

# Data Sharing and Website Competition: The Role of Dark Patterns

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NABE

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# Motivation: consumer data as asset

- Consumer data is a valuable input to firms' production functions.
  - Chen et al. (2023), Sun et al.(2022), Demirer et al. (2024), and many more.
- Consumer data includes very personal information.
  - Can be used inappropriately (Kao et al., 2023a and 2023b).
- Privacy regulation (GDPR, CCPA) and corporate privacy efforts (Privacy Sandbox, ATT).
  - Increase entry barriers and reduction in competition (Johnson et al., 2023a and 2023b, Aridor et al. (2024)).

# Regulation and consent

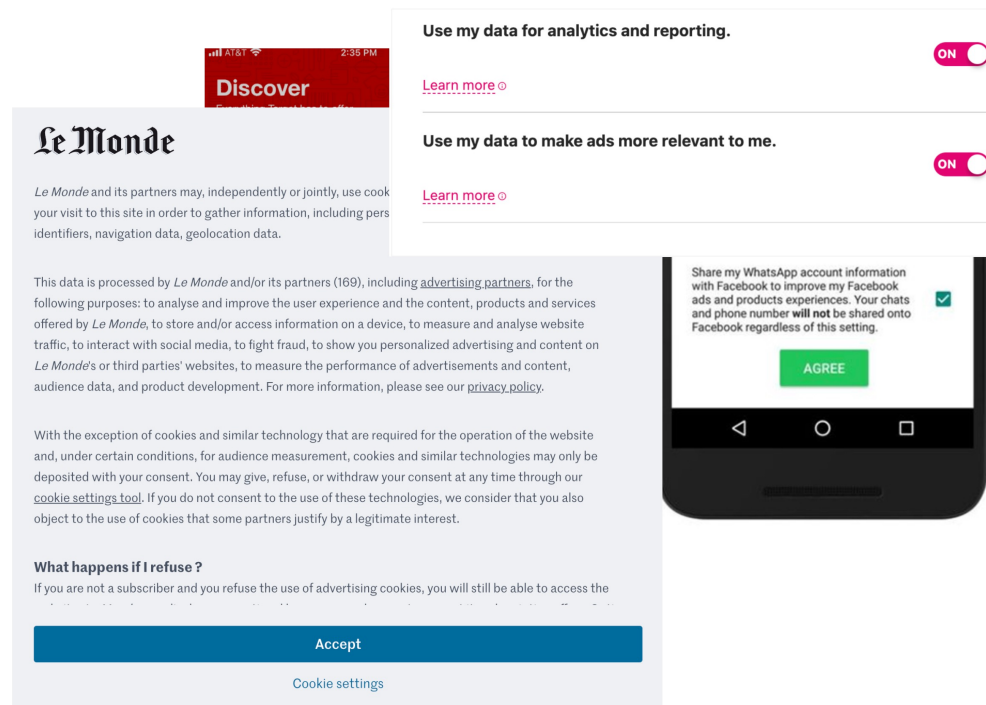
Data protection regulations require companies to obtain consumer permission to use data.

What constitutes consent (GDPR):

- Consent must be “freely given, specific, informed and unambiguous.”
- Requests for consent must be “clearly distinguishable from the other matters” and presented in “clear and plain language.”
- Data subjects can withdraw previously given consent whenever they want, and you have to honor their decision.

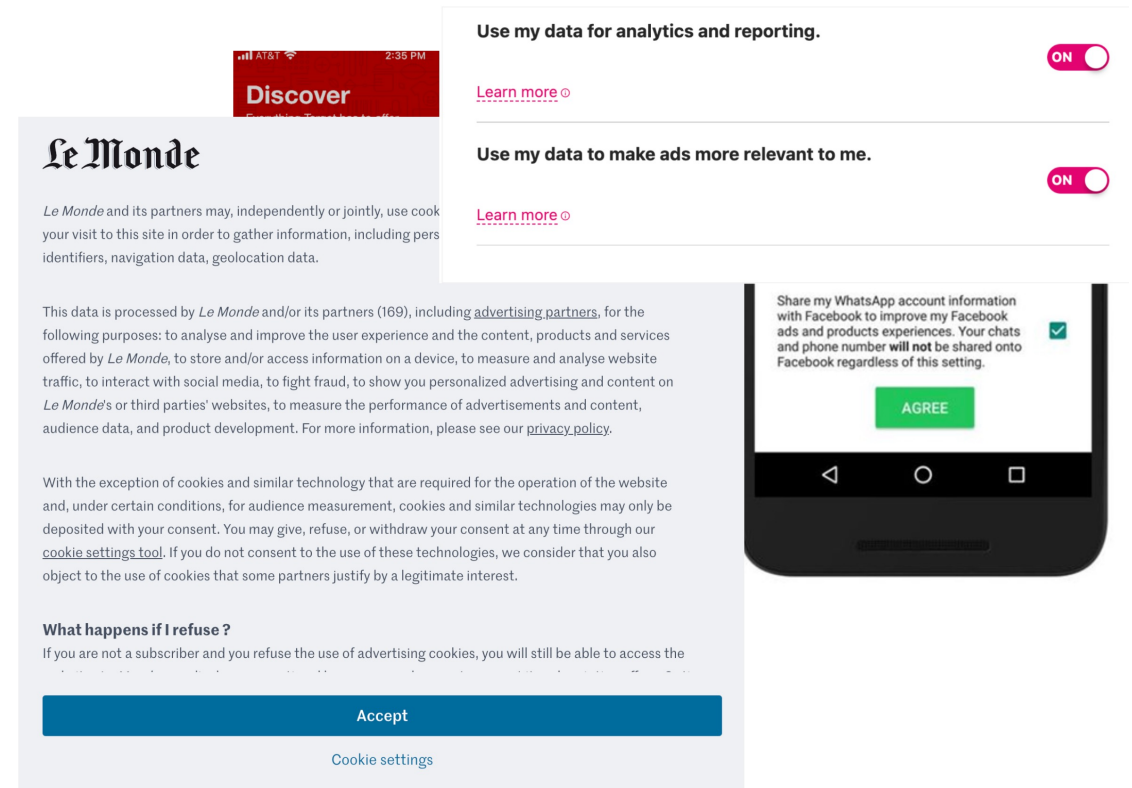
# Firms use 'dark patterns' to obtain consent

- *Dark Pattern*: a term used by designers to describe interfaces that make it hard for users to reject data sharing.



# Dark patterns are routinely used for data collection

- 57.4% of EU Websites.
- 80%+ of top 10,000 websites in the UK.
- Easy to implement using consent management platforms such as OneTrust, Cookiebot, TrustArc, etc...



Source: Utz et al. (2020), Nouwens et al. (2020)

# Research questions:

**How do “dark patterns” affect consumers’ privacy choices?**

**How do effects differ across websites and users?**

**Is there choice fatigue due to frequent pop-ups?**

# Roadmap:

1. Experimental design

2. Results

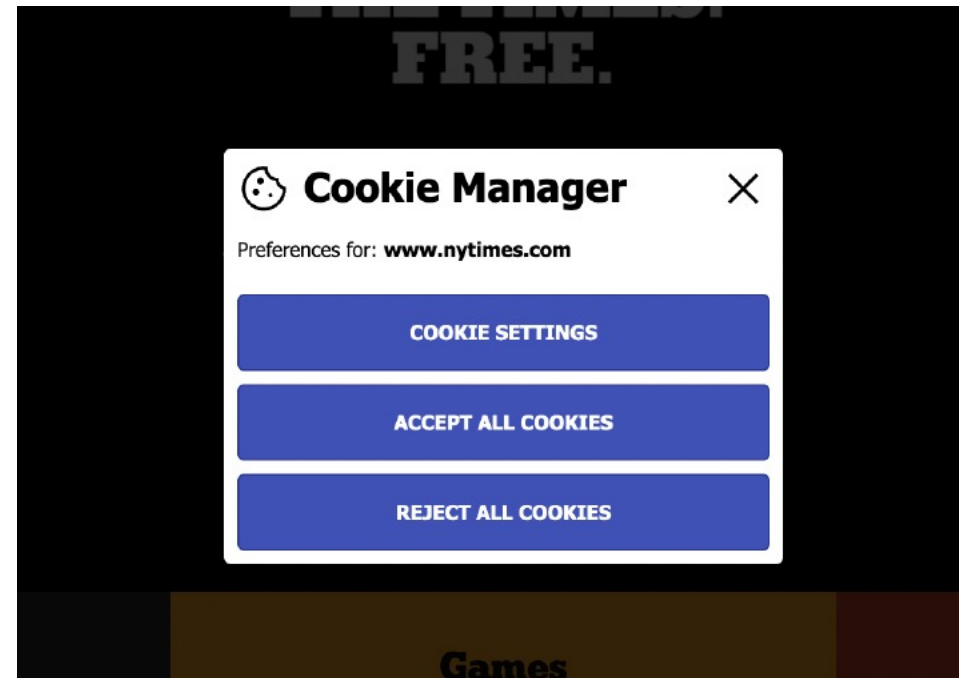
3. Conclusion

# Cookie Manager

A browser extension and cloud server infrastructure that can:

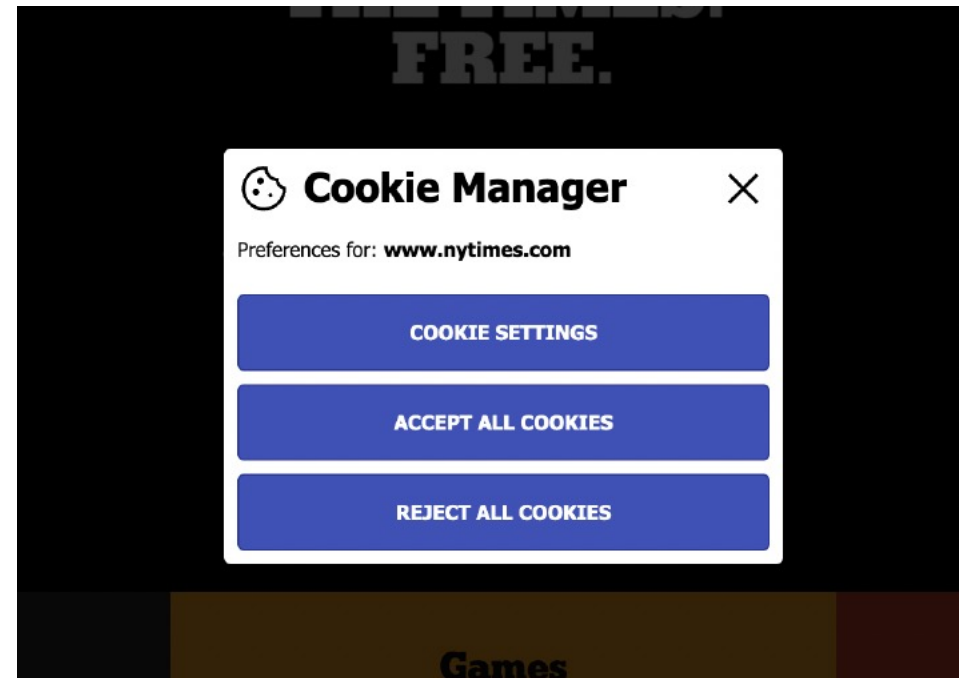
- Manipulate your browsing experience;
- Track your browsing behavior;
- Prompt you to complete additional tasks.

