Impact Of Ranking Of Organic Search Results On The Incrementality Of Search Ads

David X. Chan, Deepak Kumar, Sheng Ma, Jim Koehler

Google Inc.

March 19th, 2012

Abstract

In an earlier study [1], we reported that on average 89% of the visits to the advertiser's site from search ad clicks were incremental. In this research, we examine how the ranking of an advertiser's organic listings on the search results page affects the incrementality of ad clicks expressed through Incremental Ad Clicks (IAC) and as estimated by Search Ads Pause models [1]. A meta-analysis of 390 Search Ads Pause studies highlights the limited opportunity for clicks from organic search results to substitute for ad clicks when the ads are turned off. On average, 81% of ad impressions and 66% of ad clicks occur in the absence of an associated organic search result. We find that having an associated organic search result in rank one does not necessarily mean a low IAC. On average, 50% of the ad clicks that occur with a top rank organic result are incremental, compared to 100% of the ad clicks being incremental in the absence of an associated organic result.

1 Introduction

In a previously published paper [1], we presented a meta-analysis of several hundred Search Ads Pause studies. It revealed how organic clicks, i.e., clicks from organic results on the search results page, did not substitute for the majority of clicks from ads on the page when the ad campaigns are

turned off. We reported that on average, 89% of the ads clicks were incremental. 89% of the visits to the advertiser's site from ad clicks would not have occurred without the ad campaigns. We expressed the incremental ad clicks as a percentage of the change in ad clicks and labeled this metric as Incremental Ad Clicks (IAC). While IAC estimates were generally high across countries and industry verticals, there was some variation in the IAC estimates across the individual advertisers. In that paper, we identified the ranking of the organic search result as a potential source of variation in IAC, and focus on the relationship between the ranking of the organic result and IAC here.

Some advertisers are skeptical of advertising on keywords for which they rank high in the organic search results because they believe that the majority of the ad clicks from such search ad campaigns mostly occur at the expense of clicks from organic search results. In effect, they believe that the incremental traffic from high ranking keywords--typically branded terms--is low or zero.

While the search ads and the organic search results are generated by two completely independent systems, they appear next to each other on the same search result page. Hence it is expected that the presence (or absence) of organic listings will impact the number of clicks on the ad listings. In this paper, we examine the extent of the relationship between incrementality of the ad clicks and the ranking of organic results. The emphasis is on general trends in the relationship between organic rank and IAC and not on estimating a precise model that predicts IAC as a function of various factors (e.g., position of paid results, distribution of queries across industry categories).

2 Methodology

In this section, we lay out the approach used to study the impact of organic rank on IAC. First, we describe a typical search results page, and then describe the data used for the analysis. We examine how often a search ad is accompanied by an associated organic search result, and the impact of having an organic search result in the top rank on the incrementality of search ads, as estimated by IAC. We assume an organic search result is associated with a search ad if the domain of the website displayed in the ad and the domain of the website from the organic result match.

Below is an illustration of a search results page. On the left of the page are options to refine the search further (e.g., by location, time horizon, results type: image, maps, etc.). Ads can be shown at the top and right hand side of the page. The center of the page consists of organic search results which must include headlines at the top of the result, the URL for the listing, and a snippet describing the web page. Organic results are ranked from 1 to n=50 in the data considered in this paper. Although the rank of an organic result can be high, the average organic results rank associated with ad impressions is 5.1. Ad results range from position 1 to position 11, with ads in higher positions **1 to 3 displayed at the top** and ads in lower positions **4 to 11 displayed on the right hand side**.

The query in the illustration is “buy shoes online”, and the second organic search result is for Zappos™. Zappos™ also has a search ad in the second ad position. The organic result for Zappos™ is considered as an *associated result* (i.e., with the search ad for Zappos™) since the organic result also points to the Zappos™ website.

