

Paid Placement Strategies in Internet Search Engines

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May 7, 2002

The image shows a screenshot of the MetaCrawler.com search results page for the query "canada". The page features a yellow header with the MetaCrawler logo, a search bar containing "canada", and a "Search" button. Below the header, there are navigation options like "any", "all", and "phrase", and links for "Yellow Pages", "White Pages", and "Classifieds".

The main content area is divided into several sections:

- Are you looking for:** A list of links including "Canada Map", "Job Canada", "Canada Air", "Canada 411", "Government Of Canada", and "Canada Weather".
- Sponsored by: Orbitz**
- Find results for "canada" on the Yellow Pages!** with a link to "Get Pricing / Information on "canada"". This section is annotated with "Paid placement".
- Results for "canada" 1 to 20 of 77 results** with "View by: Relevance | Site | Source" and "You just searched these search engines: About, Ask Jeeves (DirectHit), FindWhat, Kanoodle, LookSmart, Open Directory, Overture, S...".
- Featured Search Results:**
 - SkyAuction.com: Bid on Canada** - Auctions start at just \$1. Coach to first-class international and dom safari adventures, and more. <http://www.skyauction.com>
 - Great Canada-Fishing Brochure** - Canada fishing adventures in Saskatchewan at Selwyn Lake Lodge. Download and print free travel brochure. <http://www.quickbrochures.net>
 - Save Up To 75% On A Canada Cruise!** - The best way to see Atlantic Canada is on a cruise, and we <http://www.vacationstego.com>
- MetaCrawler Results:**
 - National - canada.com network**
 - Ask Jeeves (DirectHit):* **canada.com** is a full service portal for personalized information and services business and people directory - and more.
 - Open Directory:* E-mail at **canada.com**
 - Fast:* **canada.com** is a full service portal for personalized information and service... 1000, <http://www.canada.com/> (*Ask Jeeves (Direct Hit), Open Directory, Fast*) | [More Like This](#)
 - About Canada | Canada Site**
 - Ask Jeeves (DirectHit):* On this page you will find information about **Canada**. Our history, culture, len

Annotations on the left side of the image:

- Paid placement:** A line points to the "Find results for 'canada' on the Yellow Pages!" section.
- Regular listing:** A line points to the "National - canada.com network" section.

Figure 1: Paid placement in MetaCrawler.com

Outline

- Search Engines as Information Gatekeepers
- Paid Placement and Bias
- Optimal Bias in Monopoly Setting
- Competition between Gatekeepers: Optimal Bias and Effects
- Conclusion

Search Engines as Information Gatekeepers

- Huge amount of information on the internet and Web: Over 800 million pages, 6 terabytes of text data, on 2.8 million servers
Lawrence & Giles (1999)
- Need for guided search: search engines are crucial entry points
100 million queries are made on US search engines each weekday
- More generally, need for information, advice and recommendations with regard to decisions and alternatives

Information gatekeeper: able to influence decision making using

- vast repository of information
- expertise on the topic
- algorithms for matching alternatives to requirements

Other examples: comparison shopping engines, recommender systems, bestseller lists, ...

Evolution of Search Engines

- Begin as independent, free service, later supported by advertising revenues
- Revenue problem is critical
- Paid placement: content provider pays gatekeeper in return for prominent placement
 - Deliberate perturbation of result to benefit paid provider
 - Provider: Increase clickthroughs or conversion rate
 - User: Negative impact on perceived quality and credibility

Analogy: *pay-for-play* in radio industry

Paid Placement in Search Engines

Meta Search	Paid Links	Total Links	% Paid
Dogpile	30	35	86
qbsearch	66	98	67
MetaCrawler	13	25	52
Mamma	6	15	40
Search.com	10	29	34
ProFusion	2	14	14
Ixquick	1	10	10
Vivisimo	0	20	0

Table 1: Percentage of paid links on first page of results

Research Questions

- Tradeoff between placement and user-based revenues: What is the optimal bias strategy?
- Impact of gatekeeper quality and other factors on optimal bias?
- How does competition influence bias levels and user welfare?
- Longer-term prospects for gatekeeper market structure?