Based on webmunk.org



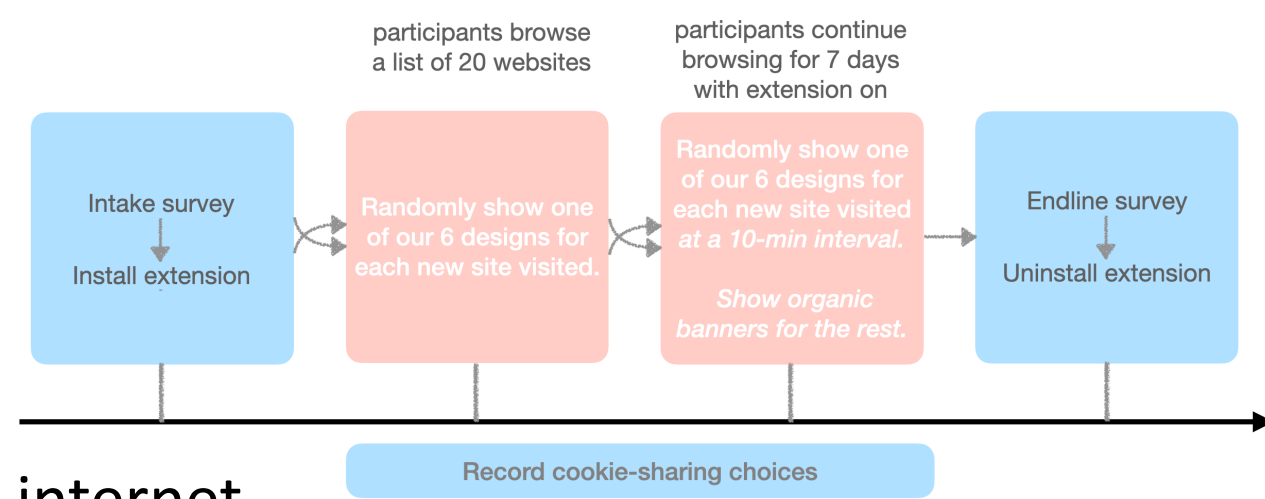
# Cookie Manager's capabilities

- Create a cookie consent pop-up as users browse the internet.
- When possible, enforce the choices users make by acting on organic pop-up if it exists.
- Prompt users to finish surveys and uninstall extension.
- Record browsing and cookie interactions.

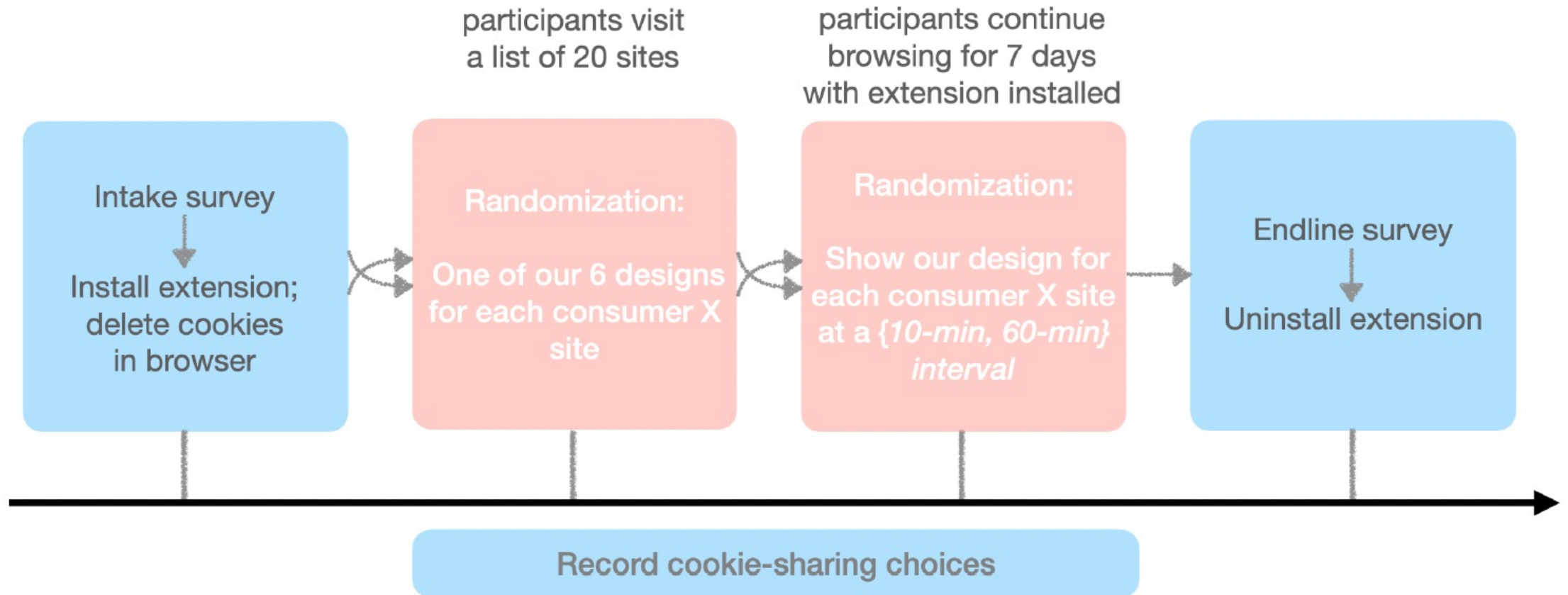


# Research design

- Recruitment through Prolific.
- Eligibility: use chrome to browse the internet.
- Install extension.
- Clear cookies.
- Visit 20 websites:
  - {news, e-commerce, entertainment/social media, search} X {large x small}.
  - E.g., Amazon v. Poppin; Google v. DuckDuckGo.
  - Make cookie preference selections for each of the 20 websites.
  - We enforce selection to the extent possible (~ Consent-O-Matic).
- Keep extension for following week:
  - Make cookie preferences when prompted to do so.
  - Random pop-up frequency: 10 min vs. 60 min.



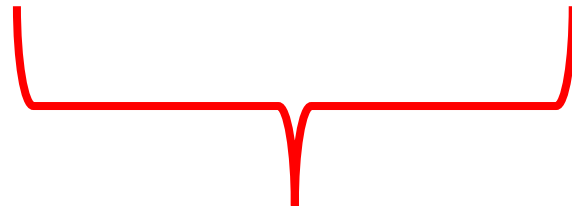
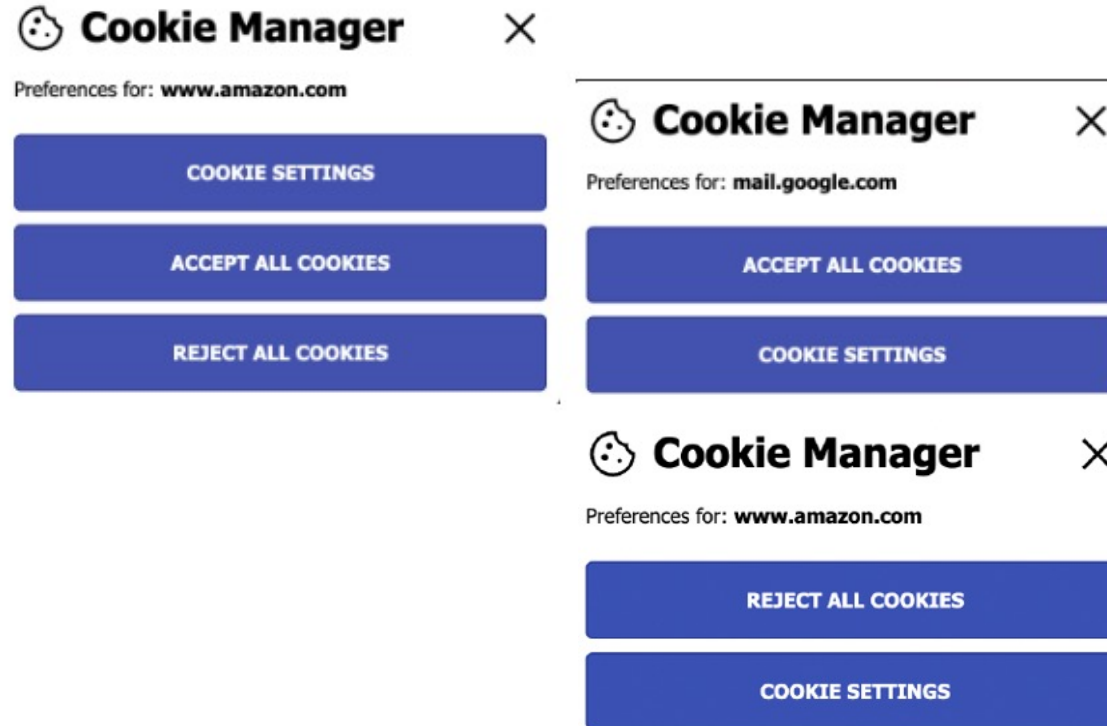
# Visual Representation of Experiment