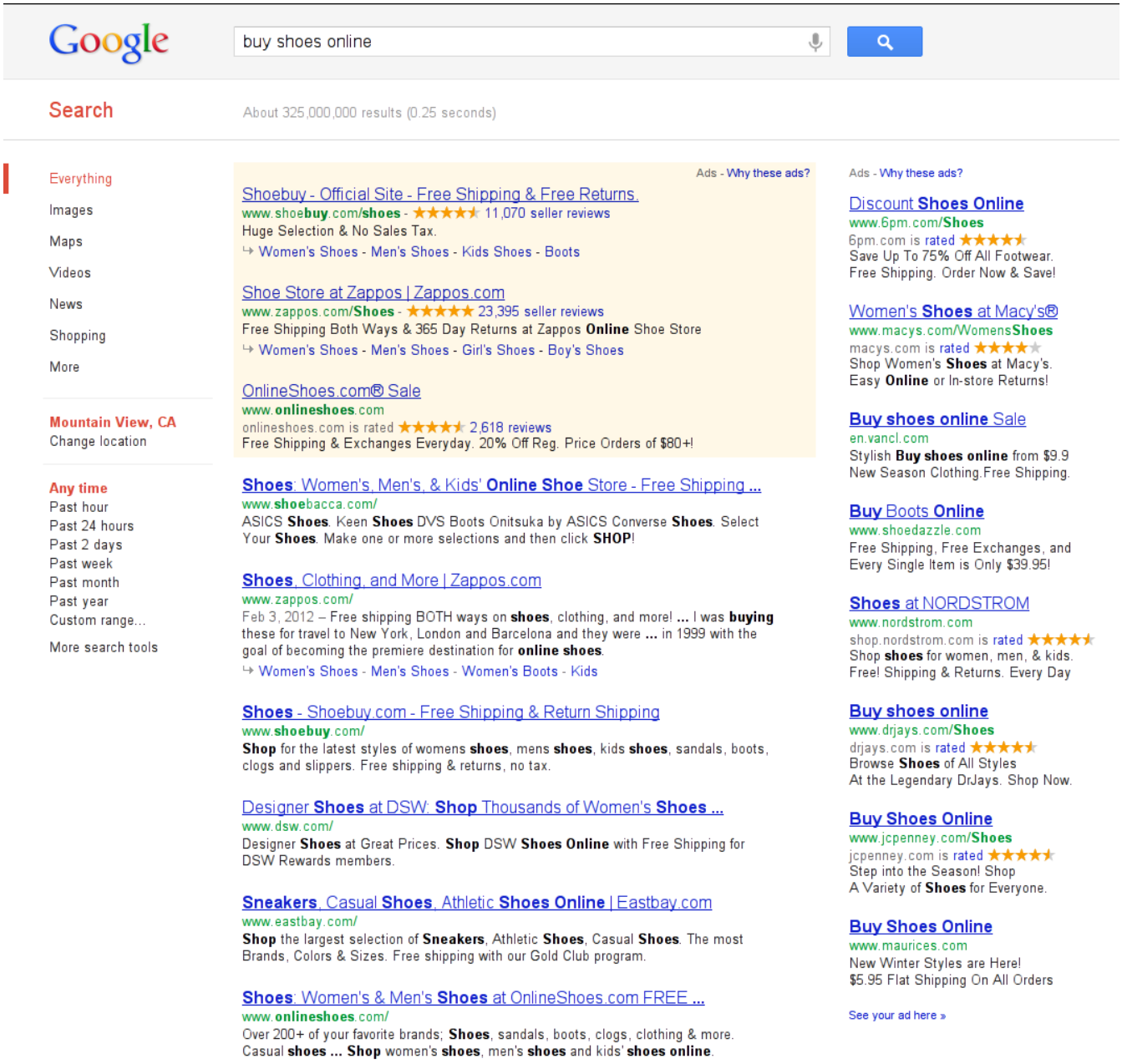

Figure 1. Illustration of an Example Search Results Page

A typical search results page has rich information (e.g., all organic search results on the page, all ads displayed on the page, the number of ads and organic results, the ranks of organic search results, and the position of the ads). However, only a subset of that information is relevant to our

analysis. This includes information on the presence/absence of an associated organic search result, and its rank for all ad impressions served across advertisers in the period prior to the pause in search ads. More details of the data extraction follow:

1. A single search query can generate multiple pages of search results. As the vast majority of browsing and clicking only occurs on the first page of results, for simplicity, we restrict the information collected to the first results page.

2. An organic result is considered *associated* with an ad impression if the website-domain displayed in the organic result matches with the domain of the website displayed in the search ad. For matching, we treat the domain as the case-insensitive string immediately after "http://", if any and before the first backslash, if any.

3. When there are multiple associated organic results for the same ad impression, only the organic result with the highest rank is considered. The rank 0 for an organic result is used to denote that there was no associated organic result in the first page of search results.

4. For each Search Ads Pause study, we extracted counts of ad impressions and clicks and counts of associated search results impressions by rank for a three week period prior to the ads pause. A three week pre-period was used since it corresponds to the minimum length of the pre-period allowed in the Search Ads Pause studies and thus likely to represent a relatively stable period (with respect to search ad spend, clicks, etc.) of the account.

5. Data extraction was a substantial computational exercise due to the volume of data that needed to be mined, and required almost three weeks of processing time on thousands of machines.

After extracting the relevant ad and organic search results metric, we examine the distribution of the rank of organic search results and their relationship with IAC. In the results section, we present the variation in IAC in the presence and ranking of organic search results for a several hundred Search Ads Pause studies from 2011.

3 Meta-Analysis Results

We examine six months of Search Ads Pause studies. This includes only the studies corresponding to advertisers who had dropped their search ad-spend by *95% or more*; these amounted to 390 studies between April, 2011 and October, 2011. The study-counts across countries and over the calendar months are summarized in Table 1.

Month	Germany	France	United Kingdom	United States
04/2011	1	1	2	19

05/2011	9	4	1	35
06/2011	13	6	5	55
07/2011	21	13	5	60
08/2011	6	10	6	35
09/2011	2	3	6	37
10/2011	8	2	0	25
Total	60	39	25	266

Table 1: Search Ad Pause Studies Across Countries and Months

Across the 390 studies, we examine how ad impressions are distributed across the rank of the organic search results, including the cases when the ad impression did not have an associated organic result. The following notation is introduced to help with readability. Let γ_r be the percentage of ad impressions with an organic result in rank r where r ∈ {0, 1, 2.4, 5.n}. r = 0 means there is no corresponding organic result while r = 2.4 means a corresponding organic result in ranks 2 to 4. Therefore, for a given advertiser, we have, $\sum_r \gamma_r$ = 100%.

