

Vertical Integration and Antitrust in Search Markets

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Abstract

Antitrust regulators are concerned that vertical integration may allow a dominant firm in one market to lever market power into another market, and a broad theoretical literature has developed to show that in fact, the effects of vertical integration on other firms in the market are ambiguous. This paper studies how a dominant search engine Google in the upstream market of Internet search enters into different downstream markets. I find that Google's vertical integration either decreases or increases clicks to other sites, depending upon whether firms compete in pricing or quality. The results have direct public policy implications as regulators determine antitrust policy in newly emerging markets.

JEL classification: L40, L86 Keywords: antitrust, tying, online, Internet, consumer search, vertical integration, Google

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1 Introduction

The organization of production attracts the attention of economists and regulators across a broad range of industries. A rich theoretical literature illustrates that the economic consequences of a firm’s boundaries can be ambiguous. On one hand, if a firm provides both the upstream and downstream products, the firm may use dominance in one market to leverage market power into another market (Whinston, 1990; Carlton and Waldman, 2002). Antitrust regulators are concerned that a vertically integrated firm may foreclose rivals by raising their costs. On the other hand, a vertically integrated firm may reduce transaction costs and improve efficiencies, which increase welfare. In fact, a growing theoretical literature even suggests that under certain conditions, vertical integration could increase welfare and the use of rival products (Rochet and Tirole, 2008; Amelio and Jullien, 2012; Choi, 2010).

While the theoretical literature is rich, limited empirical evidence exists on how vertical integration affects economic outcomes (Lafontaine and Slade, 2007; Gil, 2015; Gil and Hartmann, 2009; Forman and Gron, 2009). This paper studies Internet search markets to understand how vertical integration can affect competition across industries. I examine Google across different markets as an empirical test of the effects of vertical integration between an upstream market (search engines) and a downstream market (products and services). When a user submits a keyword query to a search engine Google, Google returns a list of search results with links to products and services from other firms. In recent years, Google has integrated its own products within its search results, which potentially compete with other products from listed firms. For instance, when an individual searches the keywords “airline tickets from Los Angeles to Boston,” Google returns a list of search results that include links to online travel agencies such as Expedia and Orbitz. In 2011, Google incorporated its own online travel agency, Google Flights, into its search results.

Search markets provide an excellent test case for studying the effects of vertical integration

tion. The markets are highly concentrated with the potential for leveraging market power; three main search engines account for over 90 percent of searches. The relative ease of tying new downstream services to the upstream search market generates many potential experiments. I can therefore study the effects of entry by the same upstream firm Google into different downstream markets.

Regulators and policymakers have focused considerable attention on vertical integration of the search market in recent years (Stutz, 2011). Antitrust regulators in both the US as well as other countries have launched investigations into Google’s practices (Kendall et al., 2013). The Federal Trade Commission completed an 18-month investigation over allegations that Google was biasing its search results to favor products and services owned by Google. Supporters of Google argue that such “search engine bias” is a beneficial consequence of search engines optimizing content for their users (Goldman, 2006). Critics are concerned that Google may hurt rivals by “manipulating internet searches” (Reuters, 2013; Edelman, 2014). The European Union reopened a four-year antitrust investigation into Google’s search business. According to FairSearch (2015), “Google has become the focus of antitrust investigations around the world” including South Korea, Argentina, and Brazil.

This paper examines the entry of Google into two downstream markets: online travel and restaurant reviews. In 2011, Google integrated Google Flights within its search results alongside other online travel agents. Google Flights provides a price comparison of plane tickets across airlines. In 2011, Google acquired Zagat (a restaurant review firm) and began embedding Zagat restaurant ratings and reviews within Google’s search results alongside other review sites. Both travel and restaurant reviews encompass large and active segments of consumer search. Online searches for travel have risen dramatically as consumers move away from traditional travel agents towards booking their travel online; the online travel market for North America accounts for revenues of over \$200 billion in 2013 (Krasny, 2012; Trefis, 2015). The National Restaurant Association finds that “over half (53 percent) of 18-

to 34-year olds report that online reviews factor into their dining decisions, as do 47 percent of frequent fullservice customers.”¹ A growing literature also documents how ratings and reviews can influence quantity and price in transactions (Jin and Leslie, 2003; Luca, 2011; Dai et al., 2012; Mayzlin et al., 2014).

I collect data on consumer behavior on three major search engines—Google, Yahoo!, and Bing—in the period before and after Google’s product integrations. To control for trends and seasonality among search engines and keyword searches, I examine how consumer behavior changes for keyword searches on flight fares and restaurant reviews on Google using consumers from Yahoo! and Bing as controls. In particular, I investigate how the number of clicks that sites receive changes before and after Google’s product integrations.

The results show that the effects of vertical integration are mixed. The integration of Google Flights led to a reduction in clicks to competing travel agencies for general flight searches. The acquisition of Zagat led to an increase in clicks, regardless of the specific content of the search term. The contrasting findings may be due to differences in the type of search: while Google Flights provides price information and therefore directly competes with other online travel agents, Google Zagat provides quality information, which may encourage more search on competing review websites.

My results also reflect the stark differences in theoretical predictions of the effects of vertical integration on other firms in the market. With different downstream products introduced by the same firm, I observe contrasting effects on other firms in the market. Second, my results link more broadly to the literature on information and technology markets that examine how information may affect consumers’ decisions (Yang and Ghose, 2010; Chiou and Tucker, 2010a; Lianos and Motchenkova, 2013). Little is known about the effects of a search engine’s tied products on non-paid and paid results on consumer search. This study

¹National Restaurant Association, ”Online Reviews: The New Word of Mouth,” 2013, <http://www.restaurant.org/Downloads/PDFs/onlinereviews1.pdf>

is complementary to concurrent work by Edelman and Lai (2015), which examines the incorporation of Google Flights and focuses on the interesting interplay between non-sponsored and sponsored listings. My study focuses on comparing entry by Google into two different product spaces of quality and pricing, and I examine the several different search engines across these two industries. Recently, Luca et al. (2015) examine experimental evidence on how consumers respond to changes in Google’s displays that favor Google partners. My paper focuses on a different question on how the addition of quality or pricing information for Google’s tied products affects consumer search.

Finally, my result that clicks rise for restaurant keywords is consistent with the growing theoretical literature on antitrust in platform markets (Evans and Schmalensee, 2012). User review sites function as platforms by bringing together two sides of a market—firms such as airlines or restaurants and consumers who seek these services. Choi (2010) predicts that vertical integration may increase the use of rival platforms when consumers multi-home and visit several platforms. My results suggest that consumers interested in quality may multi-home and visit multiple platforms, thereby mitigating the negative effects of vertical integration on other firms in the market.

2 Institutional Setting

2.1 Google Flights and Google’s Acquisition of Zagat

In 2010, Google acquired ITA Software for \$700 million. ITA Software provides data for online travel sites by using algorithms to “combine and parse multiple sets of flight information from airlines, including pricing and availability data, to create an up-to-date database that can be searched...” (Google, 2015). Competitors expressed concerns that the deal would reduce competition (Schoenberg, 2011). After an eight-month investigation, the Justice Department approved the deal, but “imposed conditions limiting how Google could use the company’s technology” (Miller, 2011). In September 2011, Google Flights was launched,

and in December 2011, Google began displaying Google Flights in its search results alongside competing travel agents (Google, 2011).

In September 2011, Google acquired Zagat, a company that reviews and rates restaurants by surveying consumers (Bosker, 2011). The acquisition reflects Google's attempt to provide more content for local searches and Google's "shift to become a content provider." Google combines factual information about a restaurant, such as hours and address, with information on reviews and ratings from Zagat. Upon acquisition of Zagat, Google announced that users would immediately see the integration of Zagat content in Google searches (Ludwig, 2011). Prior to the acquisition, users could only access Zagat content through a subscription fee; in effect, Google's integration of Zagat ratings made the ratings freely and widely available as other review sites such as Yelp.

Yahoo! and Bing also have travel services that predate the integration of Google Flights into Google's search results. Yahoo! Travel dates as far back as 1997. It evolved into a "digital magazine" with general tips on planning travel and sightseeing destinations (Schaal, 2014). Eventually in 2016, Yahoo! Travel was closed as part of a company-wide reorganization. Bing Travel debuted in June 2009 and formed a partnership in May 2011 with an online travel agent Kayak to incorporate Kayak's database and flight comparison tool (Sullivan, 2011).

Prior to Google's acquisition of Zagat, Yahoo! and Bing did not acquire or integrate restaurant ratings into their search results. In June 2012, Bing formed a partnership with ratings website Yelp. Bing's partnership with Yelp likely affects Yahoo! as well, since in 2009, Microsoft and Yahoo! announced a deal in which Bing would power the Yahoo! search engine (BBC, 2009). This partnership was formed nearly 10 months after Google's acquisition of Zagat.

2.2 Keyword Searches Online

When a consumer types in a keyword such as “airline tickets from los angeles to boston” in Google search, Google returns a list of search results that contain links to different websites. As seen in Figure 1, some of the links are from advertised sources (“paid links”) while others are from non-advertised sources (“unpaid links”). The paid links are text ads that appear at the top and on the right of the webpage. Advertisers such as southwest.com bid for the text ads that appear in response to a consumer’s keyword search, and when a user clicks on the paid link, the advertiser must pay the search engine. Google displays non-paid links below the paid links on the search results. The non-paid links are not sponsored by an advertiser.

