

Online Product Search

Michael R. Baye

Keynote for the

Fifth Annual Federal Trade Commission Microeconomics Conference

Washington DC, November 16, 2012



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Joint Work with Babur De los Santos & Matthijs R. Wildenbeest

- “The Evolution of Product Search”
- “What’s in a Name? The Effects of Prominence on Retailer Traffic from Search Engines”
- “Estimating the Effects of Brand Equity on Consumer Behavior at Search Engines”



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Recent Theoretical Work Suggests “Prominence” Impacts Competition in Search Markets

- Arbatskaya (*Rand* 2007)
- Armstrong, Vickers and Zhou (*Rand*, 2009)
- Armstrong and Zhou (*EJ*, 2011)



This Talk

- How “prominence” impacts the organic clicks retailers get from product searches at search engines
 - Position prominence
 - Name prominence
- Example: Google the search phrase “best selling managerial economics textbook”



Google Search Results



best selling managerial economics textbook



Search

About 1,700,000 results (0.35 seconds)

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Most Prominent Organic Result?



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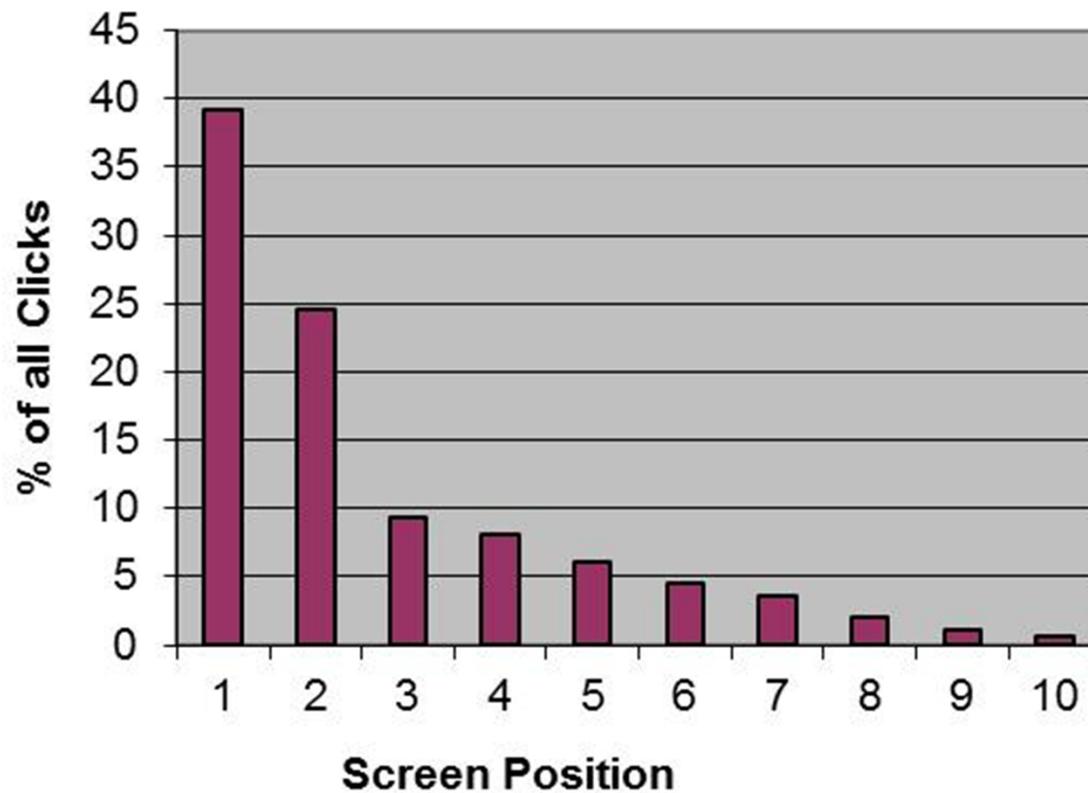


Lots of Evidence That Position Matters

- Offline markets (yellow pages, voting, academic citations, etc.)
 - De los Santos & Koulayev (2012)
- Online markets (price comparison sites, paid ads at search engines, etc.)
 - Brynjolfsson et al., 2010; Ghose and Yang (2009); Baye et al. (2009)



Example: Screen Position and Clicks at Kelkoo.com (Baye et al., 2009)