We now examine, in cases when an ad is shown, how often an associated organic search result appears in the various ranks 1, 2-4 and 5-n and how often an associated organic result does not appear (i.e., r = 0). The relationship between the percentage of ad impressions, and organic results in various ranks is illustrated in Figure 2 below.

On average, a ***search ad shows up with no associated organic result 81% of the time*** (i.e., $\bar{\gamma}_0$ = 81%). A search ad shows up with organic result in the top rank 9% of the time (i.e., $\bar{\gamma}_1$ = 9%), with an organic result in ranks 2-4, 5% of the time (i.e., $\bar{\gamma}_{2.4}$ = 5%), and in lower ranks, i.e., ranks 5-n about 4% of the time (i.e., $\bar{\gamma}_{5.n} = 4\%$). *The main takeaway from Figure 2 is that on average, 81% of the time when a search ad is shown, there is no associated organic result suggesting that the opportunity for clicks from organic results to substitute for ad clicks when those ads are turned off is limited (i.e., 19% of the ad impressions)*

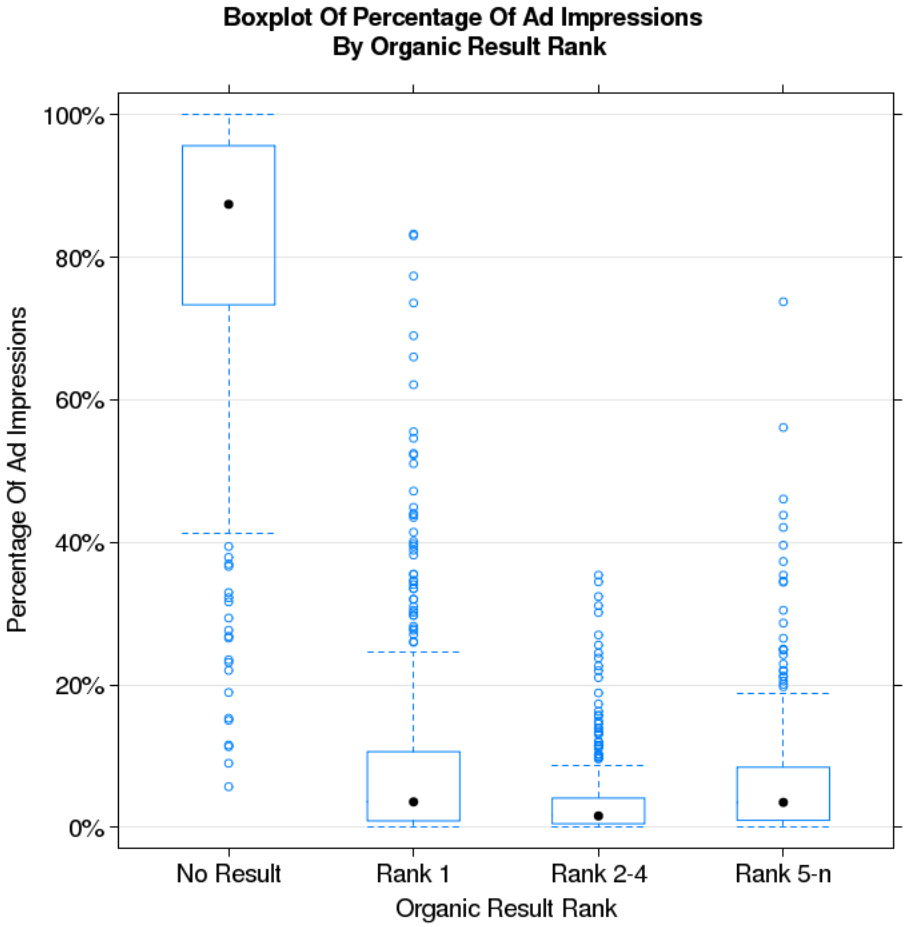

Figure 2: Distribution of Ad Impressions Percentage Across Rank of Organic Result

However, the fraction of ad clicks versus organic rank might be more relevant since we are ultimately interested in clicks from the ads, clicks from the organic results, and the extent of substitution between the two. The incrementality of the search ads, i.e., IAC, is expressed in terms of clicks. Observations based on clicks is also robust to variation in click-through rates of the ad impressions.

A plot of percentage of ad clicks by the organic results rank is presented in Figure 3. We denote the percentage of ad clicks with organic results in rank r as α_r, where r $\in$ {0, 1, 2.4, 5.n}. Figure 3 shows that ***on average, 66% of ad clicks occurred without an associated organic result*** (i.e., $\overline{\alpha}_0$ = 66%). In comparing Figure 2 with Figure 3, we make the following observations.

- First we observe that the click-through rates of ads that are accompanied by an associated organic result are higher (i.e., higher than the click-through rates of ads that have no associated organic result).
- Second, we note that ratio α_1/γ_1 is greater than $\alpha_{2.4}/\gamma_{2.4}$ and $\alpha_{5.n}/\gamma_{5.n}$, indicating that the ad click-through rate when there is an associated organic result in rank one is higher than the ad click-through rates with associated organic results in lower ranks.