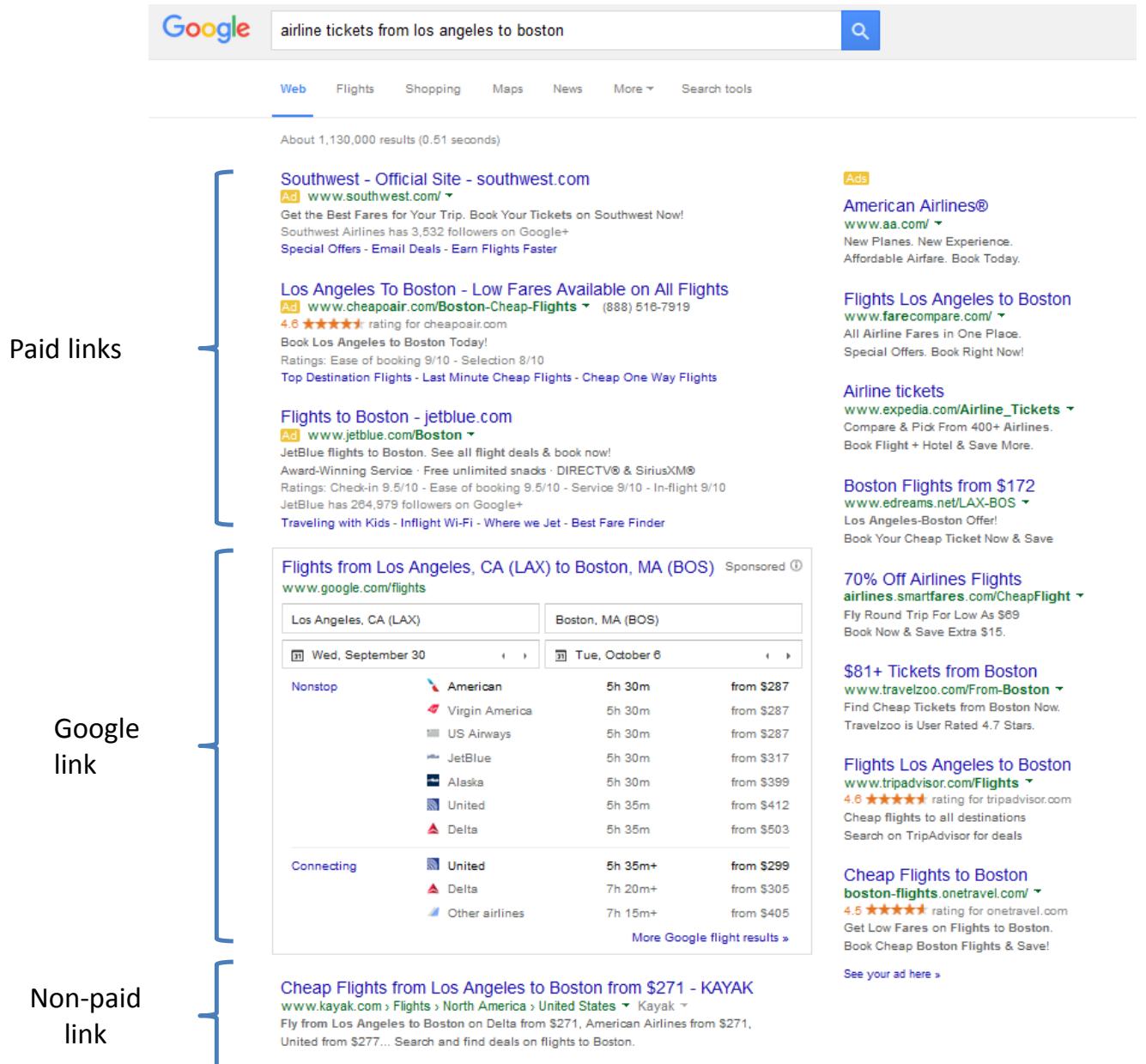
As seen in Figure 1, the integration of Google Flights created a “Google link” that appears below the paid links and above the non-paid links. The link to Google Flights lists pricing information for several airline tickets from Los Angeles to Boston by different airlines. By clicking on link to Google Flights, the user is directed to the Google Flights site with further details and the option of conducting further searches for flights or clicking on booking links to airline sites.

On one hand, Google maintains that flight search results are “not influenced by any paid relationships” (Schaal, 2011). On the other hand, critics state that “Google stands as a gatekeeper for buying decisions” and that there are “conflicting demands of being both search-arbitrator and market competitor” (Nicas, 2011). Google encountered antitrust scrutiny from the Department of Justice over its plans to acquire ITA Software, but ultimately the deal was approved. Moreover, in 2013, FTC completed its investigation of allegations over Google’s preference of its own links among search results and concluded that no sufficient evidence exists to support the allegation.²

Similarly, the acquisition of Zagat by Google led to the incorporation of ratings from

²Federal Trade Commission, “Statement of the Federal Trade Commission Regarding Google’s Search Practices,” In the Matter of Google Inc., FTC File Number 111-0163, 2013.

Figure 1: Screen shot of flight search on Google



Source: Accessed September 16, 2015. The screenshot has been excerpted to fit the page.

the Zagat surveys, also called “Zagat ratings,” into Google’s search results. The Zagat Survey collects and reports ratings of restaurants by diners. After Google acquired Zagat in September 2011, Zagat made its website freely accessible; before then, users had to subscribe in order to receive Zagat content. Figure 2 shows the two ways that Google incorporates Zagat ratings for a search on the keywords “burger near seattle.” First, the Zagat rating for food is listed below each restaurant in the search result. Second, the righthand side of the webpage lists further information on the Zagat rating for a particular restaurant. A separate rating for three categories of food, decor, and service is provided as well as a brief excerpt of the Zagat review. For instance, Google reports that Red Mill Burgers in Seattle has a rating of 24 for food, 11 for decor, and 15 for service.

3 Data Description

My data derives from two main sources: Experian Hitwise and comScore. Both Experian Hitwise and comScore are considered among the top market research firms that aggregate and track consumer behavior online (Delo, 2011). From Experian Hitwise, I identify keyword searches on flight fares and restaurant reviews. From comScore, I collect information on the number of consumer clicks from keyword searches at three major search engines.

Experian Hitwise “develops proprietary software that Internet Service Providers (ISPs) use to analyze website logs created on their network” (Hitwise, 2011). Once the ISP aggregates the anonymous data, it provides the data to Hitwise. According to their website, Hitwise collects the usage data from a “geographically diverse range of ISP networks and opt-in panels, representing all types of Internet usage, including home, work, education and public access.” Currently, Hitwise has usage data from a sample of 25 million people worldwide. Hitwise is a highly-regarded data source for Internet market research (Delo, 2011). It implements a Categorization Model that associates each website with up to three industries

Figure 2: Screen shot of restaurant search on Google

Google

burger near seattle

Search

About 3,110 results (0.60 seconds)

Everything

Images

Maps

Videos

News

Shopping

Places

More

Mountain View, CA

Change location

All results

Friends only

Just for you

Welcome to Red Mill Burgers!
www.redmillburgers.com/
 "The best burgers in Seattle!" ~ Seattle Weekly 10 years in a row. "One of the 20 Hamburgers ...
 Zagat: 24 / 30 - 133 Google reviews

Red Mill Burgers
www.redmillburgers.com/
 Seattle Weekly 10 years in a row. "One of the 20 Hamburgers You Must Eat Before You Die ...
 Zagat: 24 / 30 - 306 Google reviews
 Jonah Jones rated it excellent.

Blue Moon Burgers
bluemoonburgers.com/
 Unlike the other Burger joints. we only use Northwest Grass Fed Beef, all ... "damn straight ...
 Score: 23 / 30 - 21 Google reviews

LUNCHBOX LABORATORY | Open Daily...
lunchboxlaboratory.com/
 Get ready for your life to change. Because of our burgers. NEWS - MENU - EXPERIMENTS ...
 Zagat: 24 / 30 - 172 Google reviews

Uneeda Burger
www.uneedaburger.com/
 Located in Seattle's Fremont neighborhood, Uneeda Burger is a casual, roadside-style burger ...
 Score: 24 / 30 - 54 Google reviews

BuiltBurger
www.builtburger.com/
 BuiltBurger - Seattle's best gourmet burgers restaurant in Pioneer Square. Delicious all natural ...
 Score: 19 / 30 - 18 Google reviews

Burger Madness
www.burgermadness.com/
 Link to Burger Madness Seattle Link to Burger Madness Monroe. Burger Madness - Quality ...
 Score: 22 / 30 - 19 Google reviews

Dick's Drive-In Restaurants
www.dicksdrivein.com/
 Zagat: 19 / 30 - 180 Google reviews

Red Mill Burgers

1613 West Dravus Street
 Seattle (206) 284-6363

312 North 67th Street
 Seattle

523 Broadway Avenue East
 Seattle, WA (206) 325-2000

1253 Thomas Street
 Seattle (206) 621-1090

4306 Fremont Avenue North
 Seattle (206) 547-2600

217 James Street
 Seattle (206) 724-0599

4117 4th Avenue South
 Seattle (206) 623-3178

115 Broadway Ave. East
 Seattle (206) 323-1300

Directions

Offering some of the most "amazing" burgers in town "greasy hands down", fans say this "old-fashioned" duo in Phinney Ridge and Interbay completes the "perfect meal" with "onion rings that taste like onions" pl...

At a glance: onion rings - man vs food - deluxe with cheese - the beef patty - verde

Prices: \$\$\$\$

Hours: Mon Closed
 Tue-Sat 11am-9pm
 Sun 12-8pm

Transit: Phinney Ave N & N 67th St

Menu: zagat.com - redmillburgers.com - viewmenu.com

More reviews

yahoo.com (119)
urbanspoon.com (83)

Source: Original figure and arrows from searchengineland.com, "Google Places is Over, Company Makes Google Plus the Center of Gravity for Local Search," May 30, 2012

and one country (Hitwise, 2011).³ For each category, Hitwise ranks the firms according to their share of overall traffic to the category.

