



Exploring the Cookieverse

A Multi-Perspective Analysis of Web Cookies

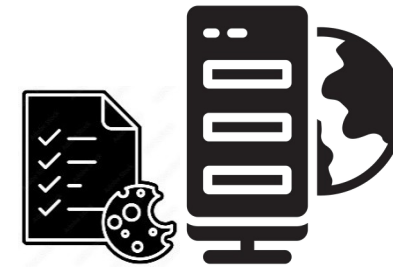
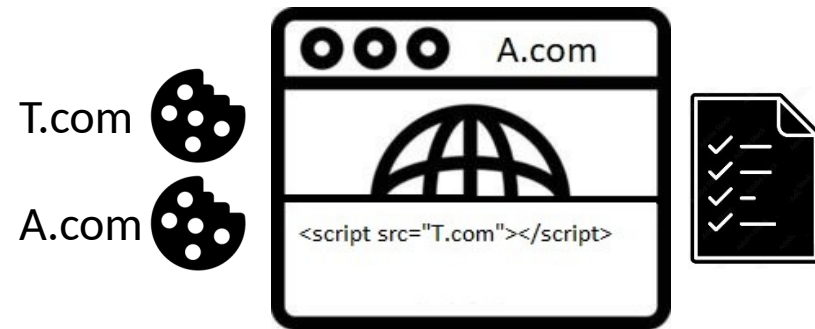
Ali Rasaii

Shivani Singh

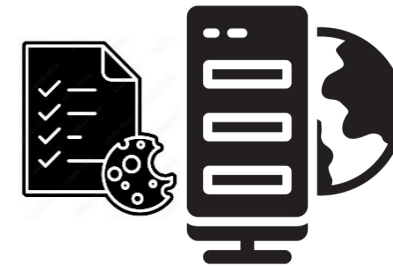
Devashish Gosain

Oliver Gasser

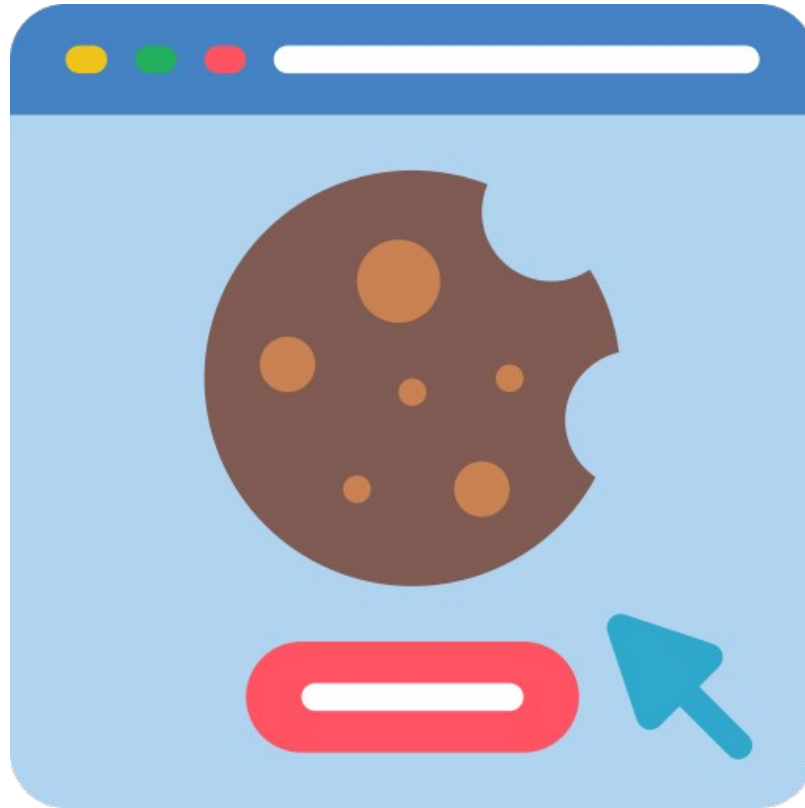
Passive and Active
Measurement
Conference (PAM23)



T.com



A.com



Background

- General Data Protection Regulation (GDPR)
 - EU law
 - May 25, 2018
 - Enhance individuals' control and rights over their personal data
- California Consumer Privacy Act (CCPA)
 - California State law
 - January 1, 2020
- Enterprises and vendors react
 - Cookies banners



Research Questions

- How many websites do show the banners?
 - Does the banner give users the options to explicitly agree or decline?
- Do they respect the users preferences?
- Do websites exhibit different behavior?
 - Geographic location (EU vs. non-EU)
 - User agent (mobile vs. desktop)