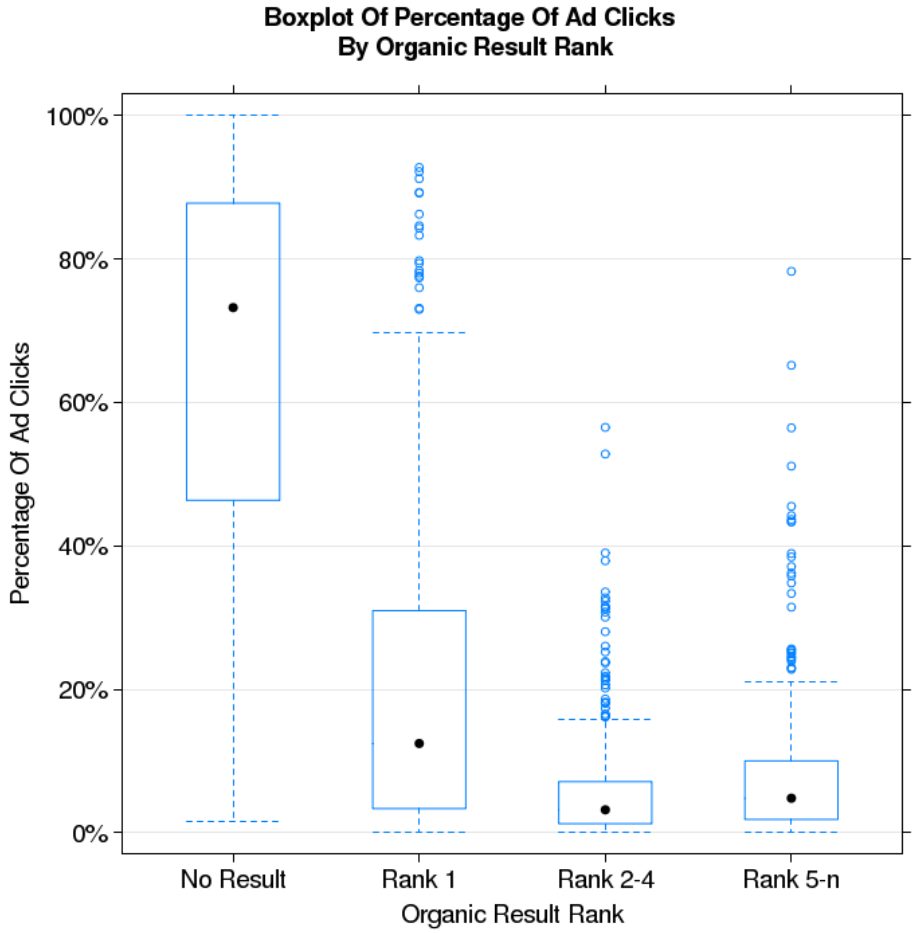

Figure 3: Distribution Of Ad Clicks Percentage Across Rank of Organic Result

To investigate why the click-through-rates are higher for ads that occur with an associated organic result further, we study the distribution of ad position and how it varies with respect to organic rank in Figure 4. We observe that the average ad position is lowest when there are no associated organic results (i.e., rank = 0) and highest when there are organic search results in the top rank (rank = 1). Also, the average ad position declines as we move from organic rank 1, to 2-4, to 5-n. Given that ad click-through-rates increase with ad position, i.e., click-through rates for ads in position 1 are higher than click-through-rates for ads in position 2 and so on, the occurrence of higher ad positions when there is an organic result (and even higher ad positions when there is an organic result in rank 1) is a likely explanation for the click-through-rate behavior.