Literature Review

- Bhargava-Choudhary (2001b)
- Corbett-Karmarkar (1999)
- Baye-Morgan (2001)
- Dewan-etal (2001)

Model of Paid Placement

- Gatekeeper quality as perceived by user
 - x : Paid links
 - q : other measures (e.g., database size; user interface; retrieval algorithm, response time)
 - $L(q)$: Size of consideration set, $L_q(q) > 0$
limited by cognitive and cost constraints
 - $\frac{x}{L(q)}$: Relative bias level
- $M(q, x) \equiv M(x)$: User demand for search service at bias x
 $M_q(q, x) > 0, M_x(q, x) < 0,$
- s : value per user
- γ : fee for paid placement

- Demand for search service

$$M(x) = aq\left(1 - \left(\frac{x}{L(q)}\right)^2\right)$$

- $L(q) = L\sqrt{q}$
- Quality-adjusted demand function for paid placement

$$\gamma = bM - cx$$

- Gatekeeper's revenues

$$sM(x) + \gamma x$$

Optimal Bias Level for Single Gatekeeper

Tradeoff between User-based revenues and Placement Revenues

- Optimal Bias

$$x^* = \frac{\sqrt{(sa + cL^2)^2 + 3a^2b^2L^2q} - (sa + cL^2)}{3ab}$$

- Increase in q allows search engine to increase paid placement links and total profits
- Increase in per user profit, s , decreases paid placements, increases market coverage M , and improves total profits π
- Increase in $L(q)$ allows search engine to increase paid placement links x^* and total profits π

Importance of good UI design: e.g., iLOR

Competition between Identical Gatekeepers

- Identical quality level q
- Bias levels x_1, x_2
- User demand

$$M(x_i; x_j) = \begin{cases} M(x_i) - \frac{1}{2}M(x_j) & \text{if } x_1 \leq x_2 \\ \frac{1}{2}M(x_i) & \text{if } x_1 > x_2 \end{cases}$$

Optimal Bias Levels

- If $x_1 > x_2$ then

$$\Omega_1(x_2) = \frac{\sqrt{(sa + 2cL^2)^2 + 3a^2b^2L^2q} - (sa + 2cL^2)}{3ab}$$

is lower than the monopoly bias level

- If $x_1 \leq x_2$ then optimal response to search engine 2's bias level is

$$\Omega_1(x_2) = \frac{\sqrt{(sa + cL^2)^2 + \frac{3}{2}a^2b^2L^2q + \frac{3}{2}abx_2^2L^2} - (sa + cL^2)}{3ab}$$

