Do Online Social Networks Increase Welfare?

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  - Average user's friends generate: 712 "likes", 790 shared items, 55 pictures daily

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- The more information is generated, the higher the OSNs control on social information flows
- What are the objectives and incentives of OSNs?
- The main revenue source of OSNs is advertising
  - 92% in case of Facebook

Introduction: Some Quotes

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- We model an online social network as strategic agent with own incentives
- **Question:** How do financial incentives of OSNs affect social information flows and social welfare?
  - OSN enable social learning and hence might increase welfare
  - But OSN might distort information towards more lucrative but welfare inferior outcomes

The Model: Firms and Consumer

- Two firms $j = 1, 2$
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  - Utility is given by quality of chosen product minus search costs

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- **Organic virality:** With probability v_B each late consumer independently observes the purchases of $k = 1$ uniformly drawn early consumer
  - Late consumers update their belief over Q^2 rationally

The Model: Banner Advertising

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- Firms simultaneously select their social advertising expenditures m_1^s, m_2^s
  - Let ϕ_j be the measure of early consumers that bought product j
  - Conditional on observing a social ad, each late mover observes a purchase of product 1 independently with probability

$$\frac{\phi_1 m_1^s}{\phi_1 m_1^s + \phi_2 m_2^s}$$

The Model: Timing

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4. Early movers see display ads, sample and select a product
5. Late movers see display ads, might see early movers choice, sample and select product

Results: Only Banner Advertising

- **Proposition 1:** In every equilibrium both firms spend the same amount on banner advertising

$$m_1^d(\mathbf{q}, v_B, v_S) = m_2^d(\mathbf{q}, v_B, v_S).$$

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Theorem

In every equilibrium expected social welfare is strictly increasing in the baseline virality. If the equilibrium advertising expenditures are positive, then expenditures are strictly decreasing in the baseline virality.

Results: Banner and Social Advertising

- **Proposition 2:** In every equilibrium both firms spend the same amount on banner advertising and social advertising

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Theorem

In every equilibrium total advertising revenue is decreasing in v_B. Total advertising revenues are maximized at either $(v_B, v_S) = (0, 0)$ or $(v_B, v_S) = (0, 1)$ depending on (F_Q, F_C).

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- Sponsored social information
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$$\frac{\phi_1 m_1^s}{\phi_1 m_1^s + \phi_2 m_2^s}$$

Extension: Increasing the Density of OSN

Result

Theorem

As k grows large social advertising expenditures converge to zero in any equilibrium and for any viralities (v_B, v_S). The total advertising revenue in the maximal revenue equilibrium is smaller for large k than for $k = 1$.

Conclusion

- We model an online social network that
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- We find that in equilibrium
  - organic virality is shut down
  - social information flows are unbiased
  - but social information might be limited