# Treatment banner design

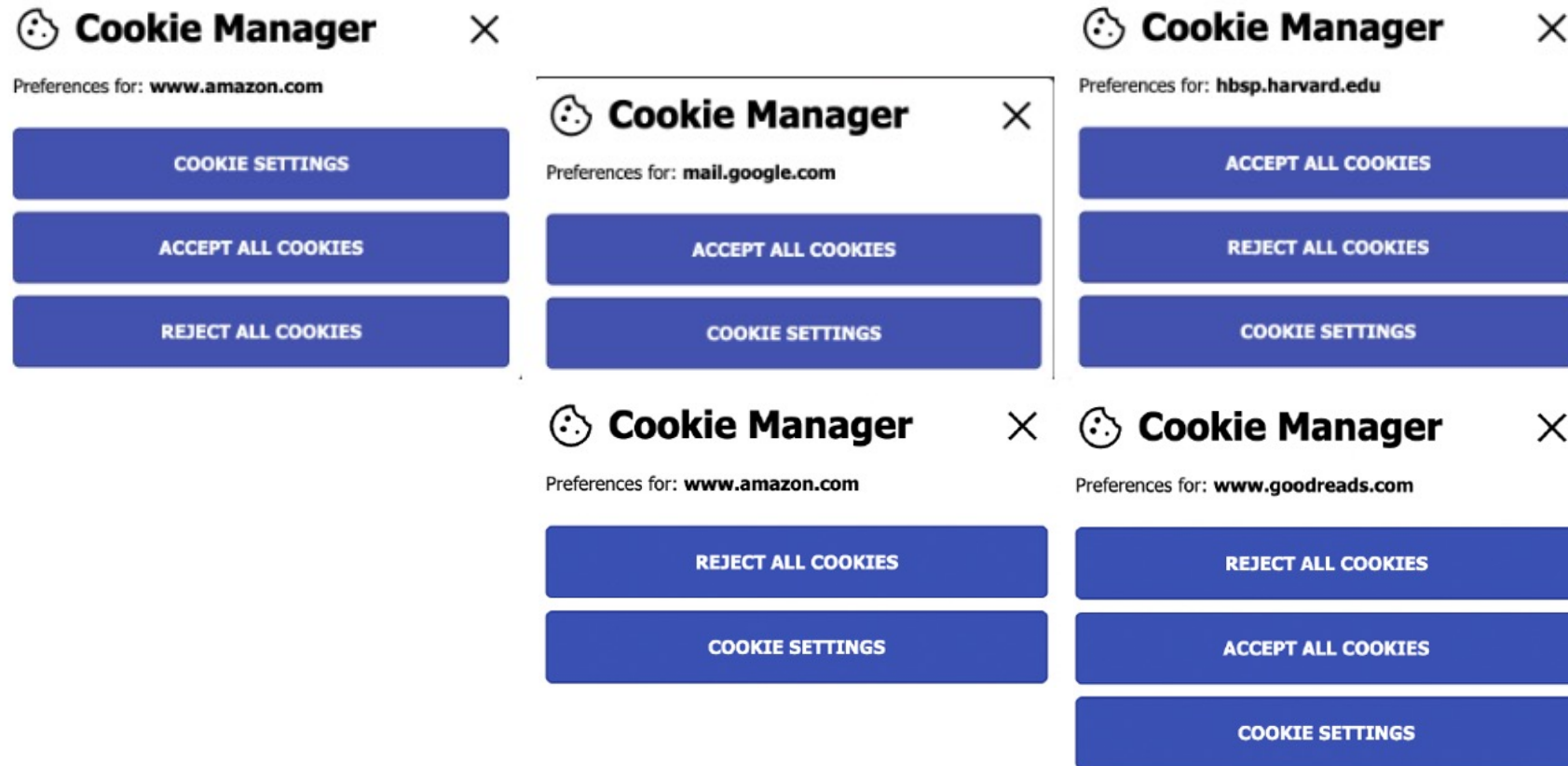


# Treatment banner design



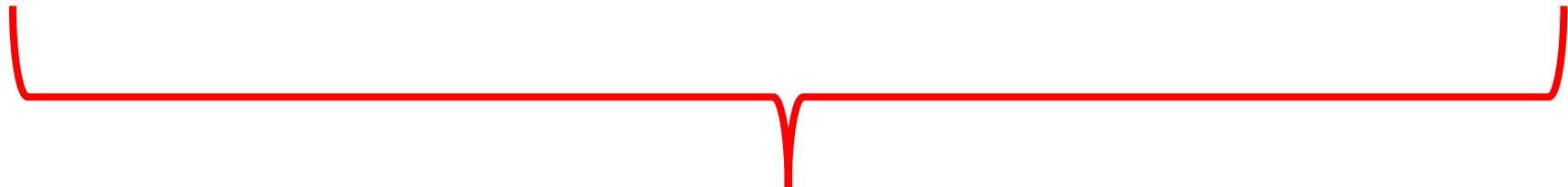
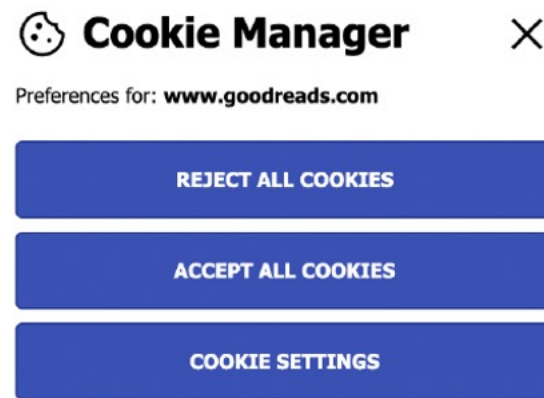
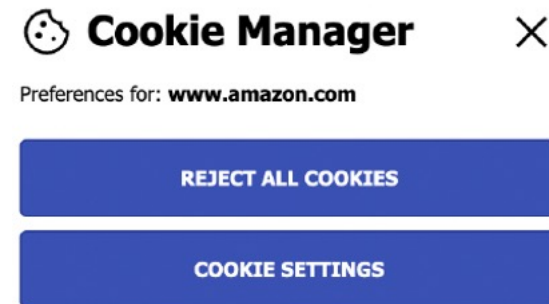
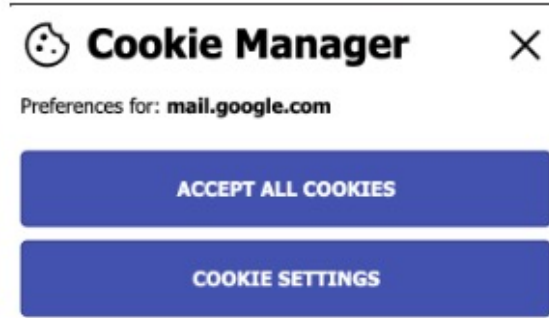
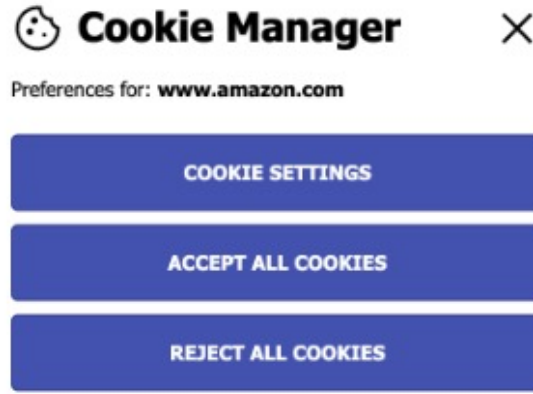
Deliberate Obstruction

# Treatment banner design



Reorder Options

# Treatment banner design



Differential Salience

# Treatment banner design

## Cookie Manager

Preferences for: **www.amazon.com**

COOKIE SETTINGS

ACCEPT ALL COOKIES

REJECT ALL COOKIES

## Cookie Manager

Preferences for: **mail.google.com**

ACCEPT ALL COOKIES

COOKIE SETTINGS

## Cookie Manager

Preferences for: **hbsp.harvard.edu**

ACCEPT ALL COOKIES

REJECT ALL COOKIES

COOKIE SETTINGS

## Cookie Manager

Preferences for: **www.etsy.com**

ACCEPT ALL COOKIES

REJECT ALL COOKIES

COOKIE SETTINGS

Preferences for: **www.etsy.com**

ACCEPT ALL COOKIES

REJECT ALL COOKIES

COOKIE SETTINGS

- ☒ [D] Information Storage and Access
- ☒ [A] Preferences and Functionality
- ☒ [B] Performance and Analytics
- ☐ [E] Content selection, delivery, and reporting
- ☐ [F] Ad selection, delivery, and reporting
- ☐ [X] Other Purposes
- ☐ **Select All**