Ways Retailers Influence The Prominence of Their Names

- Investments in brand awareness and name recognition
 - Traditional (TV, radio, print) and online advertising
- Build customer-centric websites and distribution networks
 - Product breadth and depth
 - Shopping experience
- Investments in reputation
 - Prices, quality, shipping, returns policy
- Blend of all these and other investments



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Why It's Hard to Measure the Prominence of a Retailer's Name

- Multi-dimensional nature of investments
- Thorny stock/flow issues
- Typically requires time-series data that are often unavailable
 - Many online retailers are not publically traded and don't disclose information
 - Publically traded retailers don't disclose all relevant information



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Our Measure: Number of “Name Searches” on a Search Engine

- Name Search: Search phrase that includes the name of the retailer, including misspellings:
 - “Buy camera at Amazon”
 - “Amazon.com”
 - “www.Amazon.com”
 - “Amazn”
- Count a name search when consumers click on results page to the named site.
- Interpret as measuring brand awareness/equity, name recognition, or “name prominence”



Example: Selected Search Terms Leading Users from Google to Amazon

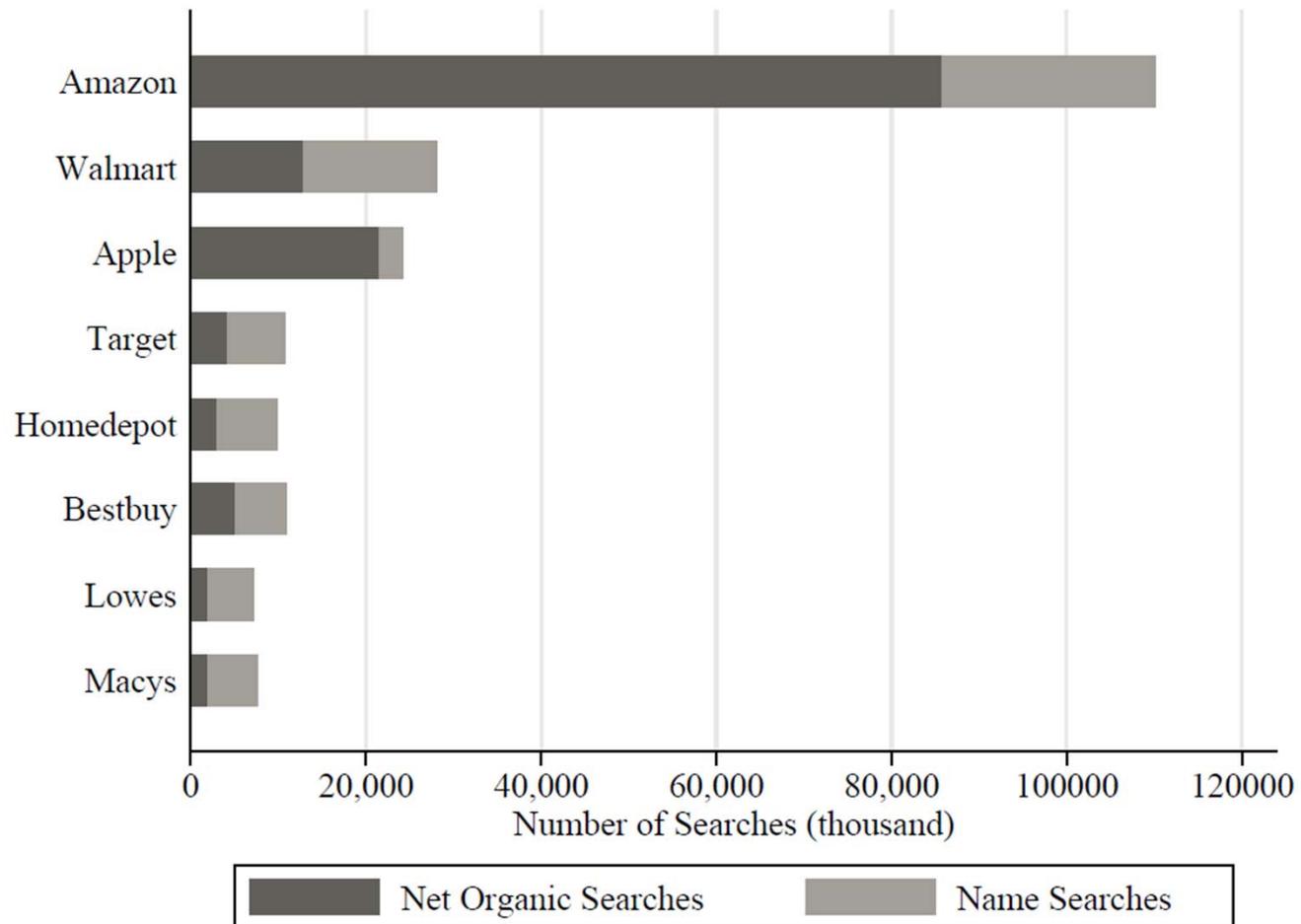
Rank	Search Phrase	# Organic Clicks
1	amazon	9,006,624
2	amazon.com	1,207,598
3	www.amazon.com	247,793
4	kindle	146,406
5	50 shades of grey	116,359
6	ebay	106,062
7	name name	105,408
8	amazon books	100,357
9	***	96,165
10	name last name	90,934
11	kindle fire	76,201
12	google	72,856
13	name name book	66,754
14	amzon	63,852
15	amazonprime	56,407

