

Ad Blocking, Whitelisting, and Advertiser Competition

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Ad blocking: a few facts

- **Ad blocker:** third-party software that prevents (some) advertisements being displayed on publishers' websites
 - 34% of internet users in the U.S. have installed an ad blocker on their desktop in 2021
 - 39% of internet users in Germany have installed an ad blocker on their desktop in 2021
- Ad blocker's business model: download for free (at least base version); do not block advertising on select publishers in return for a fraction of ad revenues (**whitelisting**)
 - Adblock Plus takes a 30% revenue share from ad revenues
- Market power of ad blockers
 - market for ad blockers highly concentrated
 - Adblock Plus with 95% market share in Germany

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Ad blocking: empirical results

- Indication of *advertising market* effects
 - ad blocking tends to decrease content provider revenues (Wilbur, 2008)
 - ad-blocking reduces publishers' revenues and consumers' visits of publishers' web site (Shiller et al., 2018)
- Indication of *product market* effects
 - “ad-blockers significantly decrease spending for heavy online advertisers as well as for brands that consumers have not experienced in the past” (Todri, 2022)

Ad blocking: theories on the effects of ad blocking

- Previous work: interaction between ad blocker and publishers; abstracts from the product market
 - publishers may increase the ad load since consumers with high nuisance cost block advertising (Anderson and Gans, 2011)
 - publishers may benefit from ad blocking because of price discrimination (Aseri et al. 2020; Depotakis et al. 2021)
 - publishers may reduce content quality in response to ad blocking (Anderson and Gans, 2011; Gritckevich et al. 2022)
- In this paper, we explore the strategic and welfare effects of ad blocking and whitelisting on **the advertising and product markets**

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Modeling setup

- Monopoly ad blocker; offers whitelisting at a fee
- Two publishers (1 & 2); offer one ad slot each (in a given product category)
- Two competing advertisers (A & B) offer imperfect substitutes
- Continuum of consumers; fraction α of which have installed the ad blocker
- Consumers visit both publishers and can buy those products about which they have seen an ad

Preview of some results

- No ad blocker
 - if the product market is highly competitive, then each advertiser wants to buy both ad slots to foreclose the rival
 - otherwise, each advertiser buys only one ad slot
- Ad blocker
 - ad blocker can find it optimal to induce *exclusive whitelisting*
 - *exclusive whitelisting softens* competition in the product market if both advertisers continue to buy one ad slot each
 - *exclusive whitelisting intensifies* competition in the product market if advertisers switch from foreclosure to buying one slot each
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Model: Timing

- 1 The ad blocker sets a uniform whitelisting fee
- 2 Publishers simultaneously decide whether to accept the ad blocker's offer
- 3 Publishers simultaneously set the advertising fee
- 4 Advertisers arrive in sequential order and decide on which publishers to advertise
- 5 Advertisers simultaneously set retail prices:
 - (today) advertisers set the same retail price to all consumers
 - (in the paper) advertisers price discriminate between consumers who use an ad blocker and those who do not

The model without ad blocker

- Define π^m and π^d as the monopoly and duopoly profits in the product market
- Consider the model w/o ad blocker. We show that publishers set $f_1 = f_2 = \pi^d$
 - suppose that $f_i < \pi^d$, then publisher i will sell it with prob 1 $\Rightarrow f_i \uparrow$
 - suppose that $\min\{f_1, f_2\} > \pi^d \Rightarrow$ the most expensive remain to be unsold \Rightarrow slightly undercut
- If $\pi^m < 2\pi^d$, then each advertiser buys one slot. Otherwise, advertiser A buys both ad slots and forecloses the rival

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Result without ad blocker

Proposition

Consider an environment without an ad blocker. In the equilibrium both publishers set fees $f_1 = f_2 = \pi^d$.

- If $\pi^m < 2\pi^d$, each advertiser buys an ad slot.
- If $\pi^m \geq 2\pi^d$, advertiser A buys the ad slot on each publisher's website.