ACCEPT SELECTED COOKIES

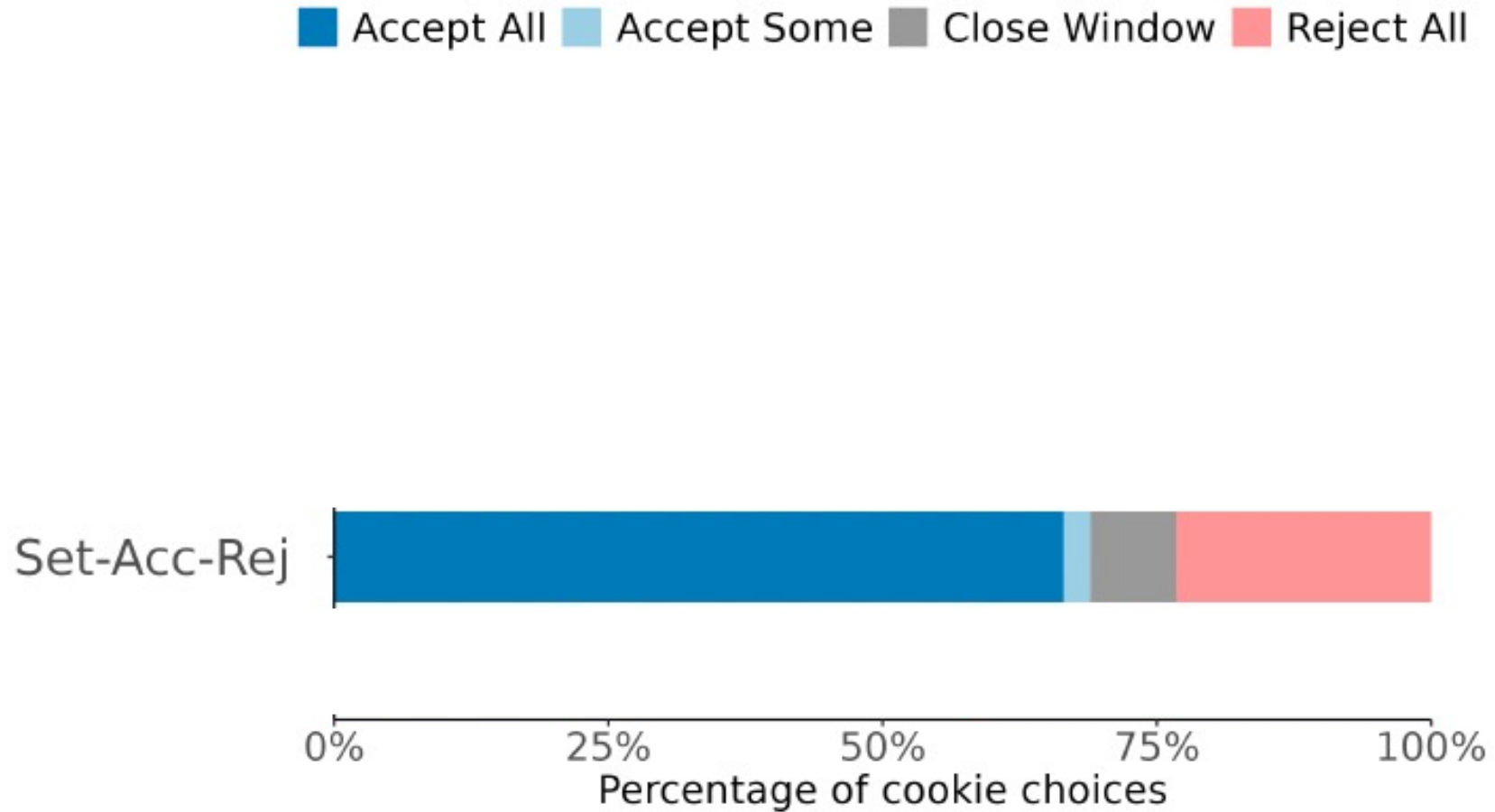
# Roadmap:

1. Experimental design

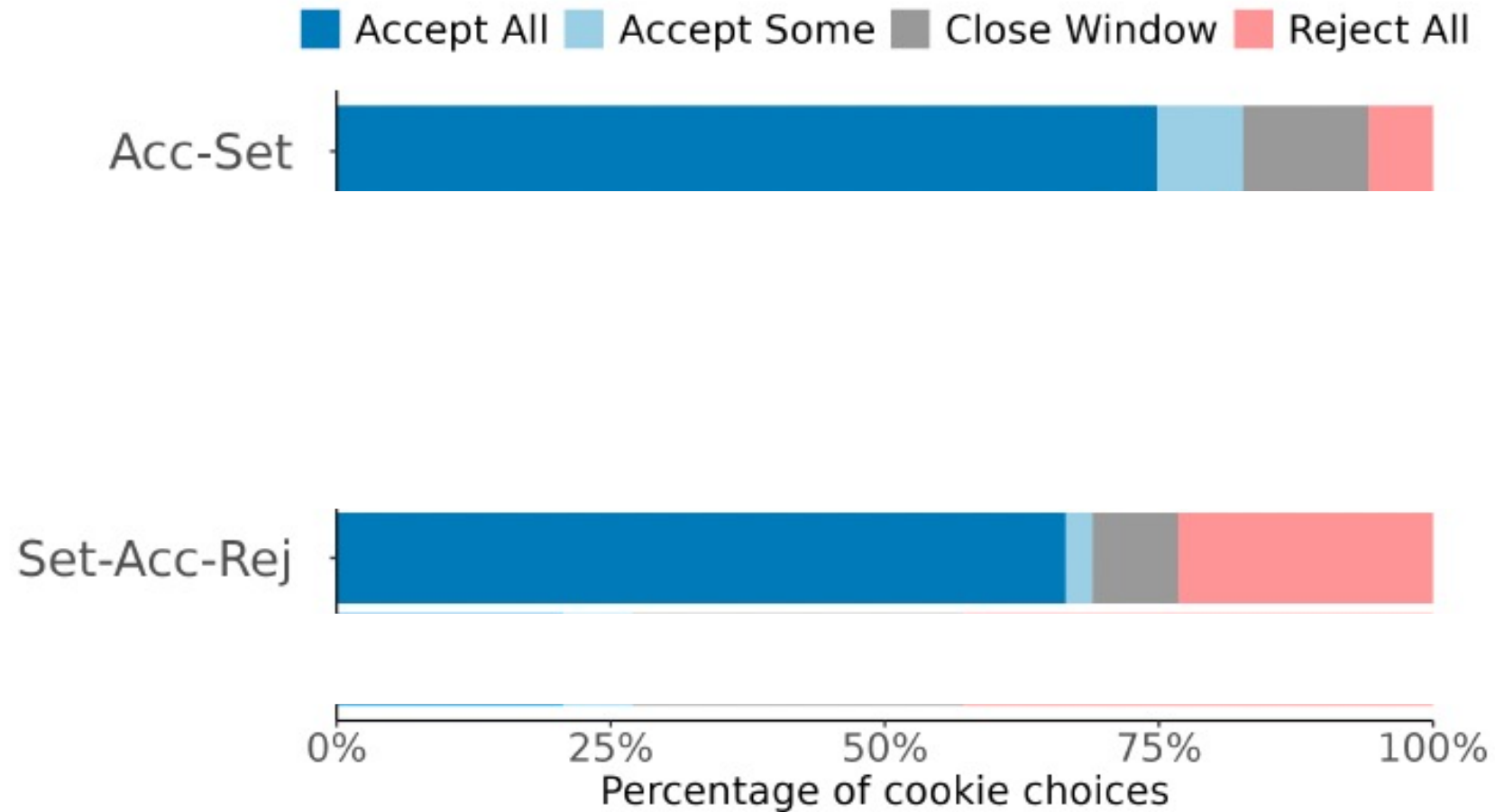
2. Results

3. Conclusion

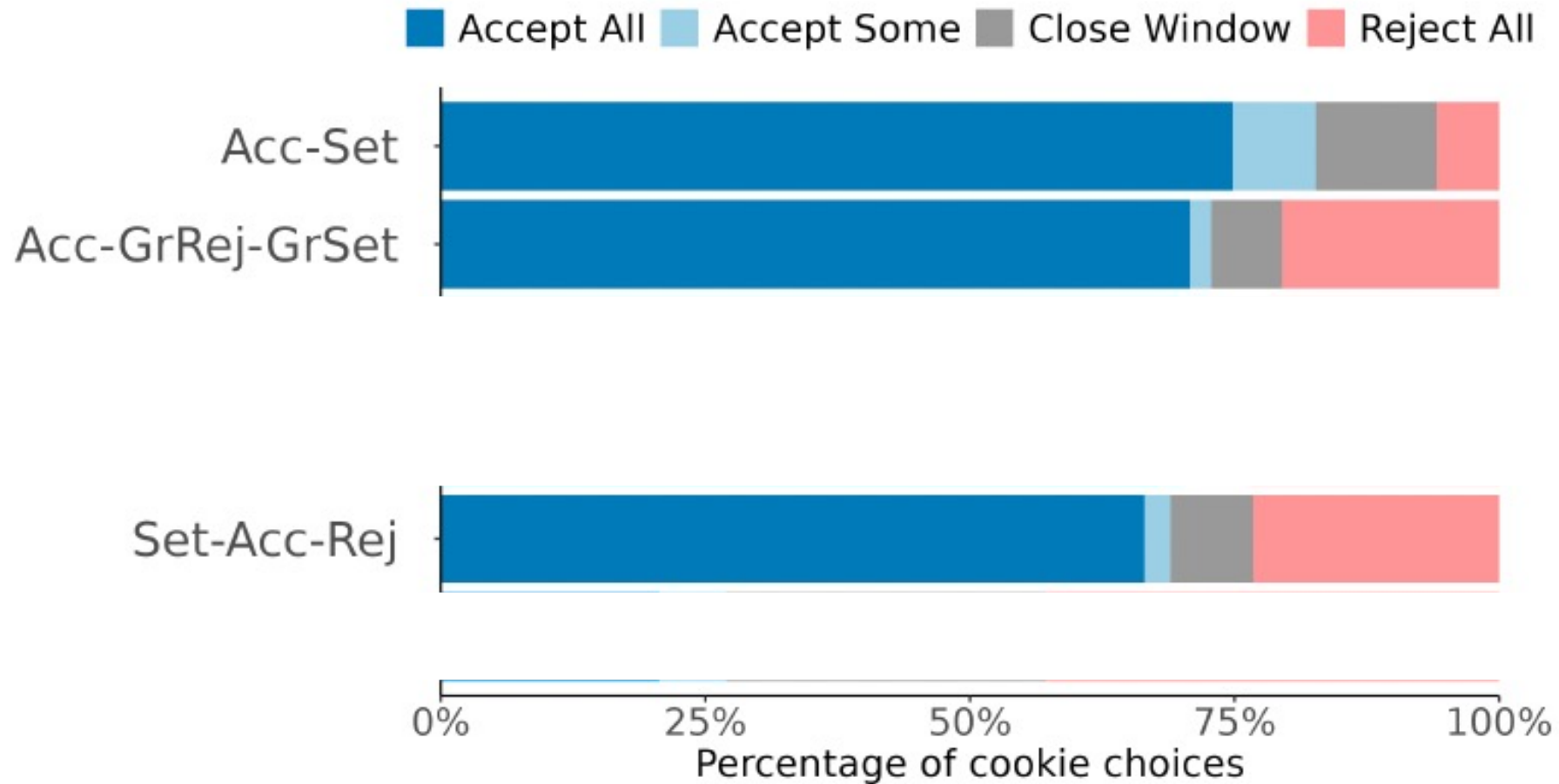
# Choices for survey websites



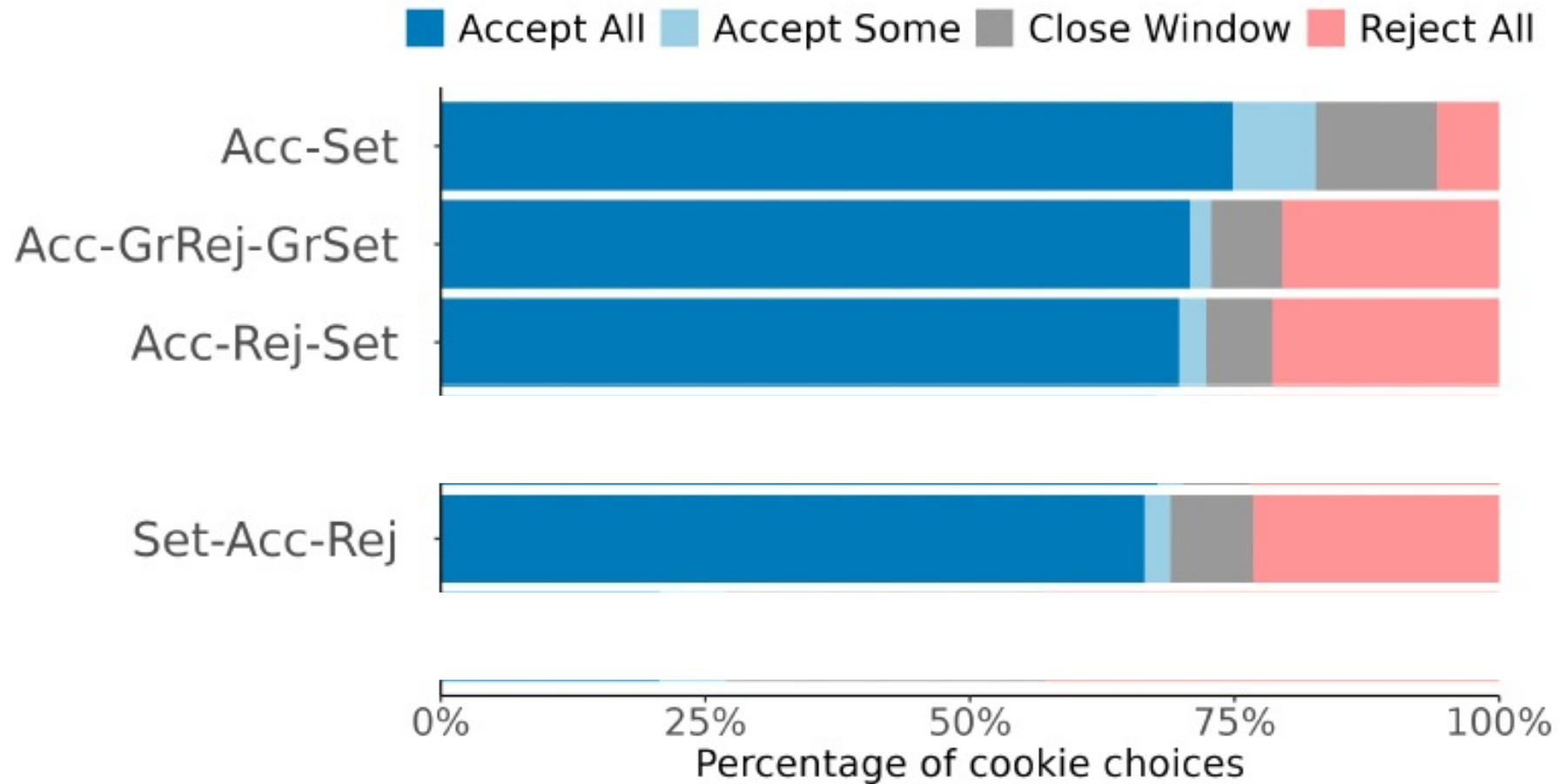
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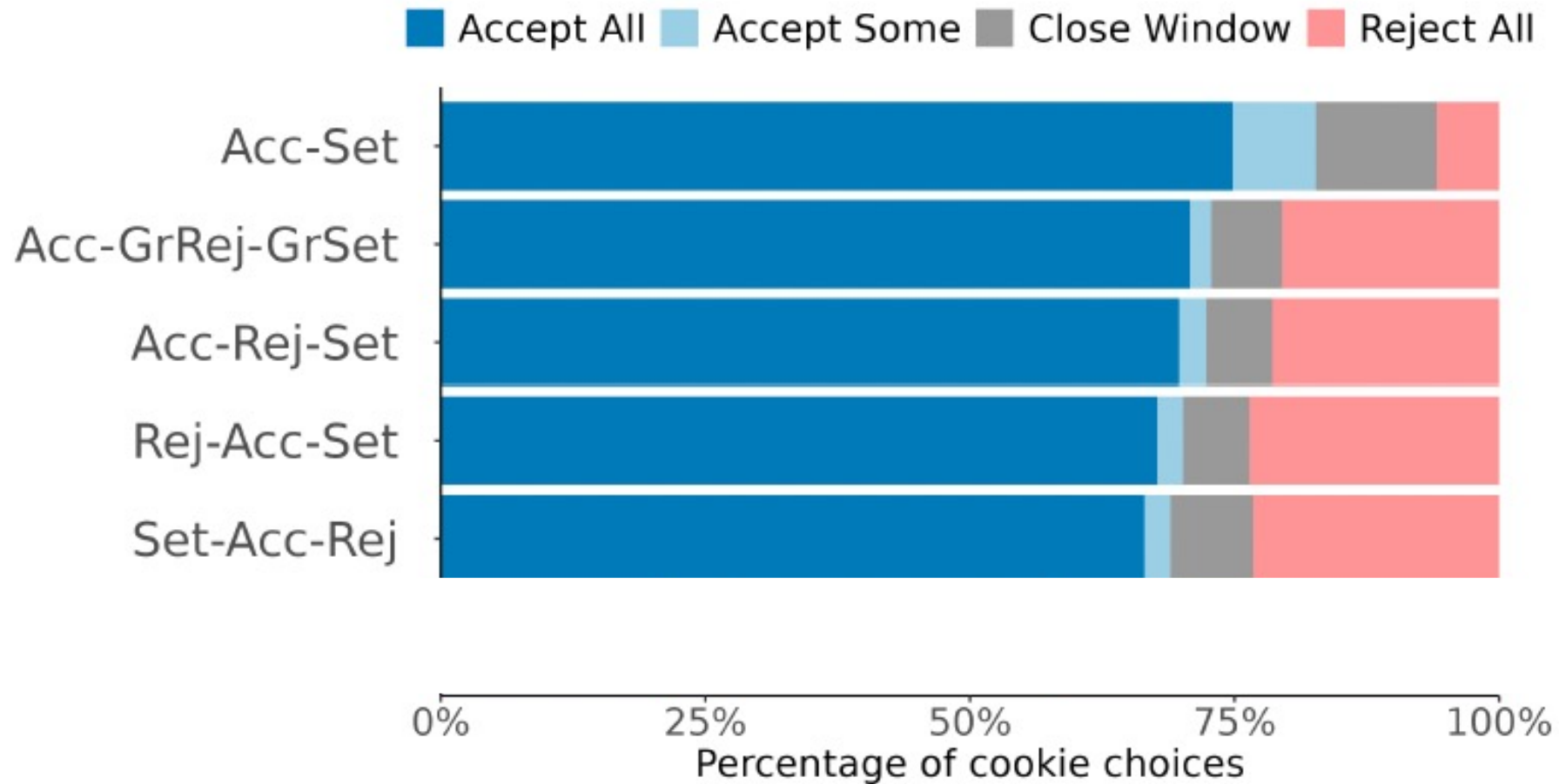
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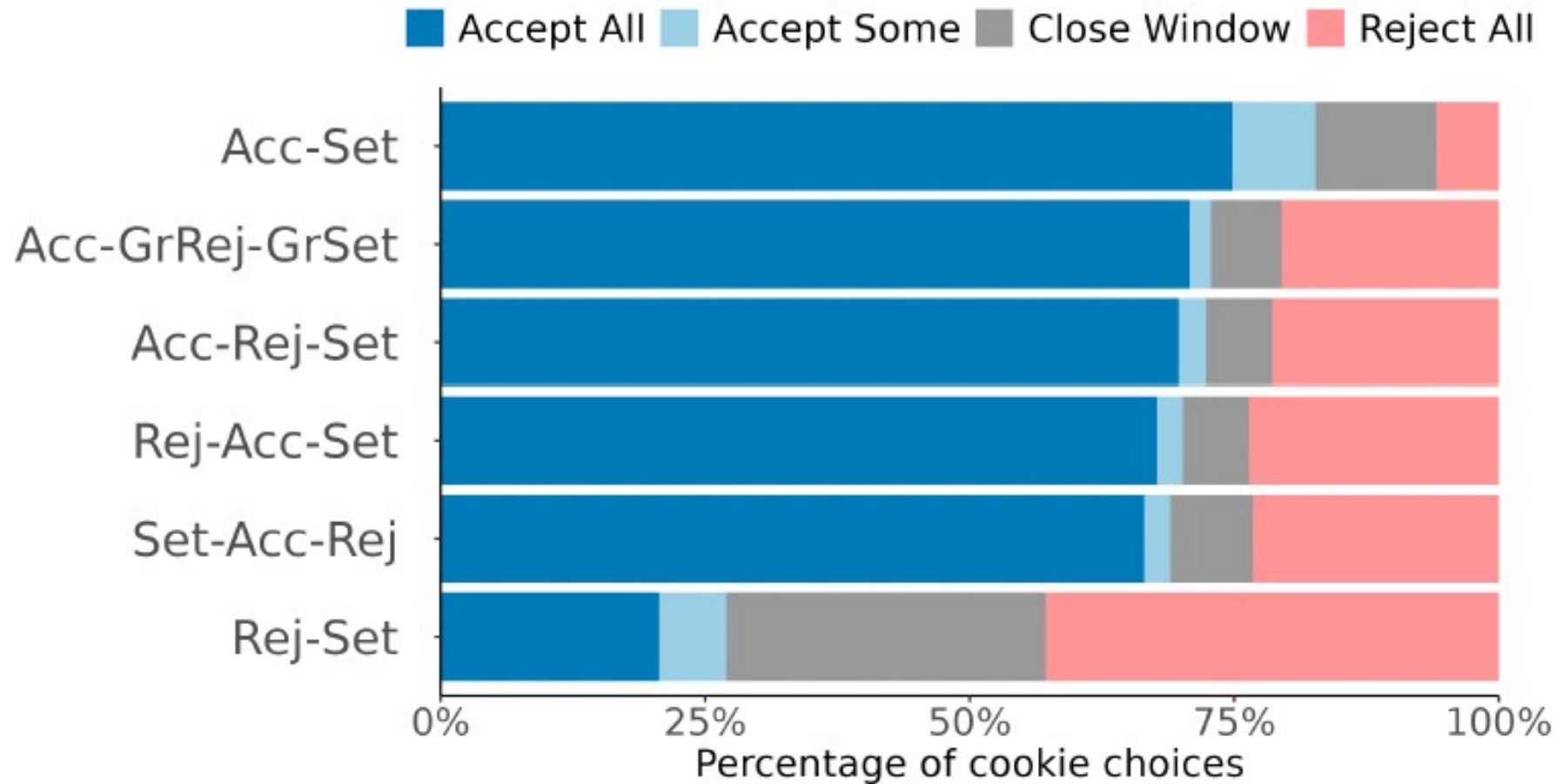