Rank	Search Phrase	# Organic Clicks
16	boss orange name	55,281
17	amazon kindle	55,272
18	amazon prime	55,259
19	kim kardashian sex tape	54,028
20	first name review	51,240
30	fifty shades of grey	29,303
40	amazo	22,909
50	bosch name	18,878
60	insanity workout	15,634
70	metal detectors	14,419
80	the night dad went to jail	13,502
90	target	12,125
100	name name books in order	11,301
All Search Terms		79,244,892



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Name Searches and Net Organic Searches, Selected Retailers





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Advantages of Our Proposed Measure of Name Prominence

- Measurable
- Embodies the “effective quality” of all investments by retailers to create brand awareness (consumer preferences)
- Represents the stock of name prominence



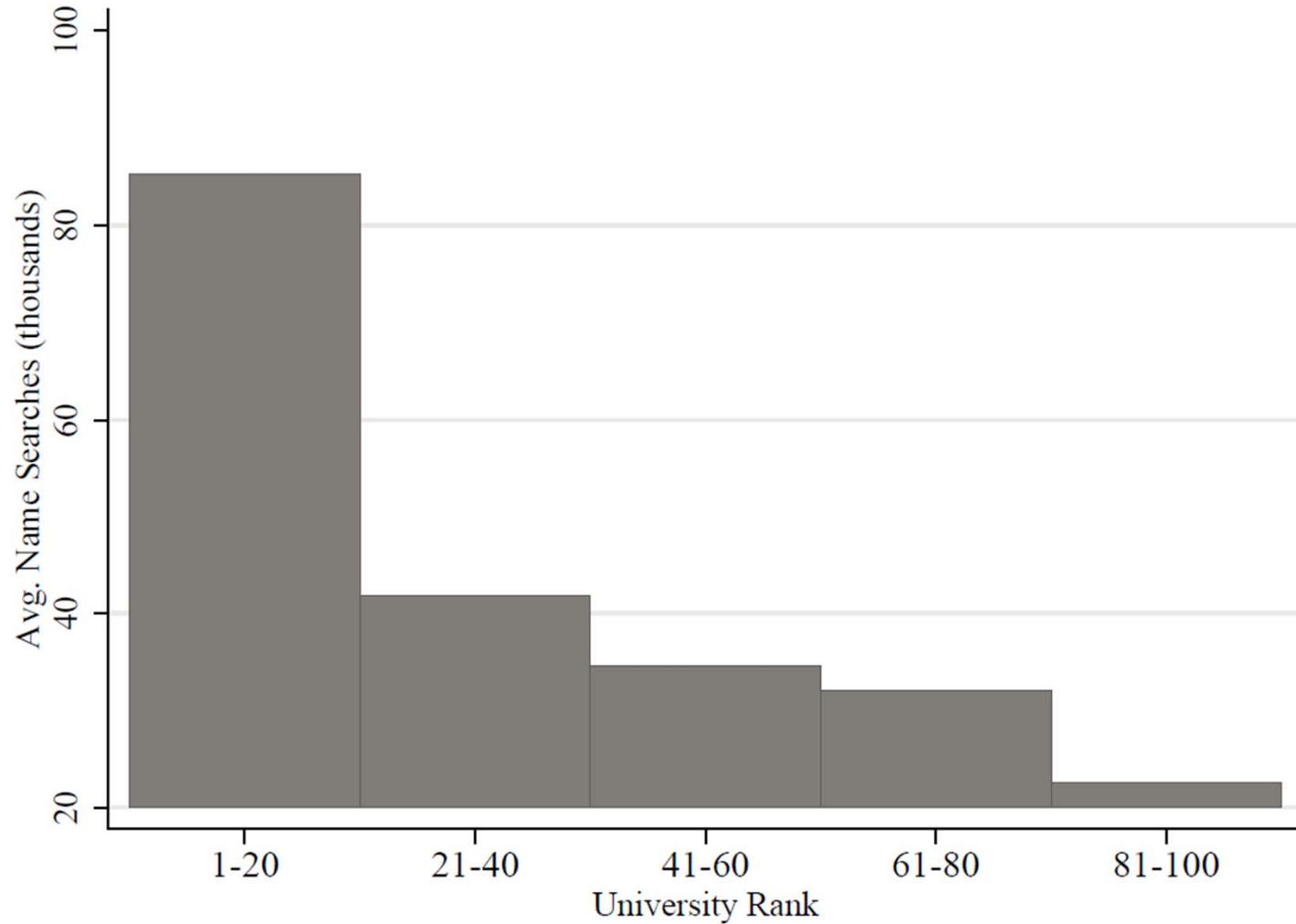
Smell Test: Does the Measure Work?