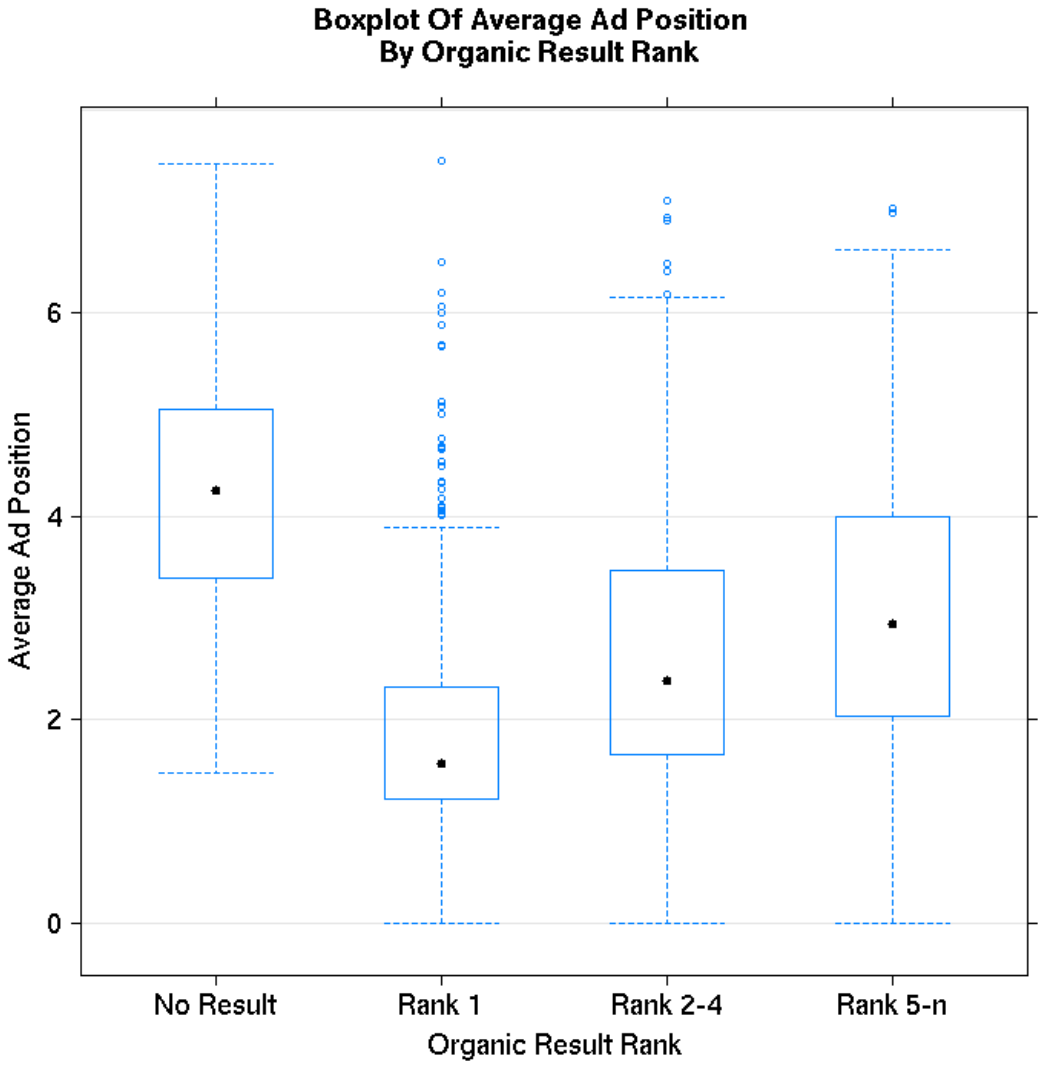

Figure 4: Distribution of Of Ad Position Versus Rank of Organic Result

Ad clicks from ad impressions which did not have an associated organic result are all incremental (i.e., IAC = 100%) since there are no organic results to compete for the clicks (and to substitute for the clicks from ads when the ads are paused). Therefore, one expects that α_0, the percentage of ad clicks which did not have an associated organic search result, imposes a lower bound on the IAC estimate. IAC is plotted versus α_0 in Figure 5 to investigate further. In Figure 5, the large majority of the IAC point estimates sit above the 45 degree line, thus providing strong evidence that α_0 is a lower bound on the IAC estimated in Search Ad Pause studies.

The red line in Figure 5 is a spline smooth [2], of the IAC versus α_0 and we see a general positive correlation between IAC and α_0. We do however observe 58 data points (i.e., ~15% of the 390 studies) below the 45 degree line. These are most probably due to the uncertainty in the estimation of the IAC. Including a 95% upper confidence interval on the IAC estimate, only 12 (3%) data points are below the 45 degree line. Another possible source of the artefact could be that while α_0 is based on a three week period prior to the Search Ads Pause, the studies themselves could have a

pre-period---a period of stable spend prior to the ads pause---longer than three weeks.