ComScore tracks the online activity of a panel of more than 2 million users based in the US and aggregates their search patterns to the search-term level for resale to commercial clients. ComScore recruits its panel members through affiliate programs and partnering with third party application providers. Its Marketer User Guide emphasizes and discusses

³Hitwise groups "potential and perceived competitors" in a category, and categories are intended to give a "broad picture of the marketplace" (Hitwise, 2009).

the representativeness of their sample to the general population. This source also has been used in several academic studies and noted as a “highly regarded proprietary [source] for information on the size and composition of media audiences” (Gentzkow and Shapiro, 2011; Montgomery et al., 2004; De Los Santos et al., 2012). The database reports the average click behavior of consumers following a keyword search on Google, Yahoo!, and Bing search engines. For each keyword search, comScore reports the monthly number of clicks received by a website either through a “paid” link or a “non-paid” link. “Paid clicks” refer to the clicks received by a paid link, and “non-paid clicks” refer to the clicks received by a non-paid link.

First, I use Experian Hitwise to identify keywords for the categories of websites that potentially compete with Google Flights or Google Zagat. For flight fares, Google Flight’s competitors include other travel agencies such as expedia.com and travelocity.com, so the relevant category is “Travel–Agencies.” For restaurant reviews, Zagat’s biggest competitor will likely be from two sources: restaurant review sites such as restaurants.com and business directories such as yelp.com, so the relevant categories are “Food and Beverage–Restaurants and Catering” and “Business and Finance–Business Directories.” I retrieve the top 10 websites under each of these categories in Hitwise. Then for each of these websites, I identify the top 50 keywords related to flight fares and restaurant reviews that consumers used to navigate to the site. I removed brand names, geographic locations, and duplicate keywords to generate a unique list of keywords. Tables A-1 and A-2 in Appendix list the keywords in the final sample.⁴

Next I collect data from comScore on consumer clicks. For each keyword search, comScore reports the number of clicks on paid links (“paid clicks”) and non-paid links (“non-paid clicks”) as well as the total number of clicks on all links (“total clicks”) in a given month for

⁴For Google Flights, I used keywords directly related to airfare or prices of flights. For Google Zagat’s, I used keywords directly related to dining and menu.

Table 1: Demographics of users are similar Google, Yahoo!, and Bing

Measure	Google	Yahoo!	Bing
Male	51.68	49.56	50.63
Age 18-24	16.57	16.35	14.91
Age 25-34	21.00	22.34	21.28
Age 35-44	21.10	21.23	19.16
Age 45-54	20.13	19.53	20.17
Age 55+	21.19	20.55	24.48
Income <30k	20.10	22.13	21.60
Income 30-60k	28.95	31.66	30.98
Income 60-100k	27.69	25.53	26.60
Income 100-150k	14.44	13.42	12.94
Income >150k	8.84	7.26	7.89

Source: Hitwise

Notes: This table reports the fraction of users within each demographic category. Statistics are reported for users of Google, Yahoo!, and Bing for August 2011.

each of the three search engines. I collect the data on total, paid, and non-paid clicks for all “broad” searches—any search phrases that contain the keywords of interest. The final sample contain websites with total clicks above comScore’s minimum reporting standard in all months.⁵

My analysis relies on using consumer behavior on Bing and Yahoo! as a control for consumer behavior on Google. I verify in Table 1 that the demographics across the three search engines are similar. As seen in the table, the gender breakdown of users across the three search engines is similar with Google having a slightly larger fraction of male users. The age and income distributions of users is also similar across the three search engines. The average age and income of a user on the three search engines is higher than the general US population.

⁵Since a vast set of combinations of search terms and websites exist, comScore imposes some selection criteria for inclusion into its database. ComScore only collects data on specific phrases that arise from queries by at least two different panel members. Under its minimum reporting standards, comScore does not record the number of clicks for websites that receive clicks from fewer than three unique users (Chiou and Tucker, 2010b). My results are robust to an alternative definition where unreported paid and non-paid clicks are assumed to be 0.

I also investigate aggregate searches to the three search engines. Table 2 reports the total number of monthly searches for each of the three search engines. A concern may be that search patterns reflect changes in overall searches to the search engines. As seen in the table, during the months preceding and following the product integrations in September 2011 and December 2011, total searches to the search engines remained relatively stable.

Table 2: Number of searches on Google, Yahoo!, and Bing are relatively stable across multiple months

Month	Google	Yahoo!	Bing
July 2011	11.2	2.8	2.5
August 2011	11.1	2.8	2.5
September 2011	11.2	2.6	2.5
October 2011	11.9	2.7	2.7
November 2011	11.7	2.7	2.7
December 2011	12.0	2.7	2.6
January 2012	11.8	2.7	2.5

Source: ComScore Press Releases. Number of searches are measured in billions.

Tables 3 and 4 report the summary statistics of the datasets on keywords for flight fares and restaurants. As shown in the tables, paid clicks are important for flight keywords and account for approximately half of all clicks while most clicks for restaurant keywords originate from non-paid links. The market for flight keywords is relatively large with an average website receiving 26,000 clicks while the market for restaurant keywords is smaller with the average website receiving 10,000 clicks. Google accounts for 59% and 90% of all observations; Google maintains the largest search volume in the US, so as expected, most clicks originate from Google.

4 Discussion of Theoretical Predictions

In this section, I discuss the relevant tradeoffs for consumers and firms when analyzing vertical integration. I also examine how the theoretical predictions apply to search markets.

Theoretical models illustrate when vertical integration lead to negative or positive spillovers.

Table 3: Summary statistics for Google Flight

	Mean	Std Dev	Min	Max
Total Clicks	25624.1	60013.9	415	897758
Paid Clicks	13946.3	53874.7	2	885220
Non-Paid Clicks	11678.7	28043.8	2	307617
Google	0.59	0.49	0	1
Observations	820			

Notes: Each observation represents a website and keyword combination from a given search engine during a particular month. The data includes searches on three main search engines (Google, Yahoo!, and Live) and spans the period from October 2011 to January 2012—before and after the integration of Google Flights.

Table 4: Summary statistics for Google Zagat restaurant ratings

	Mean	Std Dev	Min	Max
Total Clicks	10568.1	10913.0	405	57335
Paid Clicks	107.2	555.6	2	7292
Non-Paid Clicks	10462.7	10922.9	2	57335
Google	0.90	0.30	0	1
Observations	236			

Notes: Each observation represents a website and keyword combination from a given search engine during a particular month. The data includes searches on three main search engines (Google, Yahoo!, and Live) and spans the period from July 2011 to October 2011—before and after the integration of Zagat ratings to Google.

Rival firms may experience negative spillovers if the dominant firm: lever market power from the upstream market into the downstream market, forecloses rivals, or reduces transactions costs. For the leverage of market power in the online search market, Edelman (2014) argues that Google is a gatekeeper of information as the largest search engine in the US for the upstream search market. By integrating Google Flights or Google Zagats ratings into its search results, Google has tied the upstream market of search to its downstream product market. In other words, given the high fraction of consumers that use Google search, these consumers are also “forced” to “consume” Google Flights information. For foreclosure, critics have argued that exclusive access to special fonts and additional webpage space has been limited to Google’s products. As seen in Figure 1 on page 8, other competitors are restricted to 3-line text ads and unable to use the specialized ads with premium formatting. Finally, rivals may also experience negative spillovers if the newly integrated firm can reduce transactions costs for consumers. In particular, Google’s acquisition of ITA software provides flight information and fares quickly and nearly instantaneously and therefore dramatically reduces the time required for a search (Schaal, 2011).

Recent theoretical work illustrates that vertical integration may have positive spillovers in platform markets (Evans and Schmalensee, 2012). Online sites for fare comparison and restaurant ratings can be characterized as platforms or two-sided markets. Google Flights and other online travel agents bring together two sides—consumers searching for flights and airlines selling those flight tickets. Google Zagats and other online ratings sites bring together two sides—consumers searching for services such as restaurants and providers of the service, restaurants. In such markets with multiple platforms, consumers have a choice to single-home and participate in only one platform or to multi-home and use multiple platforms. Choi (2010) demonstrates how if consumers multi-home and visit multiple platforms, then when an upstream product is tied to a downstream product, multi-homing and the use of the rival’s platform may increase after vertical integration. For instance, in the long-term,

the platform may reposition its content and prices. In the case of restaurant reviews, content between Zagats and other review sites may differ as the set of reviewers vary between sites. The effective pricing of the platforms differ given that Google provides the information instantaneously after integration, and prior to integration, Zagat ratings were only available by subscription.

Multihoming is likely to occur in online environments (Athey et al., 2016). Consumers can easily switch between websites; online travel agents and online review sites often offer their platform services for free or for a nominal fee. Furthermore, multi-homing is also likely to occur for users that are engaged most deeply in search.

Other explanations exist for positive spillovers in the short-term. With the debut of a new service, consumers may “test” out the new platform. For instance, consumers that search more intensively for price by using the keywords “cheap” may increase their use of a new platform in the initial period as they compare fares. These consumers may use this initial period to determine whether the new platform provides additional, better, or cheaper results.

Overall, the prior literature suggests several predictions. First, negative or positive spillovers to rivals may occur when a firm vertically integrates. Second, consumers searching for information on price may behave differently than consumers searching for information on quality and horizontal attributes of a service. Google Flights is a direct competitor of online travel agents, so negative spillovers may exist for other rivals. Google Zagats provides quality and attribute information, which may encourage consumers to multihome and visit multiple platforms. Finally, differences in keywords could be correlated with the propensity for consumers to visit multiple platforms either to test out new services or to multihome and collect more information. For instance, consumers searching under the keyword “cheap” may be more likely to visit multiple platforms.