- Independent measure of “prominence” of universities:
 - *U.S. News and World Report* rankings of top 100 universities
- Used comScore data to measure number of name searches on Google for top 20 universities, second 20 universities, and so on)



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Name Searches and University Rank





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Three Datasets





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Data Set 1: ComScore Search Planner

- Two million users in US, June 2012
- Search phrases leading users from search engines (Google, Bing) to different sites
- Number of organic clicks each site gets from results pages based on each search phrase



Data Set 2: Internet Retailer

- Top 500 internet retailers
 - Amazon/Zappos; Sears/Kenmore, etc.
- Matched these with 759 retail sites tracked by comScore
- Identifies retailer category (15 categories such as apparel/accessories, office supplies, etc.)
- Whether site has presence on a social network site (Facebook/Twitter)
- Age of site
- Whether company is “Web Only” or also has brick-and-mortar presence



Data Set 3: Position Data

- Collected using program we wrote in Java
- 5,549 distinct search phrases in comScore data led users to the 759 sites
- Queried Google and Bing with each phrase, extracted
 - Each retailer's organic results position
 - Whether retailer had a first-page ad based on each distinct search phrase



Key Variables

- **Net Organic Clicks**
 - Retailer's total organic clicks minus its organic clicks from name searches
- **Position:** Bins for retailer's average screen position
- **Name Recognition:** Bins for total number of name searches
- **Ads:** Number of times a retailer's ad was on page 1 of search results
- **Social Network Presence** (indicator)
- **Retailer Age** (years)
- **Web Only** (indicator)



Summary of Baseline Results

- Position and name prominence important
- Position effects overstated if ignore name prominence
- Ads enhance organic clicks
- Robust to including other potential controls