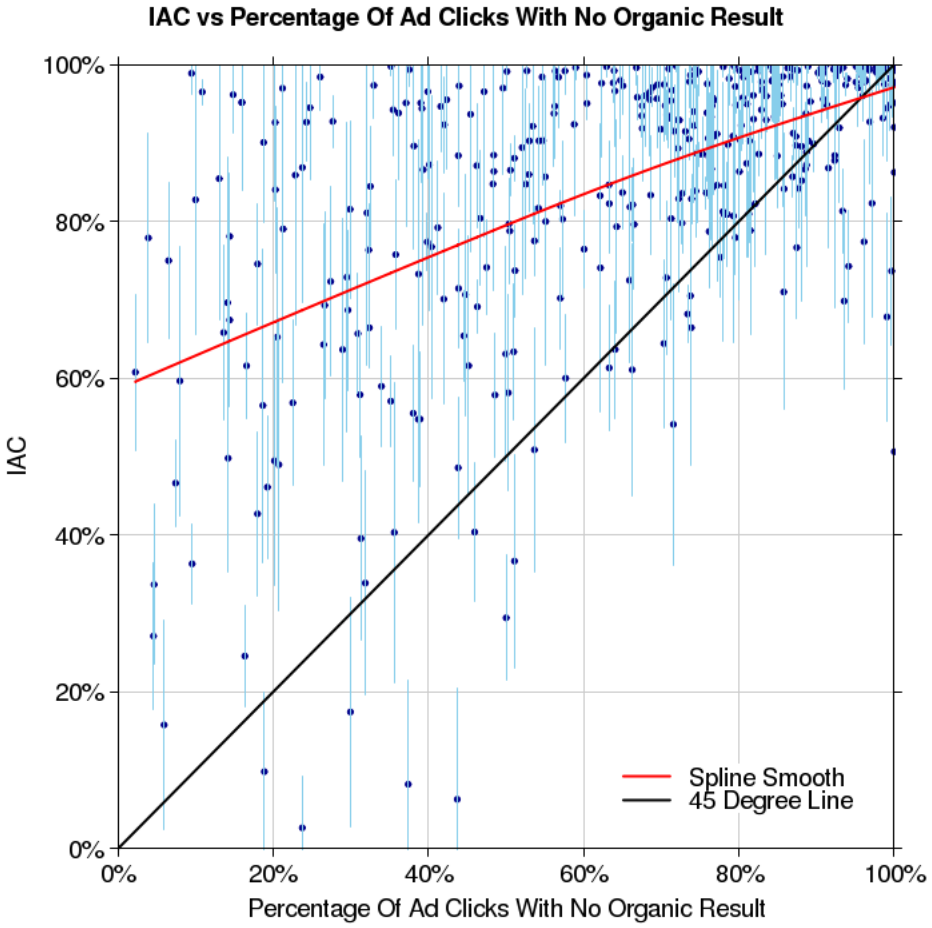

Figure 5: IAC versus Percentage Ad Clicks With No Organic Result (α_0)

Having focussed on how often an ad click (and ad impression) is accompanied by an associated organic result, we now examine more closely the effect of an organic result in rank one on the IAC.

We are particularly interested in how IAC is related to α_1, the percentage of ad clicks with an associated rank one organic result. But comparing IAC to α_1 directly might be misleading due to the confounding effect of α_0 on both IAC and α_1. To mitigate this, we normalize IAC and α_1 as shown below and use the normalized estimates instead.

$$IAC^* = (IAC - \alpha_0) / (1 - \alpha_0)$$
$$\alpha_1^* = \alpha_1 / (1 - \alpha_0)$$

IAC* can be considered as the incrementality of ad clicks in the presence of an associated organic result and α_1* is the fraction of ad clicks with an associated organic result that have an organic result in rank 1.

A plot of IAC* versus α_1* is presented in Figure 6. In the plot, there are four box plots corresponding to the four quartiles of α_1*. The first quartile of α_1* include the cases where there was the lowest number of ad clicks, with an associated organic result in rank 1 while the fourth quartile includes cases where there was the highest number of ad clicks, with an associated organic result in rank 1.

The main observation from the plot is that IAC* trends down **towards 50% as α_1* increases**, i.e, as percentage of ad clicks with organic results in rank 1 increases. This suggests that a **high α_1* does not necessarily imply a low IAC***, and should alleviate advertisers' concern that ads on queries for which they rank high on the organic search results do not drive incremental traffic. We note the high variability of IAC* with a top rank organic result. This shows that each advertiser's circumstances are different and their mileage will vary with respect to incrementality of ad clicks. Advertisers can test the incrementality of their own campaigns using geo-based experiments [3].

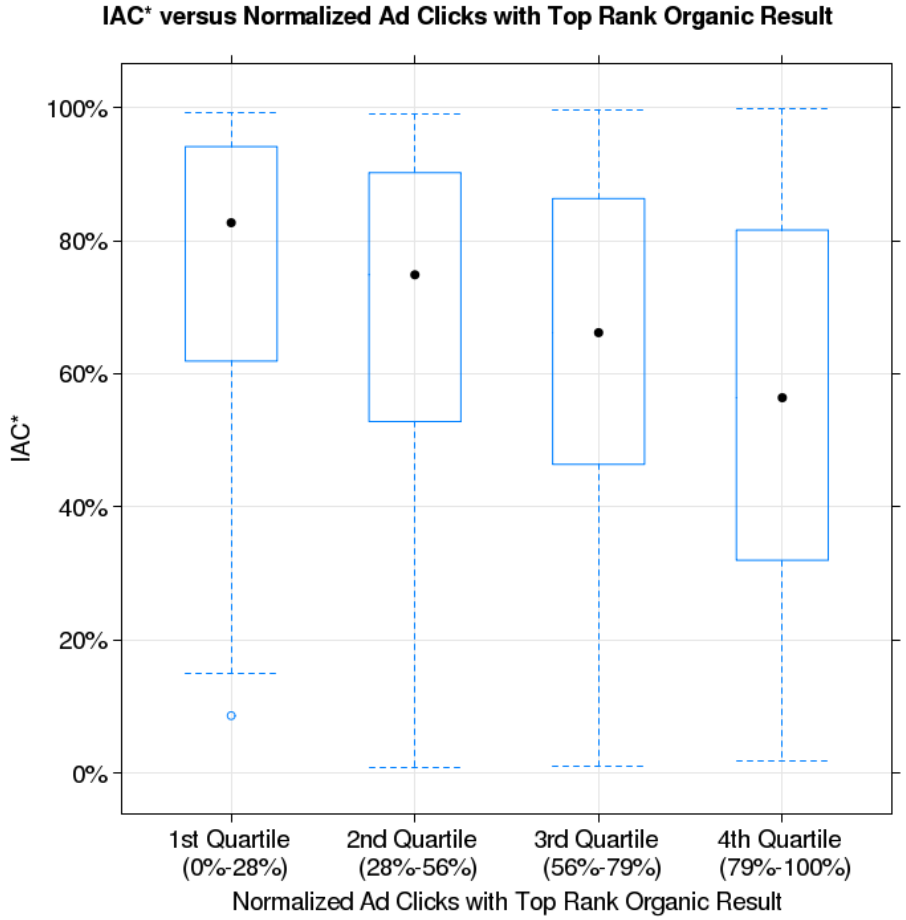

Figure 6: Residual IAC* versus Normalized Ad Clicks with Top Rank Organic Result α_1*