5 Results and Discussion

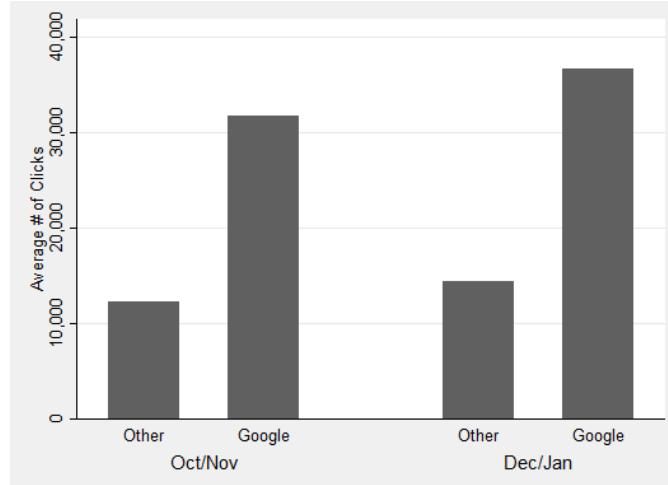
I use these theoretical predictions from the prior section to inform the empirical analysis below. I separately analyze Google Flights and Google Zagats as the effects are likely to differ between search for pricing versus quality. I also include additional controls for keywords such as “cheap” that could measure a consumer’s intensity of search. I also conduct a series of robustness checks to distinguish between the theories of short-term and long-term effects.

5.1 Google Flights

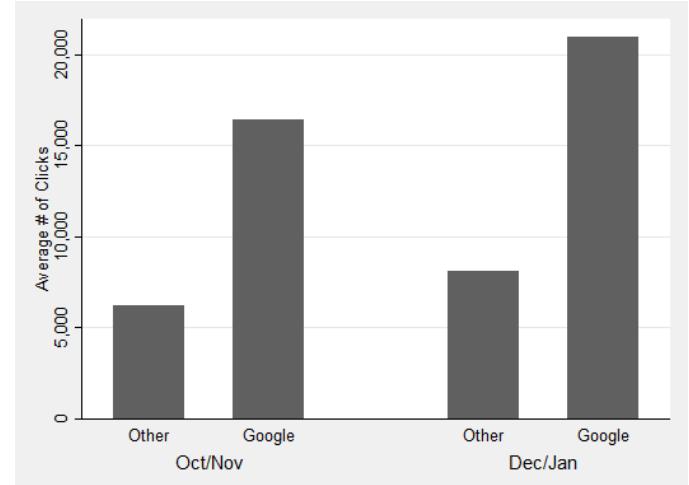
For preliminary analysis, I examine the number of clicks to websites from travel keywords across the major search engines before and after Google’s product integration. Figures 3(a)-3(c) depict the total, paid, and non-paid clicks. The figures indicate that the travel industry faces seasonal trends. As expected, clicks increase as the end of the year approaches, from the two months before (October and November 2011) to the two months after (December 2011 and January 2012), across search engines.

As discussed in the prior section on theoretical predictions, consumer search behavior may also vary by the intensity of search—as measured by the use of keywords such as “cheap.” Consequently, I examine the corresponding graphs for flight searches that contain the keyword “cheap” in Figures 4(a)-4(c). These figures graph the average number of total, paid, and non-paid clicks to a website from Google and other search engines (Yahoo! and Bing) before and after Google’s integration of Google Flights. The figures reveal a discontinuous increase in total clicks for Google relative to the other search engines after the integration of Google Flights. The figures reveal the large increase in clicks from “cheap” keywords and the importance of controlling for seasonality in the regressions below.

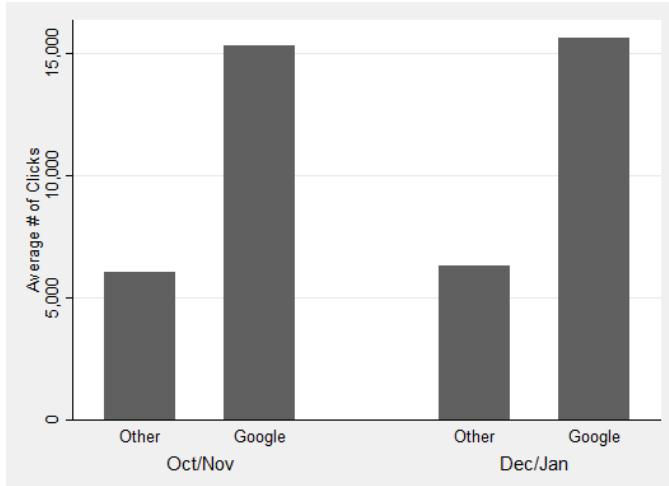
To formally examine the change in click behavior before and after the integration of Google products, I regress the logarithm of the number of clicks to website i in month t from



(a) # Total clicks

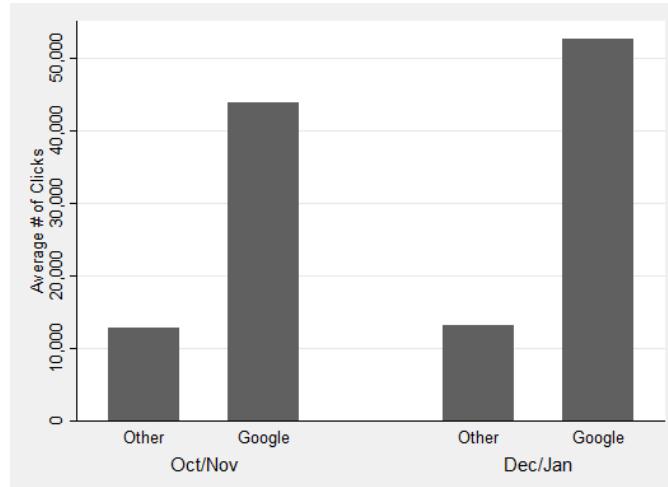


(b) # Paid clicks

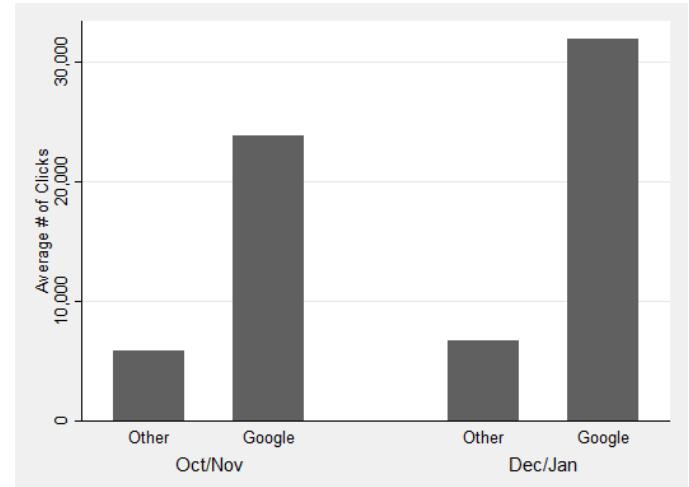


(c) # Non-paid clicks

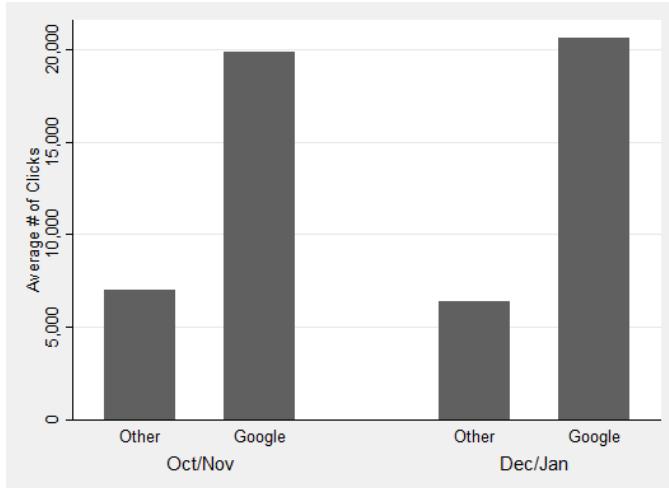
Figure 3: Seasonal changes in clicks for Google and other search engines for searches on flight fare



(a) # Total clicks



(b) # Paid clicks



(c) # Non-paid clicks

Figure 4: Total and paid clicks discontinuously increase on Google relative to other search engines for searches on flight fares, containing the keyword “cheap”

keyword k on search engine j :

$$\log(clicks_{ijkt}) = \beta_0 + \beta_1 Post_t \times Google_j + \gamma_i + \alpha_j + \delta_k + \rho_t + \epsilon_{ijkt} \quad (1)$$

where $Post$ is a dummy variable that equals one in the months after the integration of Google Flight, and $Google$ is a dummy variable that equals one for searches conducted on the Google search engine. The parameters γ , α , δ , and ρ are fixed effects at the levels of the website, search engine, keyword, and month. All standard errors are clustered at the website-level to account for correlations in click behavior at the same website over time. I examine the period two months before and after the product integration.

The coefficient of interest β_1 compares consumer click behavior on Google before and after the integration of Google Flight with consumer clicks behavior on Yahoo! and Bing. The identification of the coefficient arises from comparing clicks to a site from a given keyword search in Google before and after the product integration to the same keyword search in Yahoo! and Bing. By including fixed effects for keywords, I control for seasonal trends in search volume and clicking behavior for certain keywords. I also control for the differences in the levels of clicks across websites and search engines through fixed effects for websites and search engines. Moreover, I control for general trends in search behavior across all three search engines through monthly dummies that capture seasonality in the travel or restaurant industries.

