Observations	4243	4243	4243
R-Squared	0.0905	0.103	0.0982

Notes: Log-Linear estimates. An observation is the number of clicks for a website in a month for searches using either a trademarked search term or a geographical (top 10 by population US city) hotel search term on Google. April, May, July, August 2009 data. Lower-order interactions for *TrademarkSearch* and *TrademarkHolder* with *PostChange* are not separately identified for non-paid clicks as the geographical searches did not produce trademark holders' websites as primary search results. The Generalized Estimating Equation estimates implying population-averaged effects rather than standard fixed effects. Standard errors clustered at search-term level.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Log specification: Changes in paid search and non-paid search by number of competitors' ads

	(1) Non-Paid Clicks	(2) Paid Clicks	(3) Total Clicks
PostChange × Google × TMHolder × # Comp Borrowing TM	0.105	-0.205	0.0571
	(0.0848)	(0.311)	(0.0773)
PostChange × Google × TMHolder	0.276	-0.213	0.168
	(0.186)	(0.467)	(0.148)
PostChange × Google × # Comp. Borrowing TM	-0.0654	0.0769	-0.0375
	(0.0543)	(0.293)	(0.0620)
# Comp. Borrowing TM	-0.0567	0.123	-0.0400
	(0.0722)	(0.142)	(0.0693)
PostChange × # Comp. Borrowing TM	0.0718	-0.0344	0.0560
	(0.0441)	(0.116)	(0.0446)
Google × # Comp Borrowing TM	0.0824	0.0167	0.0567
	(0.0805)	(0.244)	(0.0797)
TMHolder × # Comp Borrowing TM	0.158*	-0.0568	0.0931
	(0.0866)	(0.157)	(0.0846)
PostChange × TMHolder × # Comp Borrowing TM	-0.0331	0.0330	-0.0330
	(0.0682)	(0.124)	(0.0602)
Google × TMHolder × # Comp Borrowing TM	-0.154	0.0592	-0.0674
	(0.107)	(0.269)	(0.102)
PostChange	0.0923	0.268	0.108
	(0.111)	(0.239)	(0.0989)
PostChange × Google	0.0235	0.0841	0.00992
	(0.129)	(0.437)	(0.119)
PostChange × TMHolder	-0.237	-0.288	-0.182
	(0.157)	(0.256)	(0.120)
May Indicator	0.0258	-0.0494	0.00753
	(0.0585)	(0.0890)	(0.0577)
Search Engine-Search Term-Website Controls	Yes	Yes	Yes
Observations	6360	6360	6360
R-Squared	0.222	0.203	0.223

Notes: Log-Linear estimates. An observation is the number of clicks for a website in a month for searches using a specific trademarked term on a specific search engine. April, May, July, August 2009 data. The Generalized Estimating Equation estimates implying population-averaged effects rather than standard fixed effects. Google × TMHolder, Google, and TMHolder are dropped due to their collinearity with the Search Engine-Search Term-Website fixed effects. Standard errors clustered at search-term level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Log specification: Websites that focused on offering discounted prices received fewer paid clicks after the policy change

	(1)	(2)	(3)
	Non-Paid Clicks	Paid Clicks	Total Clicks
PostChange × Google × TMHolder	0.414***	-1.030*	0.214*
	(0.132)	(0.536)	(0.122)
PostChange × Google × Bargain Site	-0.755	-1.264*	-1.168*
	(1.202)	(0.751)	(0.663)
PostChange × Google	-0.107	0.683	-0.0263
	(0.0900)	(0.498)	(0.0926)
PostChange × TMHolder	-0.269**	0.125	-0.202**
	(0.113)	(0.286)	(0.0981)
PostChange	0.251***	-0.136	0.191***
	(0.0758)	(0.259)	(0.0735)
PostChange × Bargain Site	-0.223	1.053**	0.744*
	(0.804)	(0.496)	(0.412)
May Indicator	0.0229	-0.0628	0.00348
	(0.0563)	(0.0814)	(0.0535)
Search Engine-Search Term-Website Controls	Yes	Yes	Yes
Observations	6360	6360	6360
R-Squared	0.178	0.173	0.188

Notes: Log-Linear estimates. An observation is the number of clicks for a website in a month for searches using a specific trademarked term on a specific search engine. April, May, July, August 2009 data. *Google × TMHolder, Google × Bargain Site, Google, TMHolder, Bargain Site* are dropped due to their collinearity with the Search Engine-Search Term-Website fixed effects. Standard errors clustered at search-term level.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$