To succinctly summarize the relationship between IAC and the rank of associated organic results (including the case with no organic results, i.e., rank r = 0), we make use of a linear model that is described in Figure 7. This model was fitted in the statistical package, R [4]. In this model, IAC is

regressed against α_0, α_1, $\alpha_{2.4}$, and $\alpha_{5.n}$. The findings from the model are largely consistent with the results reported thus far.

- 99% (+/- 2%) of ad clicks with no organic result, (based on the value of coefficient of α_0 = ~1.00) are incremental. The model results reinforces the earlier observation that an ad click cannot be substituted by a click on an associated organic result, if there is no organic result.

- 50% (+/- 4%) of ad clicks with rank 1 organic result are incremental; this corresponds to the value of coefficient of α_1 = 0.50130 in the model; this reinforces one of the key findings of the paper and informs advertisers who are concerned about low incremental clicks from ads on queries for which they are the top organic result.

- 82% (+/- 14%) of ad clicks with rank 2-4 organic result are incremental; this corresponds to the value of coefficient of $\alpha_{2.4}$ = 0.82271 in the model.

- 96% (+/- 11%) of ad clicks with rank 5-n organic results are incremental; this corresponds to the value of coefficient of $\alpha_{5.n}$ = 0.96042 in the model. Ad clicks that occur when the organic result is in ranks 5 or lower are highly incremental, with the model indicating that less that 4% of such ad clicks are replaced by clicks from organic results.

```
Call:
lm(formula = iac ~ -1 + a0 + a1 + a2.4 + a5.n, data = iac.data,
   subset = iac > a0)

Coefficients:
    Estimate Std. Error t value Pr(>|t|)
a0    0.99363    0.01059   93.83   <2e-16 ***
a1    0.50130    0.02161   23.20   <2e-16 ***
a2.4  0.82271    0.07397   11.12   <2e-16 ***
a5.n  0.96042    0.05501   17.46   <2e-16 ***
---
Signif. codes:  0  ***  0.001  **  0.01  *  0.05  .  0.1     1

Residual standard error: 10.72 on 328 degrees of freedom
F-statistic:  5541 on 4 and 328 DF,  p-value: < 2.2e-16
```

Figure 7: Linear Regression Model of IAC as a function of ad clicks with organic results in rank 0, 1, 2-4, and 5-n, fitted in R

Standard errors around these estimates are tight and all estimated coefficients are highly significant. Figure 8 below are the partial regression plots [5] of IAC versus α_0, α_1, $\alpha_{2.4}$ and $\alpha_{5.n}$. The partial regression plots attempt to show the relation between the response, IAC with a particular explanatory variable, while controlling for all the other explanatory variables in the model. We see below in the plot, that a linear relationship between IAC vs each of the the explanatory variables is plausible, further reinforcing the validity of the linear regression model.

