

Search (Non-)Neutrality and Impact on Innovation

[Short talk]

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The search neutrality debate, as a parallel to the network neutrality debate, is raging worldwide, with search engines accused of biasing the ranking of their organic links to provide a competitive advantage to their own content. Search neutrality has been and is still discussed by governments and regulators, such as in the US by the Federal Trade Commission and in a Senate hearing, or in Europe where Google is facing a \$6 billion fine. In a recent paper [1], we have designed a model and determined the optimal ranking policy for a search engine as a trade-off between short-term revenue (based on the potential immediate gain from high-ranked links) and long-term revenue (based on the satisfaction of users due to the relevance of the ranking). We here apply this model to investigate on an example whether non-neutrality impacts innovation. We illustrate that a revenue-oriented search engine may indeed deter innovation at the content level, hence the validity of the argument (without necessarily meaning that search engines *should* be regulated).

The search engine (SE) model and the corresponding results (revenue-maximizing ranking policy) are described in full detail in [1]. A summary of the model and a description of how it is used to develop further the content innovation aspect is in [2].

We consider that among 10 pages corresponding to a given request—offered by different content providers (CPs), one exactly (say, page number 1, or CP 1, for simplicity) is served directly by the SE while the others are served by third parties. To consider the impact on innovation, we assume that CP 2 invests in quality and manages to improve its relevance distribution.

The summary of our numerical results in [2] are illustrated in Figure 1:

- For a neutral ranking, CP 2 logically makes more revenue than the other CPs, since it regularly gets higher ranking. However, when the SE increases the weight of the immediate gain in the ranking (non-neutral revenue-maximizing ranking), CP 1 becomes the one with highest revenue, despite its (stochastically) lower relevance.
- We also take the perspective of CP 2, and compute its optimal decision. CP 2 invests in quality to modify its rele-

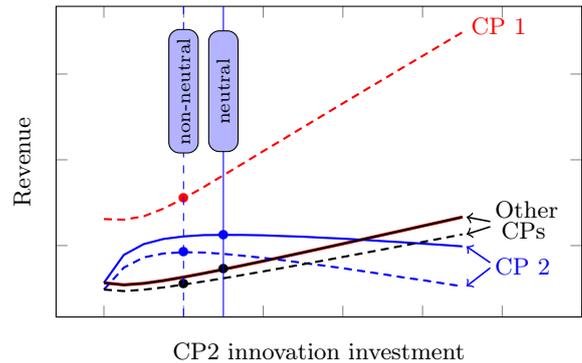


Figure 1: Revenues of all CPs

vance distribution, anticipating that the SE is going to rank requests according to the optimal policy of [1]. The profit of CP 2 is the revenue from the search market, minus the investment cost. We find that the difference between neutral and non-neutral revenues is very large for CP 1. For CP 2, the difference increases with the investment in quality, for two reasons: *i*) CP 2 is impacted more frequently by the non-neutral ranking (being more often the best CP, it is more often artificially put behind CP 1), and *ii*) CP 1 also benefits from the attractiveness that CP 2 creates, hence a large number of visits, and can afford to be even “less neutral”. As a result, investments made by CP 2 benefit for a very large part to CP 1, and a bit to the other CPs due to the higher overall visit rate. But CP 2 is significantly hurt by non-neutrality. With our numerical values, in a non-neutral regime, CP 2 would select 33% less investment than in a neutral one, and obtain a net revenue 18% less.

1. REFERENCES

- [1] P. L'Ecuyer, P. Maillé, N. Stier-Moses, and B. Tuffin. Revenue-Maximizing Rankings for Online Platforms with Quality-Sensitive Consumers. Technical report, Inria, Feb. 2014. <https://hal.inria.fr/hal-00953790>.
- [2] P. L'Ecuyer, P. Maillé, N. Stier-Moses, and B. Tuffin. Search (Non-)Neutrality and Impact on Innovation. Technical report, Inria, June 2016. <https://hal.inria.fr/hal-01330741>.