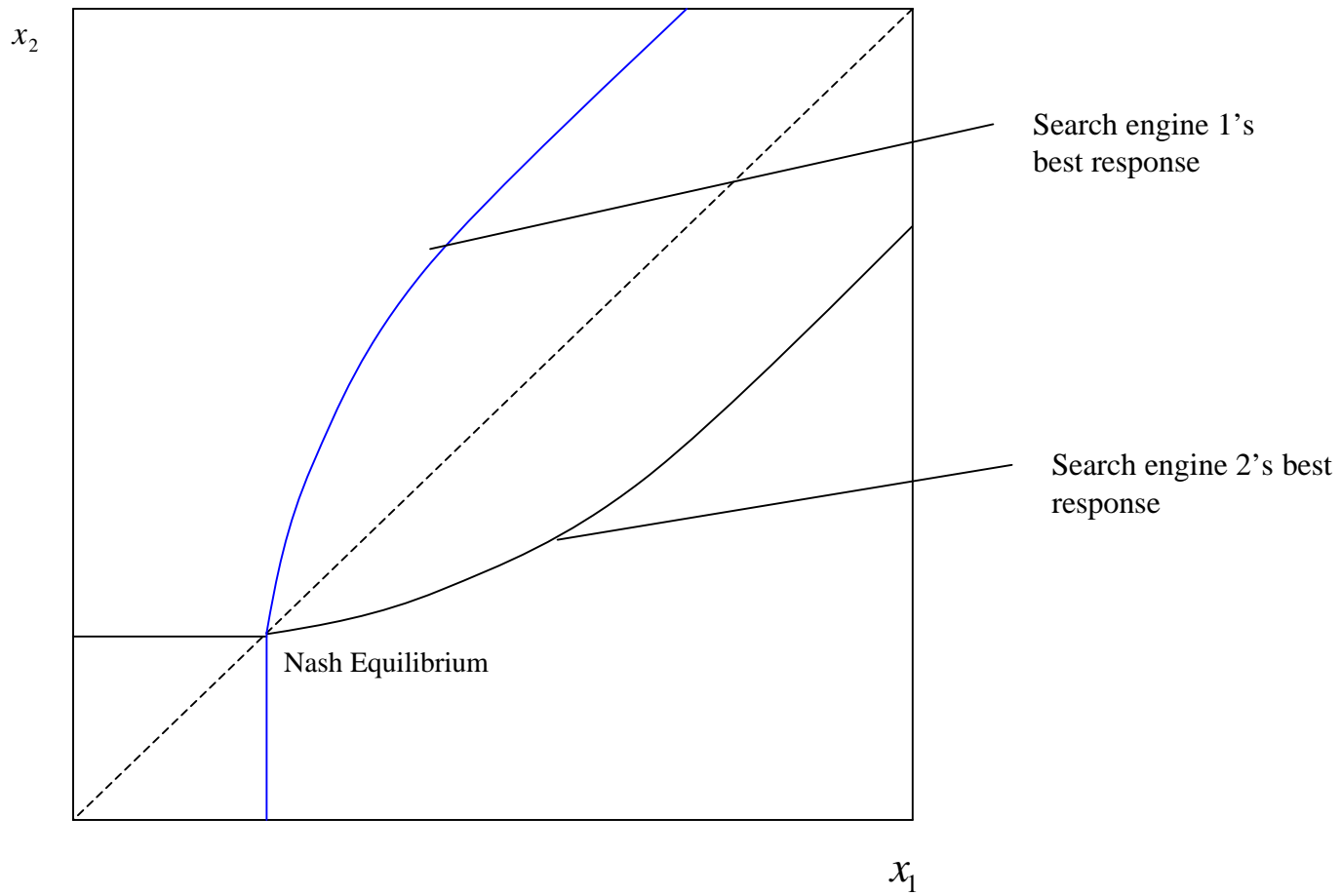


Figure 3: search engine's best response function when they have same qualities

- Unique Nash equilibrium

$$x_1^* = x_2^* = \frac{\sqrt{(sa + 2cL^2)^2 + 3a^2b^2L^2q} - (sa + 2cL^2)}{3ab}$$

is below optimal monopoly bias level

- Competition causes increase in users' welfare; reduces surplus of content providers and search engines

Find: canada

Search Where's

Powered By Ask Jeeves

Try these:

- Canada Map
- Job Canada
- Canada Air
- Immigration To Canada
- Canada 411
- Government Of Canada

Partner Search Results

SkyAuction.com: Bid on Canada -- www.skyauction.com
Auctions start at just \$1. Coach to first-class international and domestic airline tickets, hotel rooms, cruises, all-inclusive island getaways, African safari adventures, and more.

Great Canada-Fishing Brochure
Canada fishing adventures in Sask in luxury lodge, world-class pike, tr brochure.

Save Up To 75% On A Canada C
The best way to see Atlantic Cana

Travelzoo - Guide to Canada De
Travelzoo lists the best sales, spec

Study Abroad in Canada -- canad
Studyabroad.com contains informa abroad programs. Programs are o

My List - Microsoft Internet Explorer

remove from list
email selections
make favorites

National - canada.com network
 Statistics Canada - profiling Canada's business, economy and society. / Statistique Canada -
 Government of Canada Site | Site du gouvernement du Canada

Popular Web Sites for "canada"

About Canada | Canada Site -- http://canada.gc.ca/canadiana/cdaind_e.html
On this page you will find inform da. Our history, culture, language, sports, society, Canadians, events etc

Yahoo! Canada -- http://www.yahoo.ca/
Computers & Internet stocks, news and more Yahoo! Finance Click Here! Yahoo! Canada Make Yahoo! Canada your home page Government Entertainment Education Business & Economy Arts & Humanities Also out this week: Yahoo! Movies India successfully tests...

National - canada.com network -- http://www.canada.com/
canada.com is a full service portal for personalized information and services including travel, auto, careers, finance, free e-mail, news, shopping, sports, a business and people

Next Results >>

Keyword Search
Instant Access

- DMV Records
- Social Security
- Military Records
- Criminal Records
- Public Records
- Driving Records
- Sex Offenders
- State Agencies
- Federal Government

Pop-up window where users store the list they choose

Pop-up window where user can perform the operation

Figure 2: iLOR's first result page when searching "Canada"