I interpret the coefficient β_1 as the “ratio-of-ratios” (Mullahy, 1999) due to the semi-log specification and the discrete values of the variable $Post \times Google$. I determine the effect of the integration of a Google product on clicks as:

$$\frac{\left\{ \frac{E[clicks|Google=1,Post=1]}{E[clicks|Google=1,Post=0]} \right\}}{\left\{ \frac{E[clicks|Google=0,Post=1]}{E[clicks|Google=0,Post=0]} \right\}} = \exp(\beta_1) \quad (2)$$

The fraction in the numerator of Equation (2) calculates the expected number of clicks to a website from searches on Google before and after the integration of Google Flights to search results. The fraction in the denominator compares the expected number of clicks to the control search engines before and after the integration of the Google product.⁶ Consequently, Equation (2) reflects the ratio of the two ratios and simplifies to $\exp(\beta_1)$. This expression captures how clicks from Google fall relative to clicks from other search engines after the integration of the Google product. If the expression in Equation (2) is less than one, then the “interaction” between site clicks and Google’s product integration is negative. In other words, clicks to sites from Google decrease compared to clicks from other search engines after the product integration. If this expression is equal to one, then no interaction effect exists. If this expression is greater than one, then the interaction is positive; clicks from Google increase compared to other search engines after the product integration.⁷

⁶This calculation avoids the “retransformation bias” for estimating the number of clicks from the semi-log regression, and the expression offers a natural interpretation for the estimated coefficients directly (Mullahy, 1999).

⁷This interpretation is equivalent to a traditional difference-in-differences setup where a positive coefficient on the interaction term ($\exp(\beta_1) > 1$) implies a positive effect on the treatment group; a zero coefficient ($\exp(\beta_1) = 1$) implies no effect. Note that this interpretation assumes that the variances of the error terms for the treatment and control groups are equal; allowing for the variances to differ leads to similar qualitative results.

Table 5: Traffic falls to other sites for general searches on flight fares, but rises for searches containing keyword “cheap” after the integration of Google Flights

	(1)	(2)	(3)
	Total	Paid	Non-paid
Post \times Google	-0.380*	-0.858*	-0.457*
	(0.192)	(0.438)	(0.226)
Post \times Google \times Cheap	0.573***	1.624***	1.591***
	(0.199)	(0.582)	(0.517)
Post \times Cheap	-0.208	-0.639	-0.887**
	(0.199)	(0.399)	(0.417)
Google \times Cheap	0.435*	0.0930	-0.333
	(0.216)	(0.486)	(0.300)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	820	820	820
R-Squared	0.512	0.610	0.637

Notes: Robust standard errors clustered at website level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the logarithm of clicks.

As discussed earlier, search patterns may differ by a consumer’s price sensitivity. Table 5 incorporates additional interactions with the dummy variable *Cheap* that equals one if the keyword phrase contained the word “cheap.” The results reveal that the integration of Google Flights had two opposing effects. For general searches on flight fares, total, paid, and non-paid clicks fell relative to other search engines after the integration of Google Flights to the search results. Using the ratio-of-ratios interpretation, after the integration of Google Flights, total clicks declined by 32% relative to other search engines.⁸ Non-paid clicks declined even further by 58% while paid clicks declined by 37%.⁹

However, for searches that contained the word “cheap,” total, paid, and non-paid clicks increased after the integration of Google Flights to Google’s search results. Total clicks increased by 21%.¹⁰

5.2 Google Restaurant Ratings

I perform a similar analysis for Google’s integration of Zagat ratings. Figures 5(a)-5(c) graph the average number of total, paid, and non-paid clicks to a website from restaurant searches on Google and other search engines (Yahoo! and Bing) before and after Google’s integration of Zagats. The figures reveal a discontinuous increase in total clicks for Google relative to the other search engines.

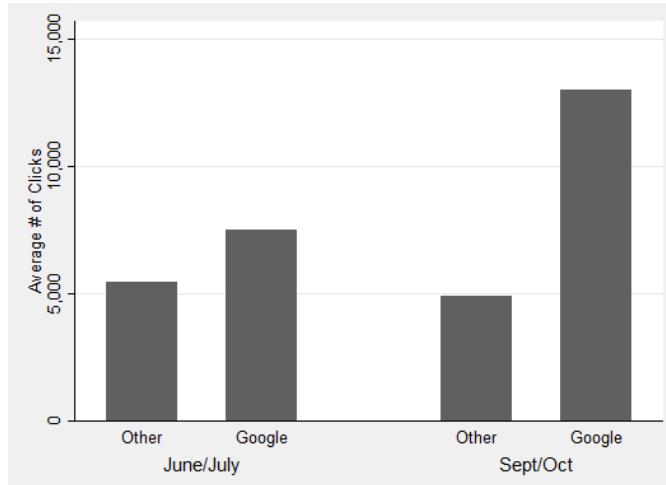
I perform a similar regression analysis using restaurant keywords for the period before and after Google’s acquisition of Zagat in September 2011. To examine the relationship between clicks and the integration of Zagat’s ratings on Google, I estimate Equation (1) using data before and after Google’s integration of Zagat restaurant ratings.

Table 6 reports the results from the regression for Google’s entry into restaurant reviews.

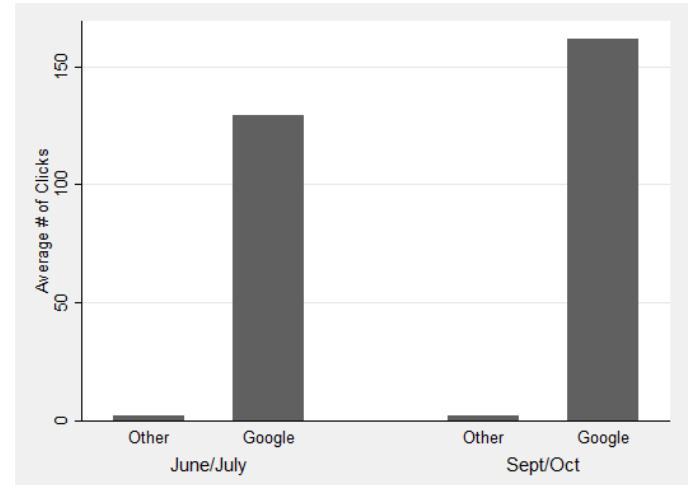
⁸Since $\exp(-0.380) = 0.68$, clicks were 68% of their previous levels, and therefore clicks declined by 32%.

⁹Since $\exp(-0.858) = 0.42$, non-paid clicks were 42% of their previous levels, and therefore non-paid clicks declined by 58%. Since $\exp(-0.457) = 0.63$, paid clicks were 63% of their previous levels, and therefore paid clicks declined by 37%.

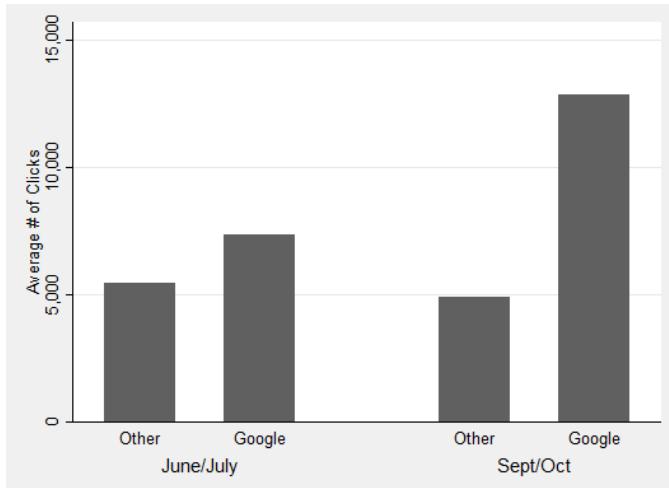
¹⁰The net effect of the integration of Google Flights for keyword phrases containing the word “cheap” is $-0.380 + 0.573 = 0.193$, and $\exp(0.193) = 1.21$.



(a) # Total clicks



(b) # Paid clicks



(c) # Non-paid clicks

Figure 5: Clicks discontinuously increase on Google relative to other search engines after integration of Google Zagat restaurant ratings

Table 6: Traffic to other sites rise after integration of Zagat restaurant ratings to Google's search results

	(1) Total	(2) Paid	(3) Non-paid
Post \times Google	0.661** (0.292)	0.0541 (0.321)	0.652** (0.290)
Post \times Google \times Menu	0.0242 (0.357)	-0.0337 (0.521)	0.245 (0.351)
Post \times Menu	-0.106 (0.233)	7.58e-16 (3.85e-08)	-0.106 (0.233)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	236	236	236
R-Squared	0.410	0.566	0.455

Notes: Robust standard errors clustered at website level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the logarithm of clicks.

After the acquisition of Zagat by Google, total clicks to other sites almost double relative to other search engines.¹¹ The increase in total clicks arises primarily from the increase in non-paid clicks.¹² The change in paid clicks is not precisely estimated.

¹¹Since $\exp(0.661) = 1.94$, clicks are 194% higher compared to the previous level, and therefore clicks increase by 94%.

¹²Since $\exp(0.652) = 1.91$, clicks are almost twice as high compared to the previous level.

5.3 Implications of the Findings

The results suggest that the effects of Google's vertical integration depends upon whether firms compete in pricing or quality information. For general searches on flight fares, Google Flights directly competes with online travel agents, so as expected, clicks to other sites fall after the incorporation of Google Flights into Google's search results. By providing pricing information, Google has provided a substitute to other online travel agents. As discussed in Edelman (2014), critics state that "Google accentuates the effects of tying through premium formatting." Figure 1 reveals how additional space beyond the 3-line text limit for paid links is devoted to Google Flights. The results suggest that users with general fare searches clicked on the Google link instead of the non-paid links below or the other paid links above.

The results also indicate that clicks to other sites increased after Google's integration of Zagat ratings. The incorporation of Zagat ratings within Google's results provide information on product quality for the various restaurants listed within the search results. Google provides the overall Zagat rating as well as snippets from reviews by Zagat as seen on the righthand-side of Figure 2.

As discussed earlier, the increase in traffic to other platforms is consistent with two explanations. First, Choi (2010) develops a model that demonstrates how usage of rival platforms can increase after vertical integration. Under this model, consumers multi-home and visit several platforms, so the integration of one platform leads to a rise in visits for all platforms in the market. This model "highlights the importance of explicitly considering the role of multi-homing in the antitrust analysis of network industries." For instance, if consumers who search for quality multi-home, then the model explains why visits to other sites would increase for searches on product quality. In fact, recent empirical work in online markets also suggests positive spillovers between online content (Athey and Mobius, 2012; Chiou and Tucker, 2012). In online media, the integration of content has been shown to lead

consumers to seek further out information.