Table: Net surplus without an ad blocker

	$\pi^m < 2\pi^d$	$\pi^m \geq 2\pi^d$
Publishers	$2\pi^d$	$2\pi^d$
Advertisers	0	$\pi^m - 2\pi^d$
Consumers	$CS(p^d, p^d)$	$CS(p^m, \infty)$

The model with ad blocker

- Suppose that ad blocker sets a whitelisting fee t
- Both publishers buy whitelisting
 - all consumers see ads on both publishers $\Rightarrow f_i = \pi^d$
- Only publisher 1 buys whitelisting
 - ad blocking consumers (α) do not see ads at publisher 2
 - suppose advertiser A buys the ad slot from the whitelisted publisher and advertiser B from the non-whitelisted publisher. Define their profits as π^w and π^{nw}
 - we show that $f_1 = \pi^w$, $f_2 = \pi^{nw}$
- The problem of the ad blocker
 - the highest fee to induce one publisher to buy whitelisting solves $\pi^w - t_1 = (1 - \alpha)\pi^d$
 - the highest fee to sell to both publishers solves $\pi^d - t_{1,2} = \pi^{nw}$
 - $t_1 > t_{1,2}$
 - the ad blocker chooses $t = \max\{t_1, 2t_{1,2}\}$

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 - $t_1 > t_{1,2}$
 - the ad blocker chooses $t = \max\{t_1, 2t_{1,2}\}$

Result with ad blocker

Proposition

Consider an environment with an ad blocker and advertisers setting uniform prices.

- If $\pi^w + 2\pi^{nw} < (3 - \alpha)\pi^d$, then the ad blocker provides whitelisting to both publishers at price $\pi^d - \pi^{nw}$, both publishers buy whitelisting and set $f_1 = f_2 = \pi^d$.
- If $\pi^w + 2\pi^{nw} \geq (3 - \alpha)\pi^d$, then the ad blocker whitelists a single publisher at price $\pi^w - (1 - \alpha)\pi^d$. The whitelisted publisher sets its fee equal to π^w and the non-whitelisted publisher sets π^{nw} .

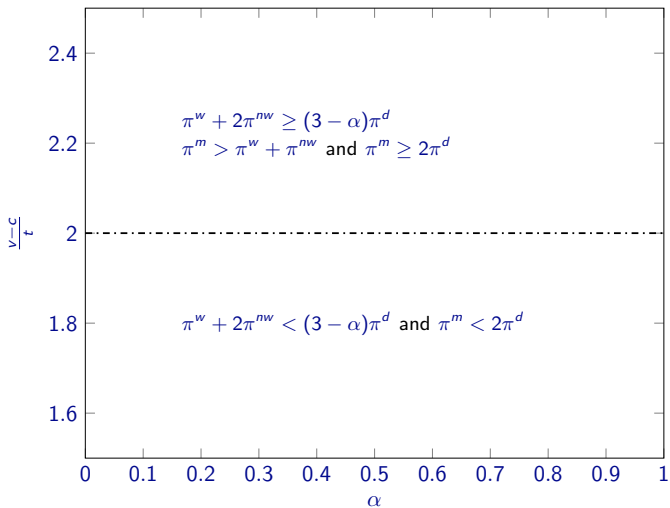
If $\pi^m \geq f_1 + f_2$, advertiser A buys the ad slot on each publisher's website and otherwise each advertiser buys one slot each.

Surpluses with ad blocker

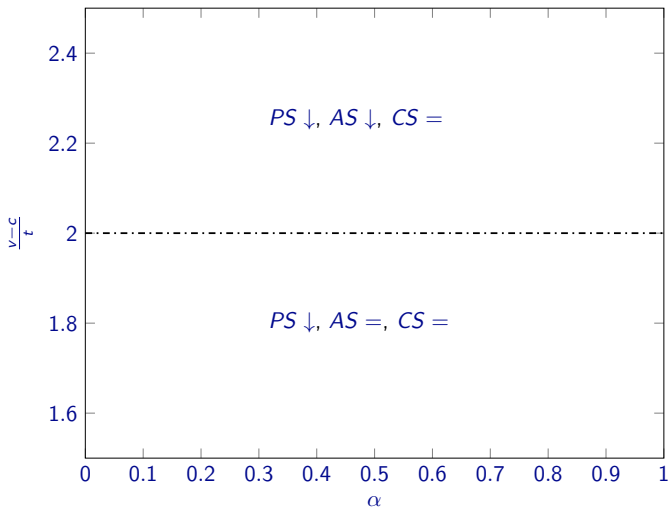
Table: Net surplus with an ad blocker

	$\pi^w + 2\pi^{nw} < (3 - \alpha)\pi^d$		$\pi^w + 2\pi^{nw} \geq (3 - \alpha)\pi^d$	
	$\pi^m < 2\pi^d$	$\pi^m \geq 2\pi^d$	$\pi^m < \pi^w + \pi^{nw}$	$\pi^m \geq \pi^w + \pi^{nw}$
Ad blocker	$2(\pi^d - \pi^{nw})$	$2(\pi^d - \pi^{nw})$	$\pi^w - (1 - \alpha)\pi^d$	$\pi^w - (1 - \alpha)\pi^d$
Publishers	$2\pi^{nw}$	$2\pi^{nw}$	$\pi^{nw} + (1 - \alpha)\pi^d$	$\pi^{nw} + (1 - \alpha)\pi^d$
Advertisers	0	$\pi^m - 2\pi^d$	0	$\pi^m - (\pi^w + \pi^{nw})$
Consumers	$CS(p^d, p^d)$	$CS(p^m, \infty)$	$\alpha CS(p^w, \infty)$ $+ (1 - \alpha)CS(p^w, p^{nw})$	$CS(p^m, \infty)$