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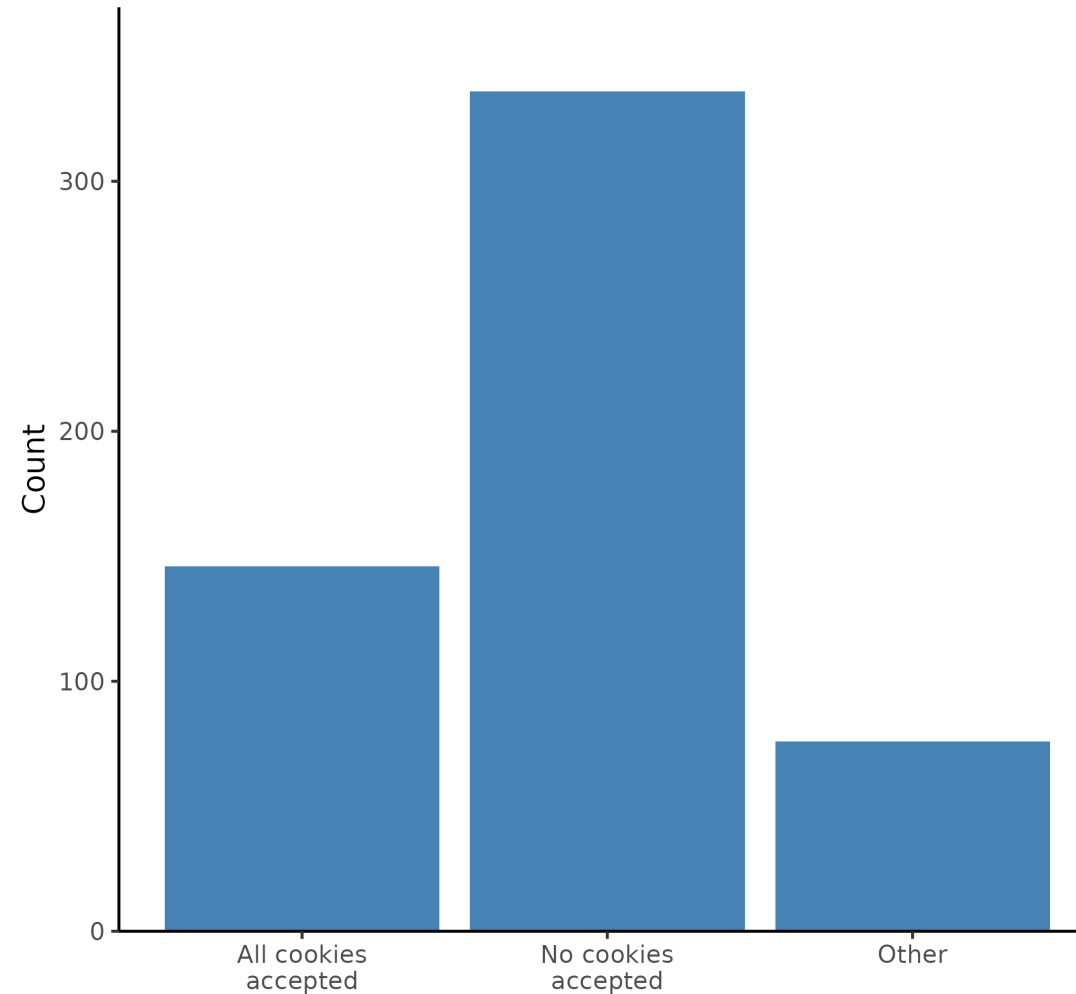
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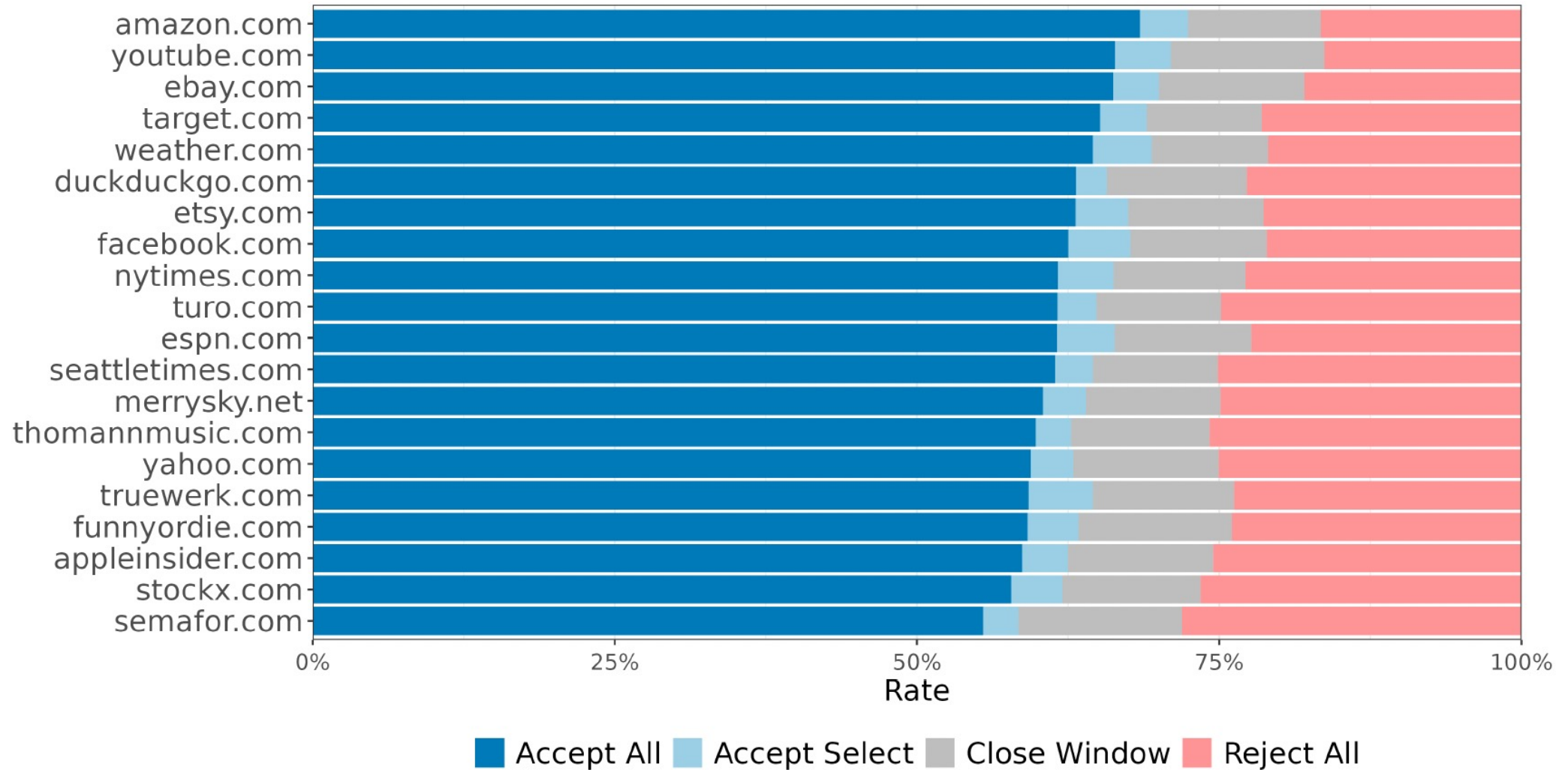
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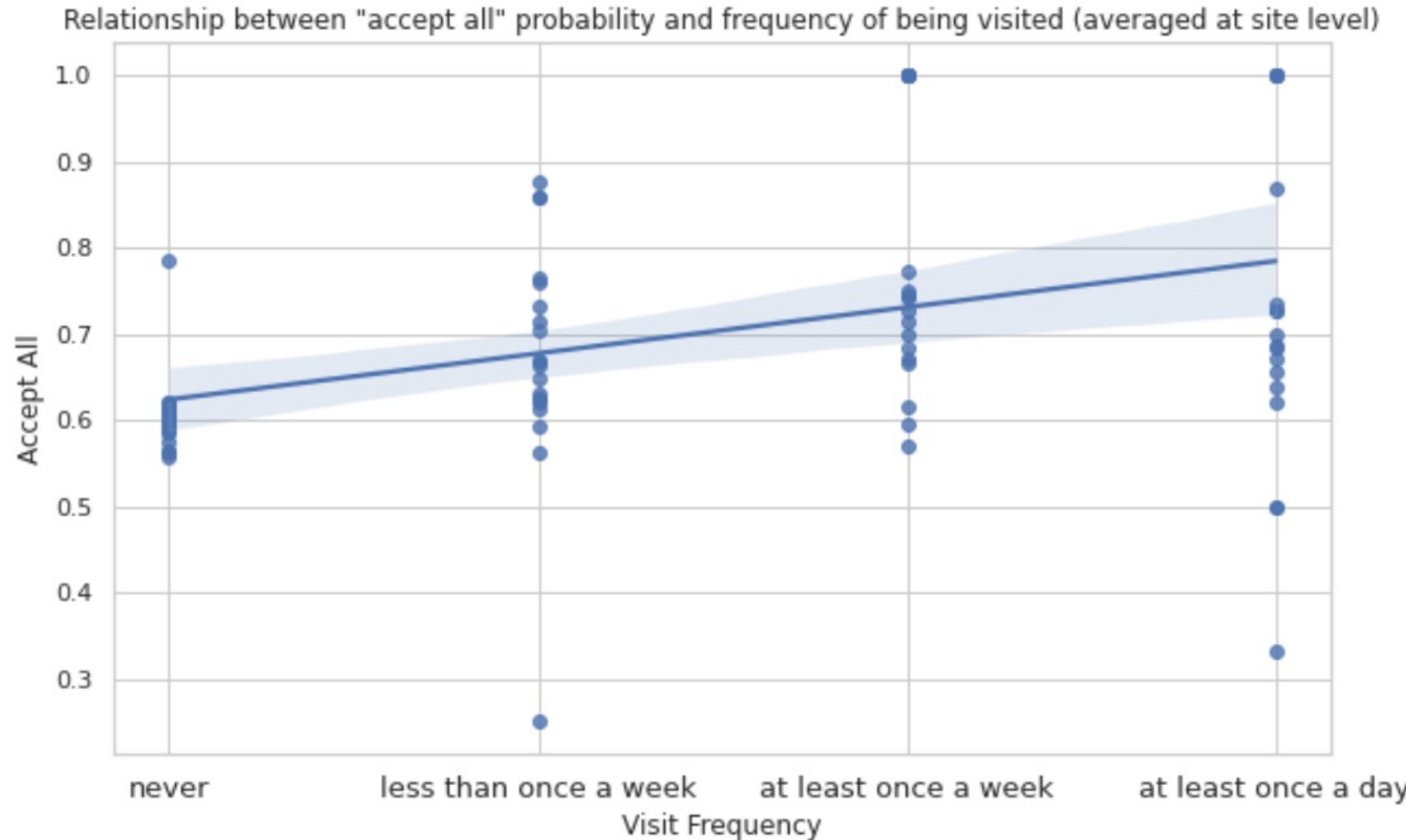
# People have mixed beliefs about 'close window'