Second, in the short-term, positive spillovers may exist if consumers test out new platforms and compare their services to existing platforms. For instance, consumers that search more intensively for price by using the keywords “cheap” may increase their use of a new platform in the initial period as they compare fares across platforms to determine whether the new platform provides additional, better, or cheaper results. In the subsequent section of robustness checks, I will test for differences between short-term and long-term effects for the product integrations.

To assess the implications of the results, I discuss whether firms and consumers may be better or worse off after the integration of products and which consumers are most likely to be affected. I complement my study of consumer search and clicks with suggestive evidence from industry anecdotes and prior empirical studies to discuss changes in welfare.

First, industry facts suggest that webpages may depend a lot upon referrals from Google. Clicks from Google are likely to be important for rival firms given Google’s role as a gatekeeper— Google accounts for 70% of all searches in the US. Anecdotal evidence suggests that webpages consider Google an important gateway for their service. In the past, industry players have expressed frustration with potential bottlenecks; Rob Krolik, CFO of Yelp, has stated that “consumers are fighting through [Google’s] content to get to ours.”

Second, consumers may be better off with the use of Google services in lieu of or in conjunction with other sites. For instance, Google Flights may improve consumer welfare by providing an innovative advance over existing online travel agencies with price alerts and the speed by which results are displayed (Strutner, 2015; Kugel, 2014). Like other major online travel agencies such as Expedia and Travelocity, Google Travel also does not include fares for low-cost airlines such as Southwest. Any gain in consumer welfare will therefore occur for consumers who use major airline carriers such as Delta, American, and United; this covers a large segment of consumers as these three airlines currently account for almost

half of the domestic airline market share (Statista, 2015). Anecdotal evidence from the industry suggests that “different flight search engines tend to retrieve the exact same prices and options” (Tuttle, 2014). Any reduction in prices from using Google Flights will likely come from using Google Flights’ new trip planning tools to identify routes and dates with potentially lower prices.

For Google Zagats, prior empirical evidence shows that quality disclosure improves health outcomes and affects restaurant revenues (Jin and Leslie, 2003). In particular, previous work has examined Zagat ratings for restaurants and finds that restaurants included in the Zagat restaurant guide tend to be the more expensive restaurants. While Zagat does not explicitly rate hygiene, the component scores of food, decor, and service quality are correlated with hygiene quality (Jin and Leslie, 2009). As one of the oldest brands in restaurant reviews since the 1970s, Zagat has an established reputation, and this is suggestive that welfare may improve for consumers that patronize more upscale dining. National Restaurant Association surveys indicate that fine-dining restaurants are “most likely” to engage in resources devoted to marketing towards travelers and tourists.¹³ Consequently, independent information from review platforms may be even more important given the extensive advertising for this segment of the restaurant industry.

This indirect evidence suggests that the two product integrations could plausibly benefit consumers.

6 Robustness Checks

In the prior section, I establish that clicks to other sites decline for general searches on flight fares and increase for keywords containing the word “cheap” after the integration of Google Flights to Google’s search results. I also find that clicks to other sites rise for searches related to restaurants after the incorporation of Google’s Zagat ratings on restaurant quality. In

¹³National Restaurant Association, “2014 Restaurant Industry Forecast,” 2014, <https://www.restaurant.org/Downloads/PDFs/News-Research/research/RestaurantIndustryForecast2014.pdf>.

this section, I explore further robustness checks for these results.

6.1 Types of Rivals

To examine how different types of rivals are affected by the integration of Google Flights into search results, I stratify my analysis by the type of website. For each website in the sample, I identified whether the site was an online travel agent (books airline tickets) or a travel guide (provides information on a particular destination). Since Google Flights provides a direct substitute for information provided by online travel agents, I would expect to observe a decrease in clicks for online travel agents for general searches on flight fares. Travel guides often provide more descriptive information about destinations for users planning the details of their trip instead of fare information and therefore may not compete directly with Google Flights.

Table 7 reports the results for online travel agents and travel guides. As expected, online travel agents experience a decrease in clicks for general searches and an increase in clicks for searches containing the word “cheap” after the integration of Google Flights. Travel guides are generally unaffected in total clicks.

Table 7: Traffic falls to online travel agents and travel guides after the integration of Google Flights for general searches on flight fares

	Online travel agents			Travel guides		
	(1) Total	(2) Paid	(3) Non-paid	(4) Total	(5) Paid	(6) Non-paid
Post × Google	-0.478** (0.204)	-0.929 (0.551)	-0.557** (0.241)	0.246 (1.028)	1.010 (0.553)	-1.218*** (0.270)
Post × Google × Cheap	0.627*** (0.203)	1.629** (0.657)	1.513*** (0.508)	-0.608 (0.881)	1.231 (3.539)	2.751 (3.841)
Post × Cheap	-0.347 (0.203)	-0.632* (0.350)	-0.878** (0.336)	0.988 (0.784)	-1.069 (3.540)	-1.622 (3.672)
Google × Cheap	0.529** (0.238)	-0.203 (0.540)	-0.272 (0.307)	1.251* (0.568)	2.066** (0.545)	-0.241 (0.872)
Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	588	588	588	100	100	100
R-Squared	0.482	0.556	0.525	0.621	0.862	0.732

Notes: Robust standard errors clustered at website level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the logarithm of clicks.

Table 8: Traffic rise for review sites after the integration of Zagat restaurant ratings to Google's search results

	(1)	(2)	(3)
	Total	Paid	Non-paid
Post \times Google	0.951** (0.334)	0.588 (0.500)	0.934** (0.330)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	92	92	92
R-Squared	0.387	0.657	0.402

Notes: Robust standard errors clustered at website level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the logarithm of clicks.

To examine how the integration of Google's Zagat ratings affected different websites, I run the analysis separately for review sites. The idea is to examine the effect on sites that compete directly with Zagat's ratings. If consumers multihome and visit multiple review sites, then we would expect the integration of Zagat's ratings on Google to lead to an increase in navigation to other review platforms.

Table 8 reports the results of the regressions. As expected, the integration of Google Zagat's ratings to the search results led to an increase in total and non-paid clicks to other review sites.

6.2 Advertising over Time

Since websites decide whether to submit a bid for a keyword advertisement, the decline in paid clicks observed for Google Flights could reflect websites' advertising decisions. For instance, advertisers may not advertise or may switch part of their advertising budget from Google to Yahoo! or Bing during the time of the policy change.

To investigate this further, I collect data on the number of ads that appeared for each keyword in my sample. I measured the number of ads by the number of websites that receive paid clicks above the minimum reporting threshold. Figure 6 reports the number of ads on Google relative to Yahoo! and Bing on the months before and after the integration of Google Flights.

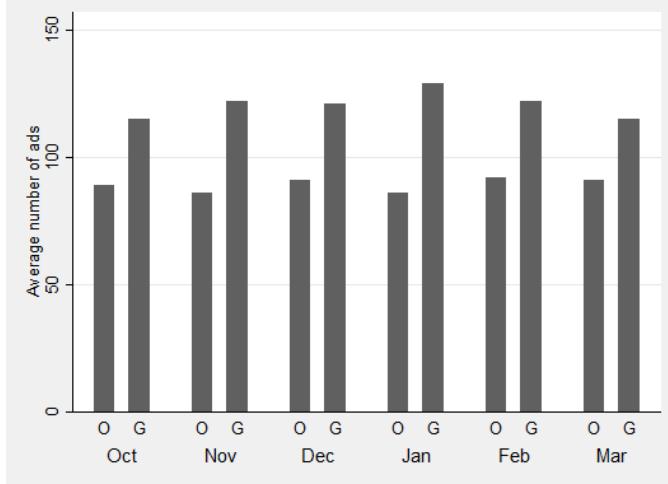
As seen in the figure, the number of ads is relatively stable across the three search engines in October and November 2011 prior to the integration of Google Flights; I do not find evidence of a strong pre-trend. Immediately after the integration of Google Flights in December 2011 and January 2012, the number of ads did not dramatically decline. In the short-term, the sharp reduction in paid clicks does not appear to be driven by a sharp decline in ads. This suggests that advertisers may not have anticipated the integration of Google Flights and did not immediately switch their advertising to other search engines. Note that Table 5 reports the estimates of the decline in paid clicks during this period before the policy change and immediately after, October 2011 to January 2012.

Second, I collect additional data to extend my analysis and examine long-term effects in advertising. In the long-term, advertisers may respond this decline in paid clicks. I compute the number of ads for February and March 2012 in Figure 6. In the long-term, the number of ads did decline for Google. As expected, in equilibrium some advertisers may switch advertising to other search engines, as it becomes apparent that clicks to paid links decline.

Overall, the figure suggests that the short-term decline in paid clicks for Google Flights

is not driven by a decline in the number of ads. In the long-term, advertisers may adjust their advertising.

Figure 6: The number of ads on Google and other search engines



Note: The labels “G” refers to Google, and the label “O” refers to the other search engines, Yahoo! and Bing.

6.3 Short- vs. Long-term Effects

The effects of the policy change may differ in the short-term versus the long-term. In the short-term, consumers may engage in exploratory search for new platforms. In the long-term firms may respond by changes in advertising as discussed earlier.

To test these hypotheses, I collect additional data for the months following my sample and perform an analysis where I allow for a long-term effect of the policy change. For Google Flights, I run a similar regression as Equation 1 and include data from February and March 2012. The variable *Post* continues to equal one for months after the product integration, and the variable *Longterm* equals one for February and March 2012 and captures the additional change in clicks in the long-term. For restaurant keywords, I include data from November and December 2011 to capture long-term effects. Tables 9 and 10 reports the results of the regression.