Table 3. Baseline Model
 Dependent Variable: ln(Net Organic Clicks on Google)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Position on Google</i>							
Poor	1.307 (0.226)*	1.328 (0.235)*	1.279 (0.230)*	1.258 (0.234)*	1.263 (0.238)*	1.221 (0.204)*	1.400 (0.212)*
Below Median	2.009 (0.220)*	1.846 (0.232)*	1.718 (0.229)*	1.707 (0.232)*	1.715 (0.237)*	1.761 (0.203)*	1.862 (0.208)*
Median	3.022 (0.223)*	2.479 (0.246)*	2.264 (0.250)*	2.277 (0.254)*	2.281 (0.259)*	2.234 (0.226)*	2.666 (0.225)*
Above Median	3.886 (0.223)*	2.993 (0.262)*	2.773 (0.276)*	2.811 (0.280)*	2.828 (0.287)*	2.881 (0.250)*	3.412 (0.242)*
Best	5.543 (0.223)*	3.925 (0.300)*	3.557 (0.344)*	3.499 (0.349)*	3.502 (0.358)*	3.475 (0.311)*	4.398 (0.290)*
<i>Name Recognition on Google</i>							
Poor		0.691 (0.224)*	0.729 (0.219)*	0.703 (0.223)*	0.731 (0.228)*	0.738 (0.201)*	
Below Median		1.094 (0.237)*	0.957 (0.234)*	0.942 (0.237)*	0.967 (0.242)*	1.042 (0.211)*	
Median		0.971 (0.239)*	0.896 (0.234)*	0.915 (0.237)*	0.944 (0.242)*	1.186 (0.220)*	
Above Median		1.045 (0.259)*	0.810 (0.256)*	0.894 (0.259)*	0.928 (0.264)*	1.183 (0.245)*	
Best		2.119 (0.299)*	1.858 (0.297)*	1.958 (0.301)*	1.980 (0.307)*	1.952 (0.282)*	
ln(# Ads on Page 1)			0.253 (0.080)*	0.253 (0.081)*	0.249 (0.083)*	0.289 (0.072)*	0.379 (0.073)*
Social Network Presence				0.268 (0.221)	0.243 (0.225)	0.564 (0.197)*	0.480 (0.206)*
Retailer Age					0.006 (0.022)	0.018 (0.020)	0.016 (0.021)
Web Only Retailer						0.107 (0.145)	-0.206 (0.144)
Constant	Yes						
Retailer Category Indica	No	No	No	No	No	Yes	Yes
Observations	759	759	759	759	759	759	759
Pseudo R2	0.35	0.38	0.39	0.39	0.39	0.43	0.40

Notes: Standard errors in parentheses. *significant at 5%.



Potential Worries With Baseline Results

- Measure of name prominence (name clicks at Google) potentially correlated with errors
 - Show results robust to using name clicks at Bing as measure of name prominence
- Name prominence measure includes “buy camera at amazon.com” rather than pure “navigational” searches
 - Show results robust to more narrow definition of name search
- Use of bins might “mask” importance of being on page 1
 - Show results robust to using number of results on page 1 rather than bins



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Principle Worry: Endogeneity of Position and Ads

- Search engines have incentives to provide users with organic results and ads that are “relevant”
- Position & ads may depend on past clicks
 - OK if predetermined at time of actual clicks, but engines continually refine algorithms
- Position & ads on Google may be correlated with error in regression
 - Use position and ads on Bing as instruments for position and ads on Google

Table 5: Specifications Controlling for Endogeneity of Position and Ads
 Dependent Variable: ln(Net Organic Clicks on Google)

Variable	(1) Two-Stage Ordered Probit	(2) Two-Stage Least Squares
<i>Position on Google</i>		
Poor	-0.475 (0.293)	
Below Median	0.455 (0.274)	
Median	0.825 (0.256)*	
Above Median	1.129 (0.270)*	
Best	1.420 (0.252)*	
ln(Page 1)		1.115 (0.190)*
<i>Name Recognition on Bing</i>		
Poor	1.158 (0.256)*	1.049 (0.273)*
Below Median	1.648 (0.227)*	1.299 (0.277)*
Median	1.916 (0.212)*	1.325 (0.296)*
Above Median	2.149 (0.221)*	1.277 (0.317)*
Best	2.832 (0.328)*	1.801 (0.358)*
ln(# Ads on Page 1)	0.815 (0.070)*	0.010 (0.188)
Social Network Presence	0.093 (0.217)	0.245 (0.234)
Retailer Age	0.069 (0.026)*	0.028 (0.024)
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Above Median	2.149 (0.221)*	
Best	2.832 (0.328)*	
ln(# Ads on Page 1)	0.815 (0.070)*	
Social Network Presence	0.093 (0.217)	
Retailer Age	0.069 (0.026)*	
Web Only Retailer	0.101 (0.183)	
Constant	Yes	
Retailer Category Indicators	Yes	
Observations	759	
Pseudo R2	0.53	
Sargan Test (p-value)		

Notes: Standard errors in parentheses. *significant at 5%.