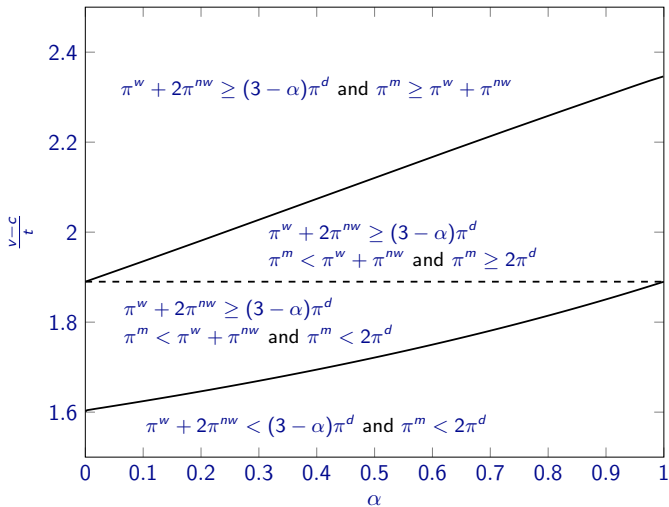
Hotelling model with linear transport cost



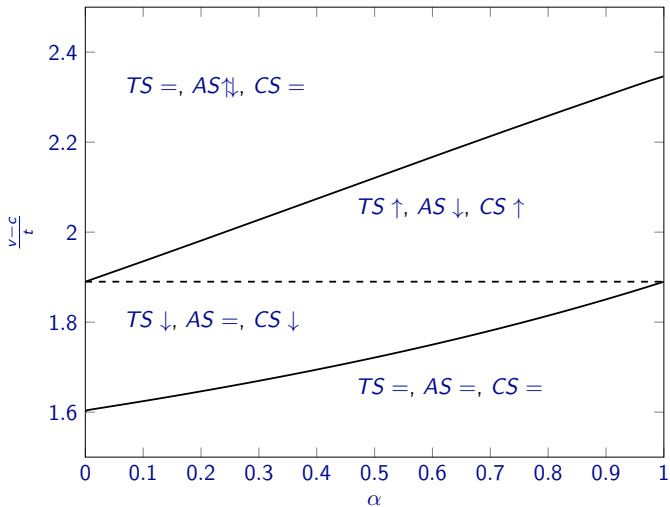
Hotelling model with linear transport cost (cont'd)



Hotelling model with quadratic transport cost



Hotelling model with quadratic transport cost (cont'd)



Publisher surplus

- Under ad blocking publisher profits are larger iff $\pi^{nw} + (1 - \alpha)\pi^d > 2\pi^d$.
- In Hotelling model, for sufficiently large values of α and $(v - c)/t$ publishers are better off
- The reason: the total fee that publishers charge becomes higher ($\pi^w + \pi^{nw} > 2\pi^d$)

What else is in the paper?

- Price discrimination in the product market
 - firms set different prices based on whether a consumer uses the ad blocker
 - exclusive whitelisting takes place if $\pi^m > 2\pi^d$
 - rents shifted from publishers to ad blocker
- Endogeneous ad blocker adoption: Upfront ad blocker installation
 - consumers might find it optimal to install the ad blocker if they expect that both publishers buy whitelisting
 - in this case no ad blocking without commitment
- Endogeneous ad blocker adoption: Committed ad blocker
 - ad blocker finds it optimal to commit to whitelist only one publisher and induce consumers to install the ad blocker

Conclusion

- Ad blocking with imperfect competition in the product market
 - Ad blocker charges for whitelisting one or both publishers
 - Viewers/consumers use both publishers (multihoming)
 - Advertisers compete in the product market and can expand demand through advertising with a publisher
 - Each publisher sells one ad slot
- Key findings
 - Ad blocking tends to come with whitelisting by one publisher
 - One of the advertisers fully or partially forecloses the competing advertiser
 - Ad blocker makes profits
 - Ad blocking does not simply shift rents from publishers to ad blocker
 - publishers sometimes gain and sometimes are worse off when an ad blocker is present
 - advertisers may be worse off when an ad blocker is present
 - consumers may be worse off when an ad blocker is present