Competition with Heterogeneous Qualities

- Quality levels q_1, q_2 , $q_1 > q_2$
- Bias levels x_1, x_2
- User demand

$$M(q_i, x_i; q_j, x_j) = \begin{cases} M(q_i, x_i) - \frac{1}{2}M(q_j, x_j) & \text{if } \tilde{x}_1 < \tilde{x}_2 \\ \frac{1}{2}M(q_i, x_i) & \text{otherwise} \end{cases}$$

$$\tilde{x}_i = q_i \left(1 - \frac{x_i}{L^2 q_i} \right)$$

Optimal Bias Levels

- If $\tilde{x}_1 \geq \tilde{x}_2$ then

$$\Omega_1(x_2) = \frac{\sqrt{(sa + 2cL^2)^2 + 3a^2b^2L^2q_1} - (sa + 2cL^2)}{3ab}$$

is lower than the monopoly bias level

- If $\tilde{x}_1 < \tilde{x}_2$

$$\Omega_1(x_2) = \frac{\sqrt{(sa + cL^2)^2 + 3a^2b^2(L^2q_1 - \frac{1}{2}L^2q_1 + \frac{1}{2}x_2^2)} - (sa + cL^2)}{3ab}$$

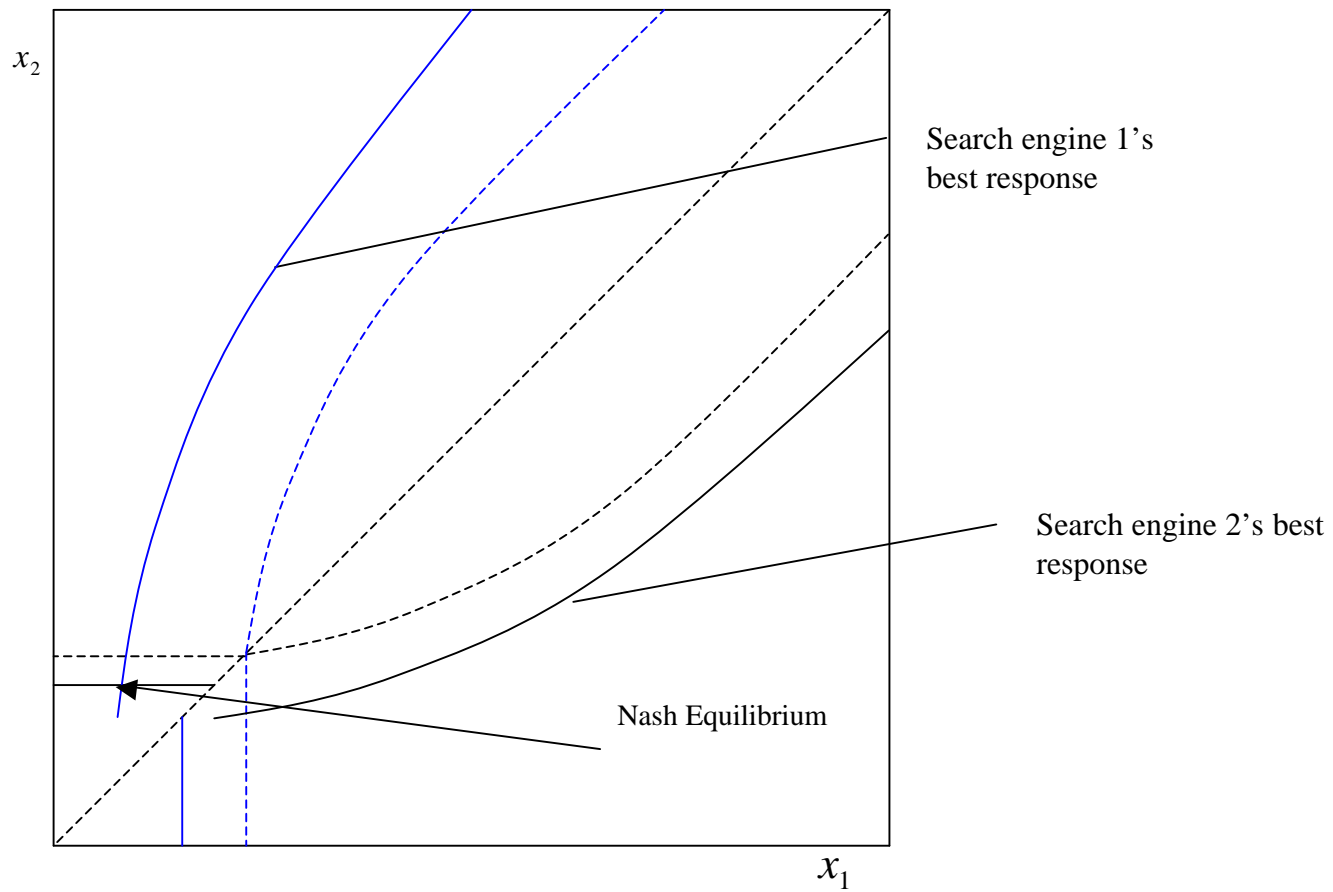


Figure 4: When L is small, higher quality search engine (1) has lower bias level.