As seen in Table 9, for general searches on flights, I observe lower total clicks in the short-term with no incremental shift in the long-term. The effects for paid clicks are not precisely measured. However, for searches with keyword “cheap,” in the short-term users click more on other sites, but in the long-term this positive spillover dissipates. I do not observe a persistent long-term effect for “cheap” keywords. This is consistent with consumers testing a new service; price-sensitive consumers may be more interested in exploring a new service and comparing fares from a new platform with existing platforms.

As seen in Table 10, for restaurants searches, I observe that the increase in clicks in the short-run does not dissipate in the long-term. No additional effect exists in the long-term. Given that advertising is not as important for restaurant keywords, the patterns are not likely to be driven by changes in advertising decisions. The patterns are also not likely to be driven by exploration of a new services, as the increase in clicks to other sites is persistent over time.

6.4 Rankings and Non-paid Clicks

The integration of Google’s product into search results may affect websites differently, depending upon their position or ranking on the search results page. Prior research has shown that consumer click behavior can vary depending upon a link’s position on the search results page (Baye et al., 2016; Glick et al., 2014; Ghose et al., 2014). In particular, the integration of the Google link pushed the non-paid links further down the search results page as seen in Figure 1.

For flight searches, I use variation in the presence of ads as a proxy for the ranking of non-paid links. Note that approximately half of clicks occur on paid links, and significant advertising exists for flight keywords.¹⁴ Since more ads will push the non-paid links further down the search results, the position of the non-paid links is directly correlated with the number of ads.

¹⁴In contrast, restaurant searches have limited advertising and few paid links.

Table 9: Long-term effect after integration of Google Flights

	(1)	(2)	(3)
	Total	Paid	Non-paid
Post \times Google	-0.429** (0.170)	-0.524 (0.354)	-0.668*** (0.231)
Long-term \times Google	0.0945 (0.153)	-0.307 (0.241)	0.328 (0.247)
Post \times Google \times Cheap	0.660*** (0.206)	1.324*** (0.491)	1.662*** (0.410)
Long-term \times Google \times Cheap	-0.698*** (0.187)	-0.891** (0.419)	-1.107** (0.465)
Post \times Cheap	-0.307 (0.204)	-0.715** (0.305)	-0.989*** (0.341)
Google \times Cheap	0.359** (0.178)	0.0619 (0.517)	-0.174 (0.314)
Long-term \times Cheap	0.240 (0.155)	0.162 (0.344)	0.458 (0.342)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	1556	1556	1556
R-Squared	0.491	0.601	0.603

Notes: Robust standard errors clustered at website level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the logarithm of clicks.

Table 10: Long-term effect after integration of Google Zagat

	(1)	(2)	(3)
	Total	Paid	Non-paid
Post \times Google	0.480** (0.216)	-0.499 (0.467)	0.589*** (0.211)
Long-Term \times Google	-0.0966 (0.388)	-0.375 (0.281)	-0.0635 (0.391)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	475	475	475
R-Squared	0.303	0.467	0.341

Notes: Robust standard errors clustered at website level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the logarithm of clicks.

Then I estimate how the policy change interacted with the position of the link. I employ a triple-difference estimator where I interact the effect of the policy change with the number of ads that were displayed for each keyword. I would expect the integration of Google Flights to have a stronger effect for non-paid links that were previously at the top of the page when few ads were shown. That is, non-paid links closer to the top of the page would have a stronger spillover from the policy change due to the salience of its position. Similarly, I would expect a weaker spillover for a link located further down the search results page.

Table 11 reports the results of the triple-difference regression. As expected, for general flight searches, sites that appeared on keywords with fewer ads experienced a stronger decline in non-paid clicks. The positive coefficient on $Post \times Google \times Number of Ads$ indicates that sites for keywords with fewer ads experienced a larger decline in organic clicks; these non-paid links were likely higher up on the search results before the integration of Google Flights. For flight searches containing the keyword “cheap,” sites for keywords with fewer ads experience a stronger increase in non-paid clicks. If consumers are visiting other sites immediately after the integration of Google Flight, the sites most likely to benefit are those

located higher up on the search result page.

6.5 Falsification Checks

I perform a series of falsification checks in this section to test for any pre-existing trend or placebo effects. As a falsification check, I test for pre-existing trends in the months leading up to the product integration. The concern is that the observed results may reflect underlying trends in consumer search behavior during the period of analysis. I run a regression similar to Equation (1) using data from the months prior to the policy change.¹⁵

Table 12 reports the results from the falsification checks for flight keywords. The sample contains the months prior to the policy, and the variable *FakePost* is a dummy variable that equals one for the second half of the time period. I do not observe a pre-existing trend of clicks on sites from flight keywords on Google relative to other search engines. Table 13 reports the results from the falsification checks for restaurant review keywords. I also do not observe a trend in clicks on Google relative to other search engines in the months prior to the incorporation of Zagat's restaurant ratings within Google's search results.

¹⁵For Google Flights, I use the months in the pre-period of my analysis to avoid confounding the results with the debut of Google Hotels in September 2011. For Google's Zagat, I use the four months prior to the policy change.

Table 11: How the number of ads affected non-paid clicks after integration of Google Flights

	(1)
Post \times Google	-1.963** (0.854)
Post \times Google \times Number of ads	0.0972** (0.0417)
Post \times Google \times Cheap	4.624*** (1.309)
Post \times Google \times Cheap \times Number of ads	-0.209** (0.0807)
Post \times Number of ads	-0.0591 (0.0356)
Post \times Number of ads	0.0246 (0.0336)
Post \times Cheap	-3.397*** (1.065)
Google \times Cheap	-0.815 (0.880)
Cheap \times Number of ads	-0.147 (0.141)
Month Fixed Effects	Yes
Website Fixed Effects	Yes
Keyword Fixed Effects	Yes
Search Engine Fixed Effects	Yes
Observations	1128
R-Squared	0.622

Notes: Robust standard errors clustered at website level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the logarithm of clicks.

Table 12: No evidence of a pre-trend before integration of Google Flights to Google’s search results

	(1)	(2)	(3)
	Total	Paid	Non-paid
FakePost \times Google	0.298 (0.212)	0.492 (0.414)	0.0305 (0.395)
FakePost \times Google \times Cheap	-0.256 (0.266)	-0.0495 (0.559)	-0.124 (0.522)
FakePost \times Cheap	0.217 (0.227)	0.175 (0.523)	0.416 (0.439)
Google \times Cheap	0.391* (0.210)	-0.302 (0.550)	0.301 (0.425)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	546	546	546
R-Squared	0.582	0.640	0.655

Notes: Robust standard errors clustered at website level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the logarithm of clicks. The falsification check examines the months prior to the integration of Google Flights and creates a fake “post variable” that equals one for the second half of this time period.

Table 13: No evidence of a pre-trend before the integration of Zagat’s restaurant ratings to Google’s search results

	(1)	(2)	(3)
	Total	Paid	Non-paid
FakePost \times Google	-0.514 (0.488)	-0.108 (0.224)	-0.498 (0.487)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	200	200	200
R-Squared	0.342	0.536	0.351

Notes: Robust standard errors clustered at website level. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. The dependent variable is the logarithm of clicks. The falsification check examines the months prior to the integration of Google Zagat ratings and creates a fake “post variable” that equals one for the second half of this time period.

I also construct two placebo tests to rule out the alternative explanation that other changes in flight and restaurant searches can account for the results. The idea is to identify categories that may share similar underlying trends in searches and clicks to the two industries of travel and restaurants, but are unaffected by the policy change. As a placebo test for Google Flights, I use keyword searches on “car rentals.” Car rentals are likely to share similar underlying trends on travel searches as flights. Car rentals are not directly affected by the integration of Google Flights as Google Flights only reports prices for airline tickets and not car rentals. Table 14 on page 41 of the draft reports the results for the difference-in-difference analysis on the placebo group of searches for car rentals. Reassuringly, I do not find evidence of an effect for the placebo group of car rentals after the integration of Google Flights into search results.

As a placebo test for Google Zagats, I use keyword searches on food-related health searches. Consumer searches and interest in food-related health categories and food-related dining may be correlated. Food-related health searches are unlikely to be directly affected by Google Zagats as Google Zagats reports information on food-service establishments. I perform an analogous construction of my dataset for the placebo group; I identify the top 10 websites from the Hitwise category of “Food & Health” and obtain the top keywords related to food.¹⁶ Table 15 on page 41 in the draft reports the results for the difference-in-difference analysis on the placebo group of food-related health searches. I do not find evidence of an effect for the placebo group after the integration of Google Zagat’s into search results.

7 Conclusion

This study examines the entry of Google, a dominant search engine in the market for Internet search, into downstream products of flight fares and restaurant reviews. In 2011, Google embedded Google Flights within its search results, so users would receive this pricing

¹⁶I collect data on searches for “calorie counter,” “foods that are hard to digest,” and “belly fat.”

Table 14: Traffic is unaffected for searches on placebo group of car rentals

	(1)	(2)	(3)
	Total	Paid	Non-paid
Post \times Google	-0.0142 (0.136)	-0.293 (0.267)	0.254 (0.366)
Post \times Google \times Cheap	-0.0975 (0.225)	-0.614 (0.557)	2.484 (2.018)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	710	710	710
R-Squared	0.579	0.743	0.582

Notes: Robust standard errors clustered at website level. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. The dependent variable is the logarithm of clicks.

Table 15: Traffic is unaffected for searches on placebo group of food-related health searches

	(1)	(2)	(3)
	Total	Paid	Organic
Post \times Google	0.115 (0.232)	-0.157 (0.215)	0.307 (0.346)
Month Fixed Effects	Yes	Yes	Yes
Website Fixed Effects	Yes	Yes	Yes
Keyword Fixed Effects	Yes	Yes	Yes
Search Engine Fixed Effects	Yes	Yes	Yes
Observations	168	168	168
R-Squared	0.535	0.895	0.748

Notes: Robust standard errors clustered at website level. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. The dependent variable is the logarithm of clicks.

information based upon their search queries. Google also acquired Zagat and embedded the restaurant ratings and reviews into its search results.