Table 5: Specifications Controlling for Endogeneity of
Dependent Variable: ln(Net Organic Clicks)

Variable	(1) Two-Stage Ordered Probit
<i>Position on Google</i>	
Poor	-0.475 (0.293)
Below Median	0.455 (0.274)
Median	0.825 (0.256)*
Above Median	1.129 (0.270)*
Best	1.420 (0.252)*
ln(Page 1)	
<i>Name Recognition on Bing</i>	
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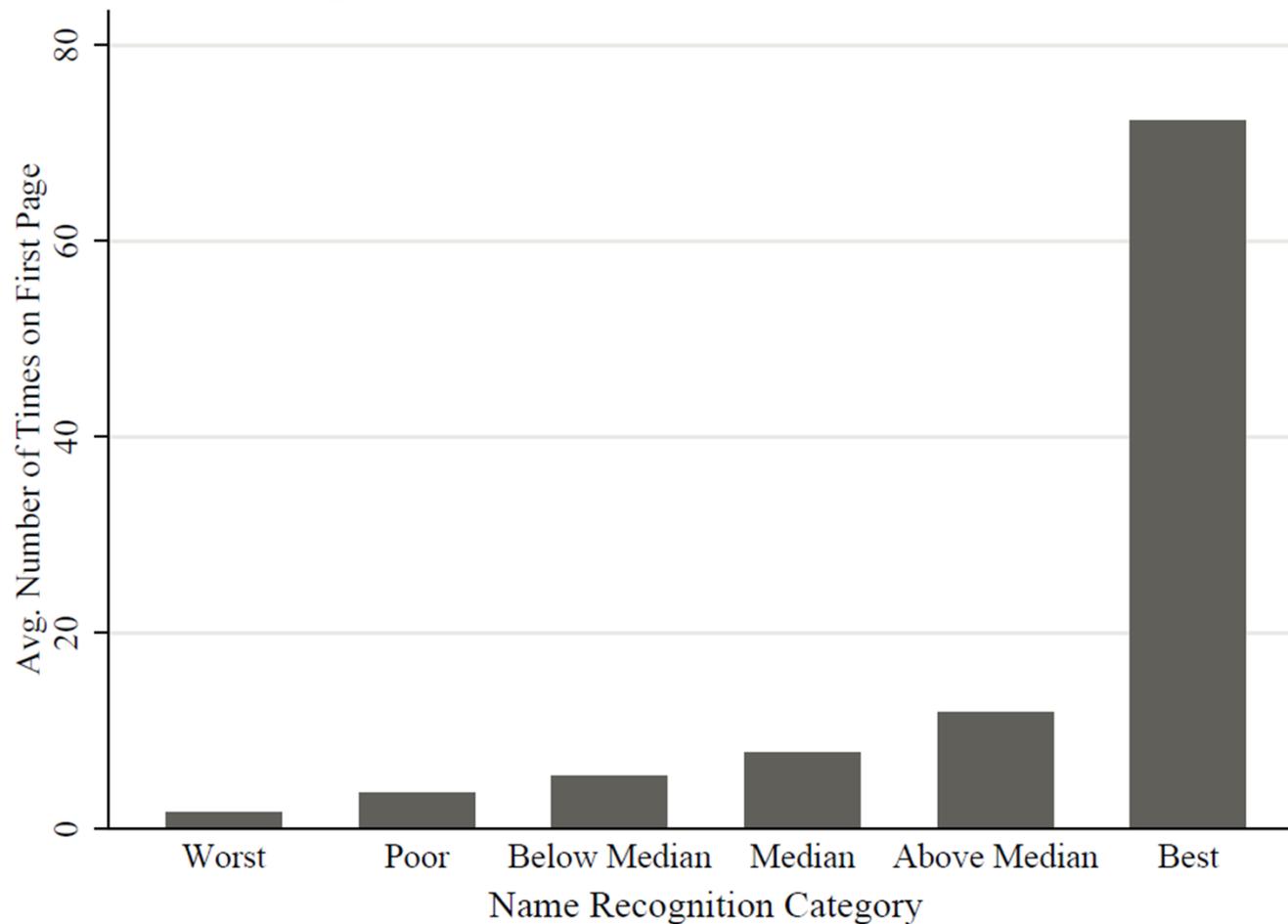


Total Effect of Name Prominence on Clicks

- Firms with more prominent names get more clicks; ultimately translates into better positions
- Effects of retailer investment in name recognition:
 - Direct effect: For a given position, more prominent retailers get more clicks
 - Indirect effect: More prominent retailers get better positions, leading to an additional clicks