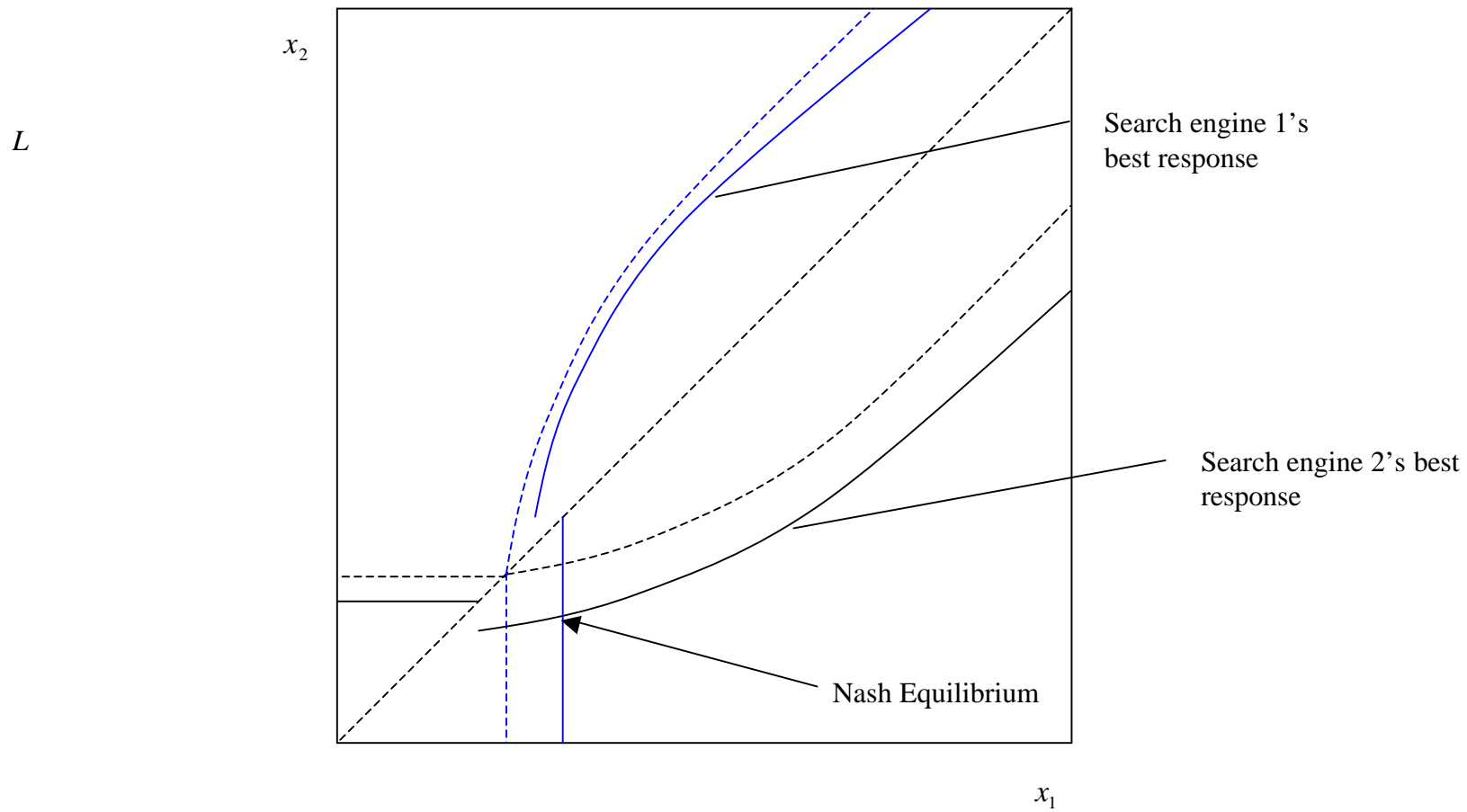


Figure 5: When L is large, higher quality search engine (1) has higher bias level.

Equilibrium Bias Level

- Lower quality search engine (2) will decrease its bias level below monopoly case
- Higher quality search engine (1) will
 - Increase bias below monopoly level if users have “high” tolerance for paid links
 - Decrease bias level if user tolerance is “low”

Increase in $L(q)$ gives increases search engine 1's ability to increase its bias level

Conclusions and Future Work

- Economic logic of paid placement
- Competition between search engines reduces bias level
- Long-term viability of *free* and *fair* search engines?
- Prospects for market segmentation and fee-based search engines?