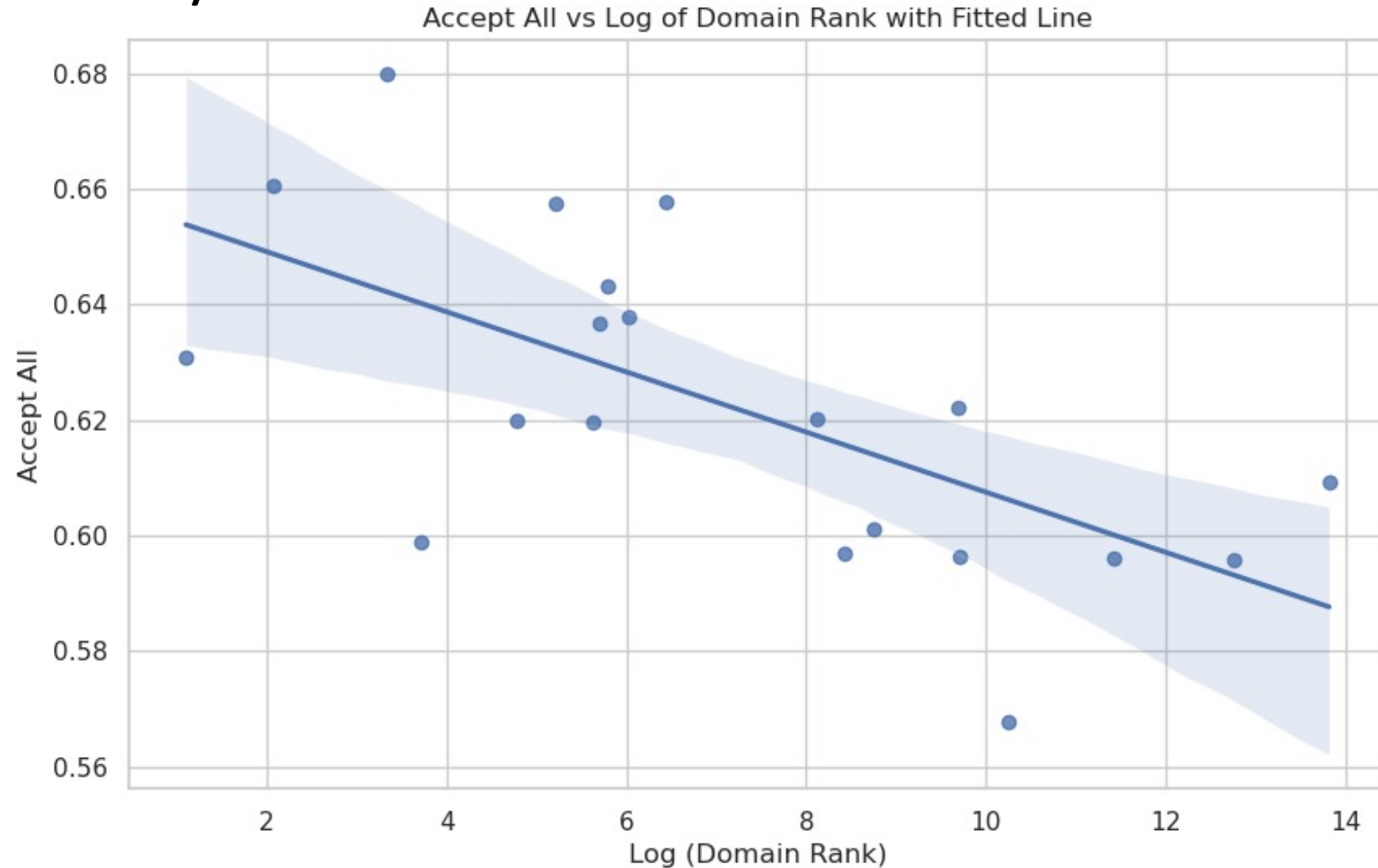
# Heterogeneity by site



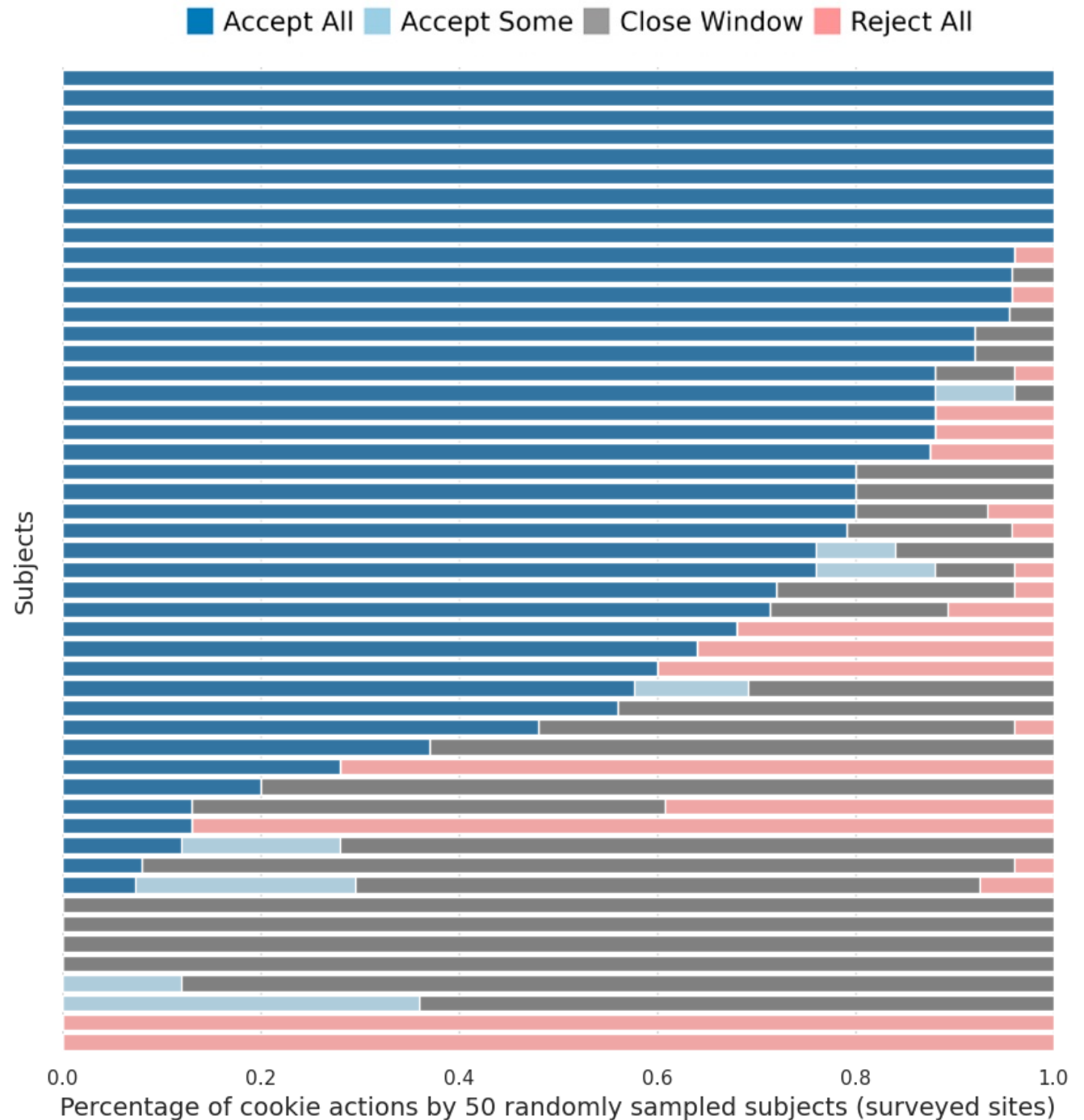
# Variation across familiarity with website