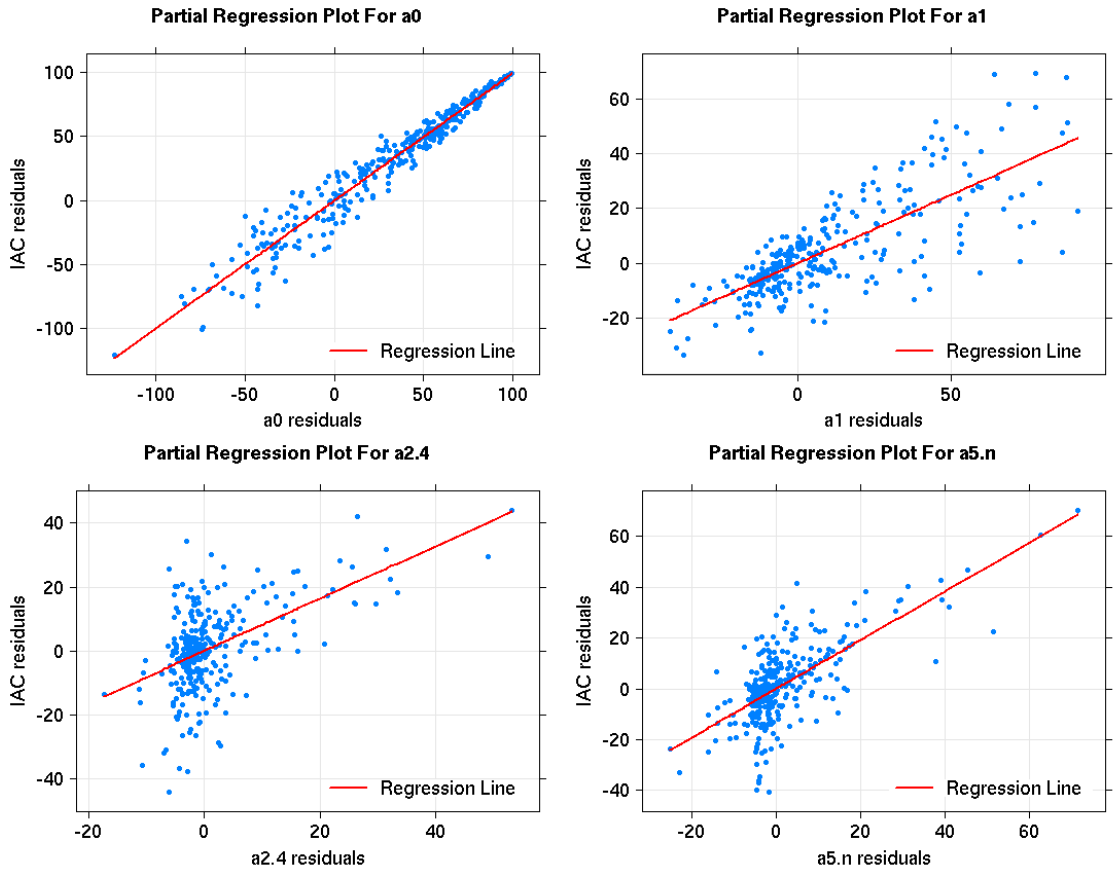

Figure 7: Partial Regression Plots of IAC versus α_0, α_1, $\alpha_{2.4}$ and $\alpha_{5.n}$

4 Concluding Remarks

In an earlier research study [1], we reported that on average, 89% of ad clicks from Google Search Ads were incremental. That study revealed the extent to which organic clicks, i.e., clicks from organic results on the search results page, substituted for clicks from ads on the search results page when the ad campaigns are turned off. In this research, we addressed two main questions around the high values of IAC reported in the earlier work: (1) how often an ad impression is accompanied by an associated organic result, and (2) how the IAC varies versus the rank of organic results, and in particular, when the rank of the organic result is equal to one.

The first finding is that on average, 81% of ad impressions and 66% of ad clicks occur without an associated organic result. The second finding is regarding IAC when the advertiser ranks first organically. On average, 50% of the ad clicks that occurred with a top rank organic result are incremental, i.e, they would not be recovered organically if the ad campaign is paused. For ad clicks with an associated organic result in rank 2-5, on average, 82% of the ad clicks are incremental. Finally, for ad clicks with an associated organic result in rank 5-n, on average, 96% of the ad clicks are incremental.

While the findings in this paper provide guidance on overall trends, results for individual advertisers vary. Advertisers with similar IAC estimates may have very different organic rank for the terms in their ad campaign. And advertisers who have similar organic rank may have very different IAC estimates. Organic rank depends on a variety of factors including the mix of branded and unbranded terms in the campaign. Given that branded terms have high organic rank, and the variability in IAC estimates across advertisers, we recommend that advertisers use value-per-click calculations in [1] to decide how much to spend on such terms. We recommend the use of randomized experiments (e.g., geo based experiments described in [3]) to better quantify the incremental traffic from the search ad campaigns. In a geo experiment designed to estimate IAC, a test group of geos would be exposed to the pull back in paid search ads while search ad spend would be held constant in a control group. A comparison of the paid and organic click volumes in the two groups would then yield an IAC estimate.

Acknowledgments

We would like to thank Adam Ghobarah and Tony Fagan for their encouragement and support. Paul Liu and Hal Varian for insightful discussions and constructive feedback. Lizzy Van Alstine for her editorial contributions. Thank you also to the many others at Google who made this research possible.

References

[1] D. Chan and Y. Yuan and J. Koehler and D. Kumar. Incremental Clicks Impact Of Search Advertising, Journal of Advertising Research, 51(4):58-62, 2011.

[2] J. Chambers and T. Hastie. Statistical Models in S, Wadsworth & Brooks/Cole 1992.

[3] J. Vaver and J. Koehler. Measuring Ad Effectiveness Using Geo Experiments, 2011, http://googleresearch.blogspot.com/2011/12/measuring-ad-effectiveness-using-geo.html

[4] R Development Core Team. R: A Language and Environment for Statistical Computing, Foundation of Statistical Computing, Vienna, Austria, ISBN 3-900051-07-0, 2011, http://www.r-project.org/about.html

[5] D. Belsley and E Kuh and R. Welsch. Regression Diagnostics: Identifying Influential Data and Sources of Collinearity, Wiley-IEEE 2004.

Appendix

Verifying the representativeness of $\bar{\gamma}_0$ and $\bar{\alpha}_0$

The two main findings in the paper that on average, 81% of ad impressions and 66% of ad clicks occur without an associated organic result (i.e., $\bar{\gamma}_0$ = 81% and $\bar{\alpha}_0$ = 66%), were based only on the sample of 390 studies. To understand how representativeness of these estimates, we went back and looked at larger set of advertisers. We used a 50% stratified random sample of companies in the United Kingdom, Germany, France and United States that meet the ad-spend threshold of $50 USD per day. For this set of companies, we extracted one week of ad and organic result metrics. Based on this 50% sample of companies, 78% of ad impressions and 65% of ad clicks occurred without an associated organic result.