This study directly relates to the issue of vertical integration and how dominance in an upstream market (Internet search) can be levered into a downstream market (products and services). Google serves as a prominent test case, as Google expands its products and search offerings over the next several years. The theoretical effects of vertical integration are ambiguous. On one hand, vertical integration may improve efficiencies by decreasing transaction costs. On the other hand, vertical integration may allow a dominant upstream firm to exert market power in a downstream market.

I find that Google's entry into downstream products may either decrease or increase traffic to other sites in the market, depending upon whether the good provides pricing or quality information. After the integration of Google Flights, clicks to other websites declined for general searches on travel keyword on Google relative to other search engines. In contrast, when Zagat's ratings were incorporated into Google search results, clicks to other sites increased, as the Zagat's rating provided restaurant quality information and reviews. My results are consistent with a story where consumers interested in quality multi-home and visit multiple platforms, thereby mitigating the effects of vertical integration.

As a caveat, Google is a dominant player in the search market, so the results of Google's product expansion may not be generalizable to other search engines. Given Google's large role in the economy and how little is known about its product expansion, this study provides the first exploration into Google's effects in other markets. The main focus of this study is on consumer search and information. A future area of work would be to examine other industries where substitution across online and offline products and webrooming are likely to occur (Halzack, 2015).

References

Amelio, A. and B. Jullien (2012). Tying and Freebies in Two-sided Markets. *Tying and Freebies in Two-Sided Markets* 30, 436–446.

Athey, S., E. Calvano, and J. Gans (2016). The Impact of Consumer Multi-Homing on Advertising Markets and Media Competition. *working paper*.

Athey, S. and M. Mobius (2012). The Impact of News Aggregators on Internet News Consumption: The Case of Localization. *working paper*.

Baye, M., B. De los Santos, and M. Wildenbeest (2016). Search Engine Optimization: What Drives Organic Traffic to Retail Sites? *Review of Industrial Organization* 25, 6–31.

BBC (2009). Microsoft and Yahoo seal web deal.

Bosker, B. (2011). Google buys zagat: Here's why. *The Huffington Post*.

Carlton, D. and M. Waldman (2002). The strategic use of tying to preserve and create market power in evolving industries. *RAND Journal of Economics*, 194–220.

Chiou, L. and C. Tucker (2010a). Content Aggregation by Platforms. *working paper*.

Chiou, L. and C. Tucker (2010b). How does pharmaceutical advertising affect consumer search? *Mimeo, MIT*.

Chiou, L. and C. Tucker (2012). How does the use of trademarks by third-party sellers affect online search? *Marketing Science* 31(5), 819–837.

Choi, J. (2010). Tying in two-sided markets with multi-homing. *Journal of Industrial Economics* 58, 607–626.

Dai, W., G. Jin, J. Lee, and M. Luca (2012). Optimal Aggregation of Consumer Ratings: An Applicaton to Yelp.com. *working paper*.

De Los Santos, B., A. Hortacsu, and M. R. Wildenbeest (2012). Testing models of consumer search using data on web browsing and purchasing behavior. *American Economic Review* 102(6), 2955–80.

Delo, C. (2011). Your guide to who measures in the online space. *Advertising Age*.

Edelman, B. (2014). Leveraging market power through tying: Does google behave anti-competitively? *Journal of Competition Law and Economics*, forthcoming.

Edelman, B. and Z. Lai (2015). Design of Search Engine Services: Channel Interdependence in Search Engine Results. *Harvard Business School Working Paper*.

Evans, D. and R. Schmalensee (2012). The antitrust analysis of multi-sided platform businesses. *Coase-Sandor Working Paper Series in Law and Economics*.

FairSearch (2015). Global scrutiny. Technical report, FairSearch.org.

Forman, C. and A. Gron (2009). Vertical Integration and Information Technology Investment in the Insurance Industry. *Journal of Law, Economics, and Organization* 27, 180–218.

Gentzkow, M. and J. M. Shapiro (2011). Ideological segregation online and offline. *The Quarterly Journal of Economics* 126, 1799–1839.

Ghose, A., P. Ipeirotis, and B. Li (2014). Examining the Impact of Ranking on Consumer Behavior and Search Engine Revenue. *Management Science* 60, 1632–1654.

Gil, R. (2015). Does Vertical Integration Decrease Prices? Evidence from the Paramount Antitrust Case of 1948. *American Economic Journal: Economic Policy* 7, 162–191.

Gil, R. and W. Hartmann (2009). Airing Your Dirty Laundry: Vertical Integration, Reputation Capital, and Social Networks. *Journal of Law, Economics, and Organization* 27, 219–244.

Glick, M., G. Richards, M. Sapozhnikov, and P. Seabright (2014). How Does Ranking Affect User Choice in Online Search? *Review of Industrial Organization* 60, 99–119.

Goldman, E. (2006). Search engine bias and the demise of search engine utopianism. *Santa Clara University School of Law: Legals STudies Research Paper Series*, No. 06–08.

Google (2011). See Flight Results Right on Google.com. *The Official Google Search Blog*.

Google (2015). Facts about google's acquisition of ita software. Technical report, Google.

Halzack, S. (2015, February). The New Shopping Behavior that is Creating Big Challenges for the Retail Industry. *The Washington Post*.

Hitwise (2009). Hitwise Online Help.

Hitwise (2011). Hitwise online help. Technical report, Hitwise.

Jin, G. and P. Leslie (2003). The Effects of Information on Product Quality: Evidence from Restaurant Hygiene Grade Cards. *The Quarterly Journal of Economics* 118, 409–451.

Jin, G. and P. Leslie (2009). Reputation Incentives for Restaurant Hygiene. *American Economic Journal: Microeconomics* 1, 237–267.

Kendall, B., A. Efrati, T. Catan, and S. Ovide (2013). Behind google's antitrust escape. *The Wall Street Journal*.

Krasny, J. (2012). Travel agents could go the way of the dodo by 2016. *Business Insider*.

Kugel, S. (2014). How to Choose an Air Travel Search Site. *The New York Times*.

Lafontaine, F. and J. Slade (2007). Vertical Integration and Firm Boundaries: The Evidence. *Journal of Economic Literature* 45, 629–685.

Lianos, I. and E. Motchenkova (2013). Market dominance and search quality in the search engine market. *Journal of Competition Law and Economics*, 419–455.

Luca, M. (2011). Reviews, Reputation, and Revenue: The Case of Yelp.com. *working paper*.

Luca, M., T. Wu, S. Couvidat, D. Frank, and W. Seltzer (2015). Does Google Content Degrade Google Search? Experimental Evidence. *Harvard Business School Working Paper*.

Ludwig, S. (2011). Google acquires zagat, strikes a major blow against yelp. *VentureBeat*.

Mayzlin, D., D. Yaniv, and J. Chevalier (2014). Promotional Reviews: An Empirical Investigation of Online Review Manipulation. *American Economic Review* 104, 2421–55.

Miller, C. (2011). U.S. Clears Google Acquisition of Travel Software. *The New York Times*.

Montgomery, A. L., S. Li, K. Srinivasan, and J. C. Liechty (2004). Modeling online browsing and path analysis using clickstream data. *Marketing Science* 23(4), 579–595.

Mullahy, J. (1999, November). Interaction effects and difference-in-difference estimation in loglinear models. NBER Technical Working Papers 0245, National Bureau of Economic Research, Inc.

Nicas, J. (2011). Google roils travel. *The Wall Street Journal*.

Reuters (2013). EU Commission’s Google Investigation Won’t Be Affected by American Decision.

Rochet, J. and J. Tirole (2008). Tying in two-sided markets and the honor all cards rule. *International Journal of Industrial Organization* 26, 1333–1347.

Schaal, D. (2011). Google launches flight search with booking links to airline sites only. *Tnooz*.

Schaal, D. (2014). Yahoo Relaunches Yahoo Travel as a Digital Magazine with Lots of Sponsored Content . *Skift*.

Schoenberg, T. (2011). Google's \$700 million purchase of ita cleared by u.s judge. *Bloomberg Business*.

Statista (2015). Domestic Market Share of Leading U.S. Airlines between February 2015 and January 2016. *The Statistics Portal*.

Strutner, S. (2015). 6 Google Flights Tricks that Are Better Than Any Travel Agent. *Huffington Post*.

Stutz, R. (2011). An examination of the antitrust issues posed by google's acquisition of ita. *The American Antitrust Institute*.

Sullivan, D. (2011). Bing's Travel Search & Kayak Favoritism Angers No One, While Google's Gets Headline Attention from WSJ. *Search Engine Land*.

Trefis (2015). An update on the online travel agencies. *Forbes Investing*.

Tuttle, B. (2014). Average Airfare Soars Past \$500! 5 Tips to Save on Flights. *The New York Times*.

Whinston, M. (1990). Tying, foreclosure, and exclusion. *The American Economic Review*, 837–859.

Yang, S. and A. Ghose (July/August 2010). Analyzing the relationship between organic and sponsored search advertising: Positive, negative, or zero interdependence? *Marketing Science* 29(4), 602–623.

Appendix

Table A-1: Keywords for travel

airfare
airline tickets
airplane tickets
cheap airfare
cheap airline tickets
cheap flights
cheap plane tickets
last minute flights
plane tickets

Notes: This table lists the associated keywords in the final sample.

Table A-2: Keywords for restaurant reviews

best restaurants
chinese restaurant
italian restaurant
japanese restaurant
menus
mexican restaurant
restaurant guide
restaurant menu
romantic restaurants

Notes: This table lists the associated keywords in the final sample.