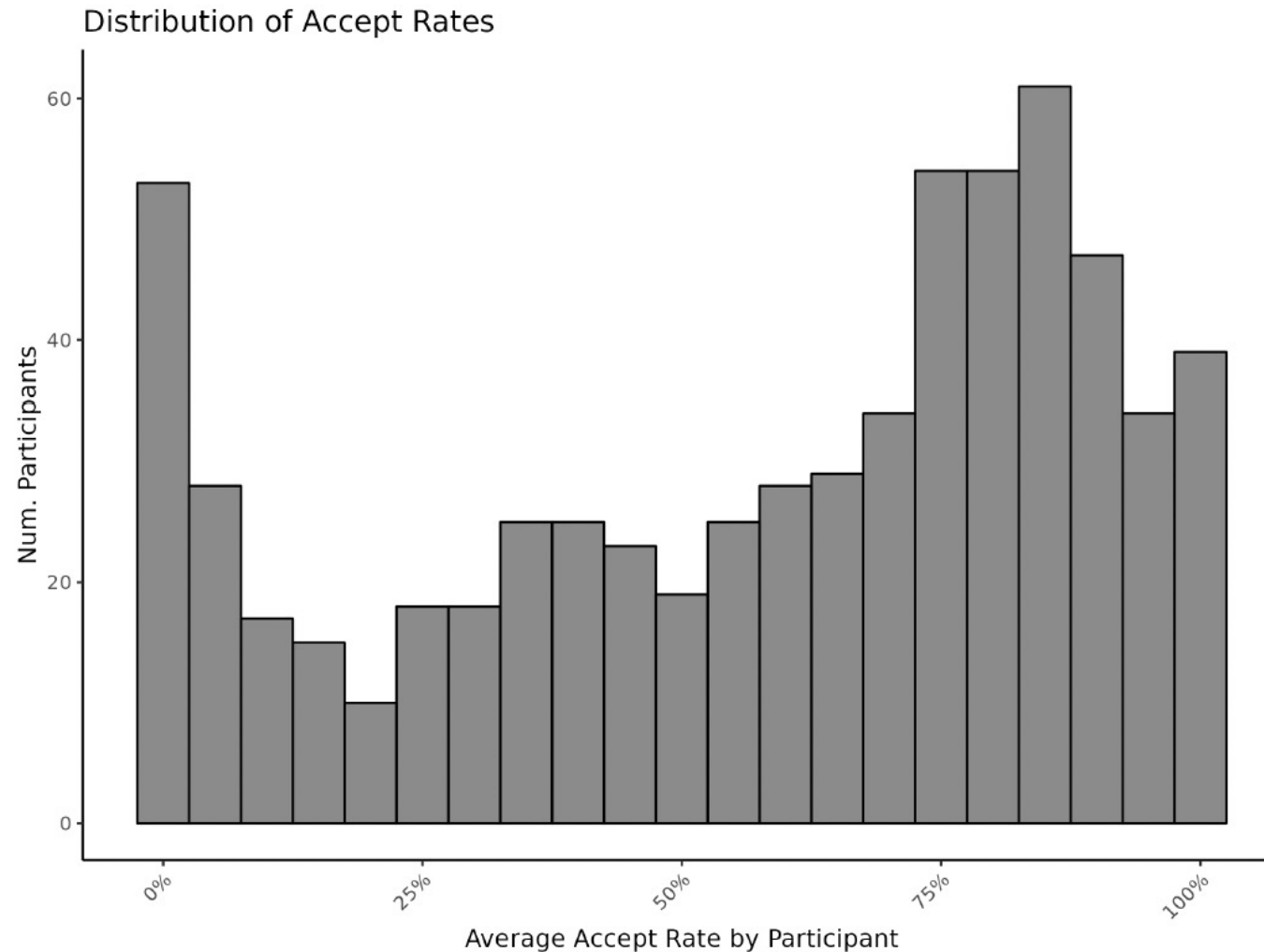
# Variation across website popularity



# Variation across participants

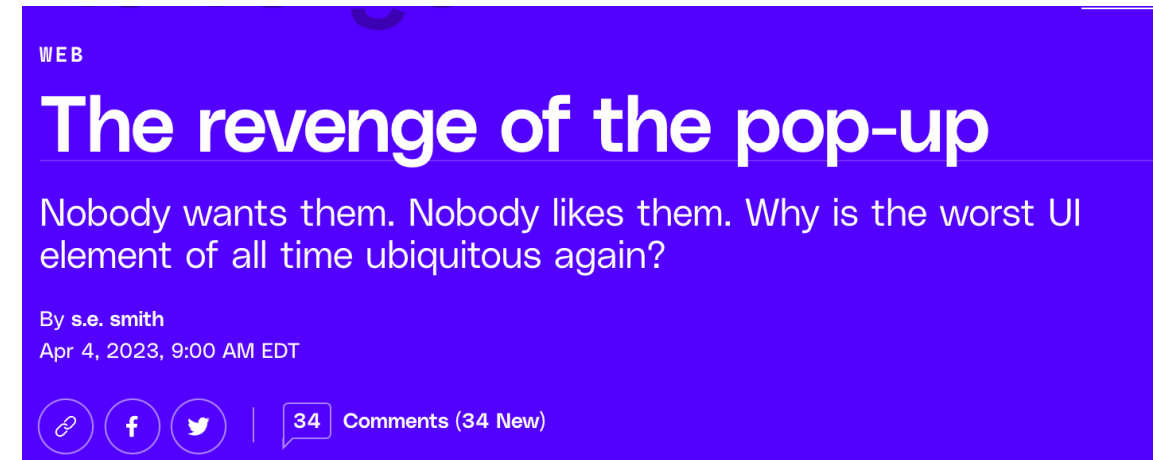


# Individual heterogeneity – neutral condition



# The 'too many consent notices' problem

- Time spent to make a choice may be a significant cost.
- With many consent notices, people may stop attending to the choice.
- Organic browsing portion of the study randomized users to either a 10 or 60-minute pop-up condition.



# Effects on time spent per choice

Overall group mean time spent: 5.72 seconds on average in survey, and 7.55 seconds in organic.

|                 | Survey               |     | Organic |     |
|-----------------|----------------------|-----|---------|-----|
|                 | Time Spent (Seconds) |     |         |     |
|                 | (1)                  | (2) | (3)     | (4) |
| Acc-Set         | 0.481                |     | -0.493  |     |
|                 | (0.288)              |     | (0.374) |     |
| Rej-Set         | 2.160***             |     | 0.955*  |     |
|                 | (0.276)              |     | (0.389) |     |
| Acc-Rej-Set     | -0.390               |     | -0.112  |     |
|                 | (0.237)              |     | (0.403) |     |
| Rej-Acc-Set     | -0.214               |     | -0.329  |     |
|                 | (0.245)              |     | (0.379) |     |
| Acc-GrRej-GrSet | -0.094               |     | -0.335  |     |
|                 | (0.253)              |     | (0.384) |     |

# No evidence of choice fatigue

$$y_{is} = \beta_{10 \text{ minutes}} + \gamma * \text{time in study}_{is} + \nu_{c(s)} + \epsilon_{is}.$$

|                           | Accept All<br>(1)    | Reject All<br>(2)   | Close Window<br>(3) |
|---------------------------|----------------------|---------------------|---------------------|
| 10 Min Pop-up             | 0.003<br>(0.035)     | 0.008<br>(0.022)    | -0.008<br>(0.030)   |
| Time in Study (Days)      | -0.012***<br>(0.003) | -0.006**<br>(0.002) | 0.019***<br>(0.003) |
| R <sup>2</sup>            | 0.009                | 0.005               | 0.014               |
| Observations              | 14,575               | 14,575              | 14,575              |
| Domain Cat. fixed effects | ✓                    | ✓                   | ✓                   |

# Roadmap:

1. Experimental design
2. Results
3. Conclusion

# Research Questions:

## **How do “dark patterns” affect consumers’ privacy choices?**

- Hiding options has much larger effects than other patterns.
- Hiding ‘reject’ reduces ‘accept all’ by 5.3pp to 7.9pp, mostly in favor of closing the window.

## **How do effects differ across websites and users?**

- Not correlated with website popularity.
- Large user-level heterogeneity.

## **Is there choice fatigue due to frequent pop-ups?**

- No, but over time increase in propensity to close pop-up.

# Policy implications

- Keep the major options on the first page.
- Defaulting all users into one choice does not represent preferences well.
- Importance of default when closing window.
- Time wasted can be substantial. If a pop-up was shown for every unique domain visited, then the time spent would be approximately 10 minutes per week per user (or \$5.73 at mean hourly wages).
  - Browser-level choices may be valuable here.

Thank you

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|                          | N    | Overall attrition | 10 min | 10 min attrition | 60 min | 60 min attrition | Everytime | Everytime attrition |
|--------------------------|------|-------------------|--------|------------------|--------|------------------|-----------|---------------------|
| Start Survey             | 1227 | 1.000000          |        |                  |        |                  |           |                     |
| Eligible for Study       | 917  | 0.747351          |        |                  |        |                  |           |                     |
| Study Consent            | 877  | 0.714751          |        |                  |        |                  |           |                     |
| Finished Survey          | 807  | 0.657702          |        |                  |        |                  |           |                     |
| Clicked all links        | 804  | 0.655257          | 359    | 1.0              | 418    | 1.0              | 17        | 1.0                 |
| Have Browser Cookie Data | 789  | 0.643032          | 357    | 0.994429         | 415    | 0.992823         | 17        | 1.0                 |
| Have Cookie Action Data  | 787  | 0.641402          | 356    | 0.991643         | 414    | 0.990431         | 17        | 1.0                 |
| Finished Endline Survey  | 613  | 0.499593          | 273    | 0.760446         | 325    | 0.777512         | 15        | 0.882353            |