Screen Position & Name Recognition



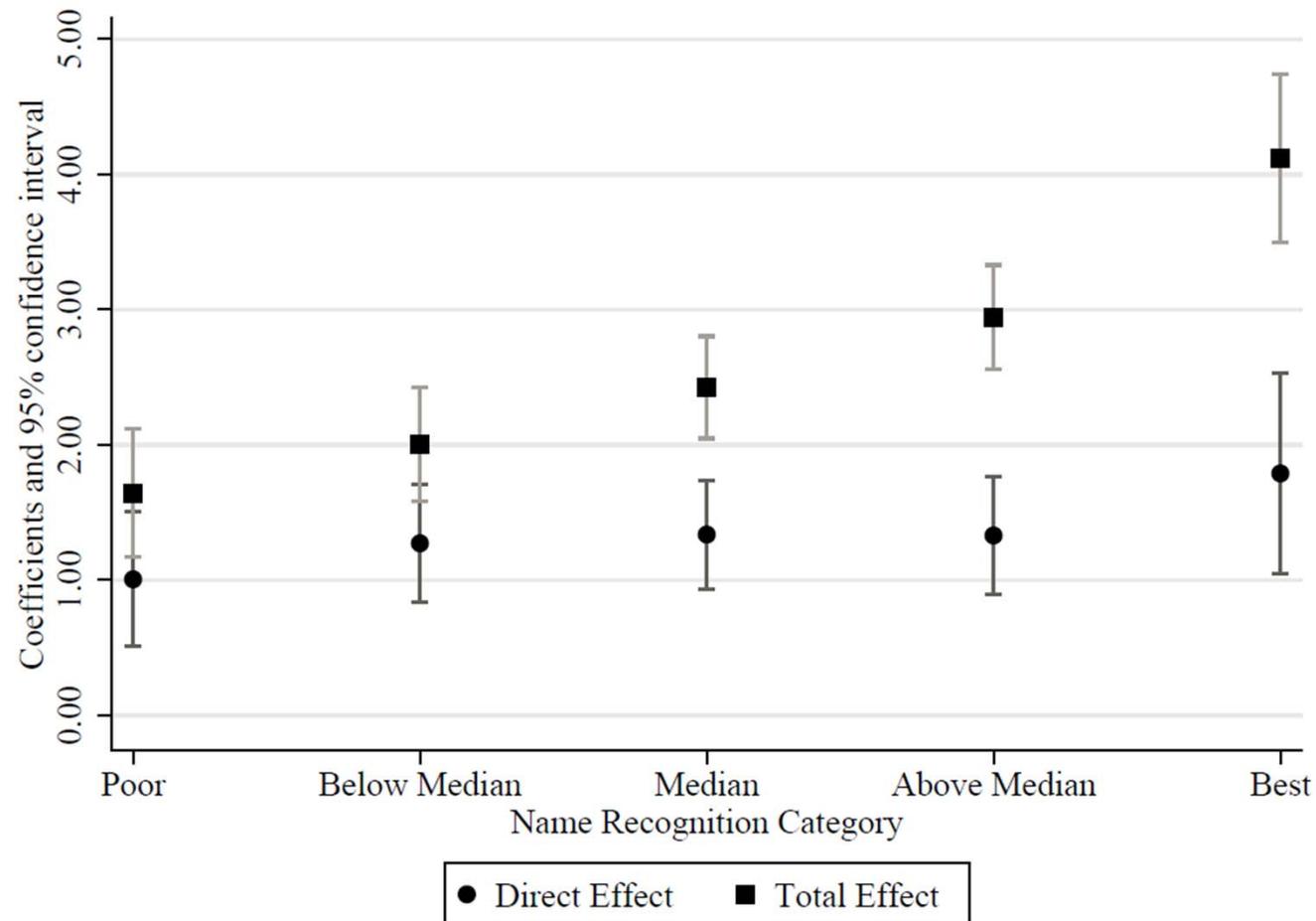


Unpacking the Effects of Name Prominence on Clicks

- Residualized regressions
 - Step 1: Regress position on name recognition; residual captures non-name determinants of position
 - Step 2: Regress clicks on residual and other controls
- Use both OLS as well as IV to control for potential endogeneity



Direct and Total Effects of Name Recognition





Other Robustness Checks

- Replicated the above analysis using search results at Bing rather than Google
 - Qualitatively similar results
- Disaggregated results by search term
 - Corrections for Censoring
 - Corrections for Endogeneity



Summing Up

- Name searches are a potentially useful measure of the “prominence” of retailer names
- Name and position prominence are both important determinants of clicks
- Magnitude of name effects greater than position effects when one accounts for
 - Endogeneity of positions and ads
 - Indirect effects of name prominence