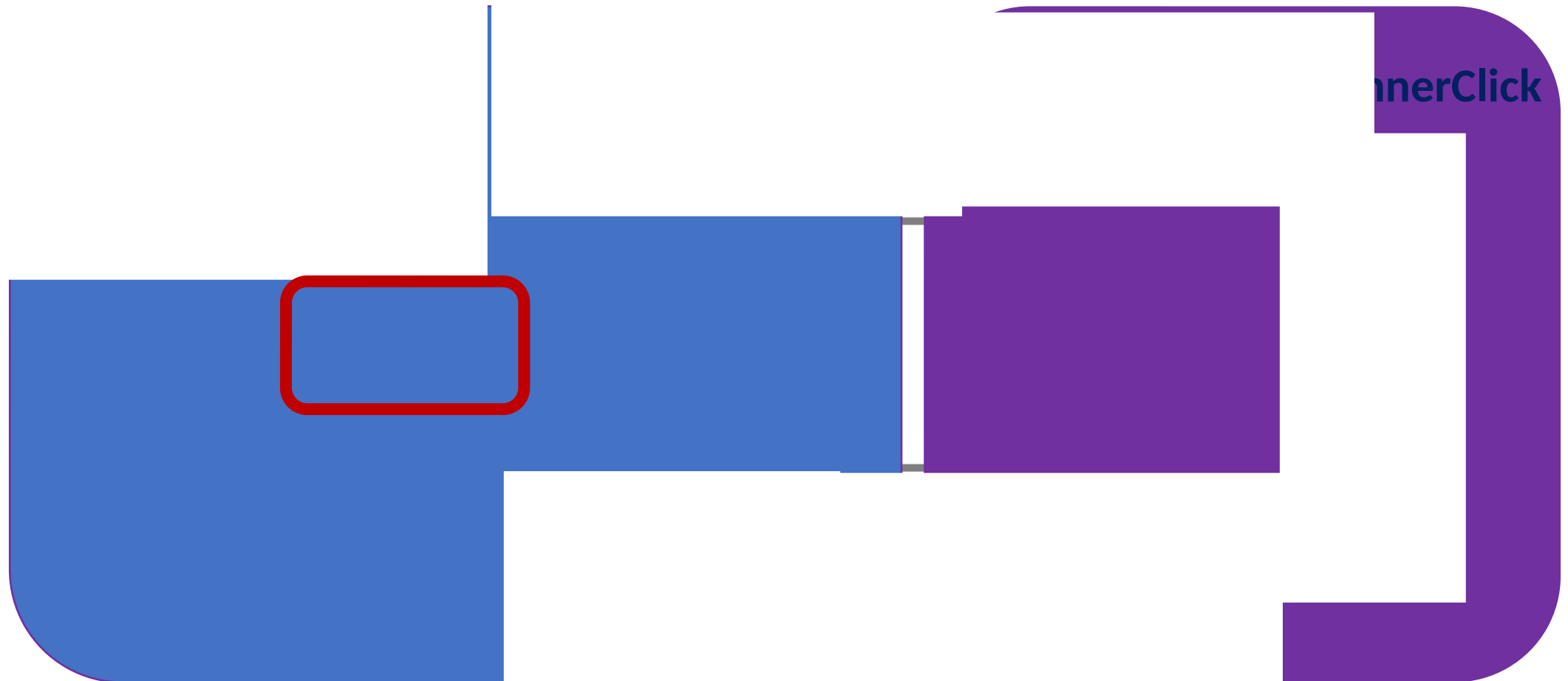
Related works

- Not considering users' characteristics
- Manual or semi-automated inspection
- Hard-to-scale automated tool
- Just “accept” option

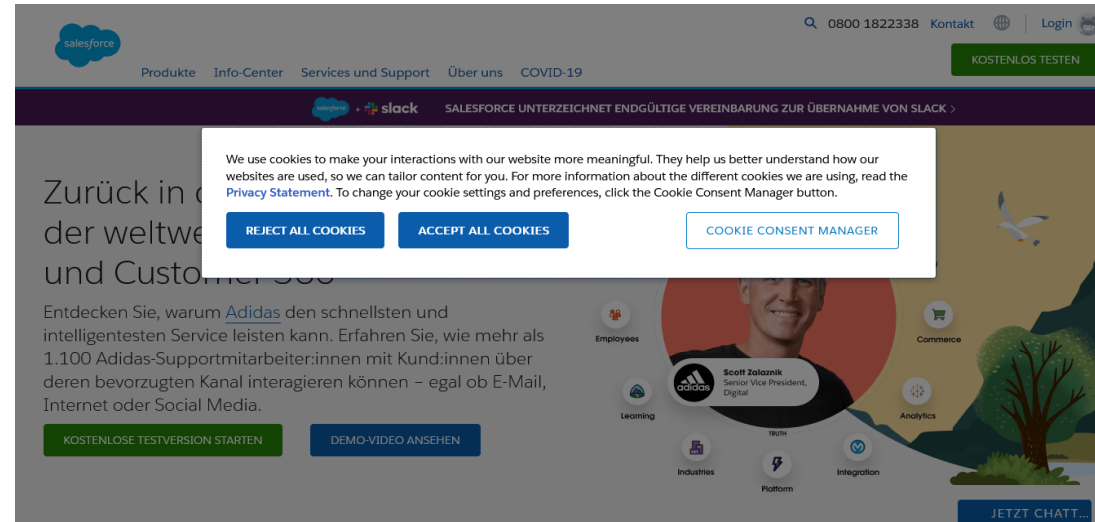


Goal: analysis of cookie landscape from different perspectives in a automated way

Methodology



BannerClick



We use cookies to make your interactions with our website more meaningful. They help us better understand how our websites are used, so we can tailor content for you. For more information about the different cookies we are using, read the [Privacy Statement](#). To change your cookie settings and preferences, click the Cookie Consent Manager button.

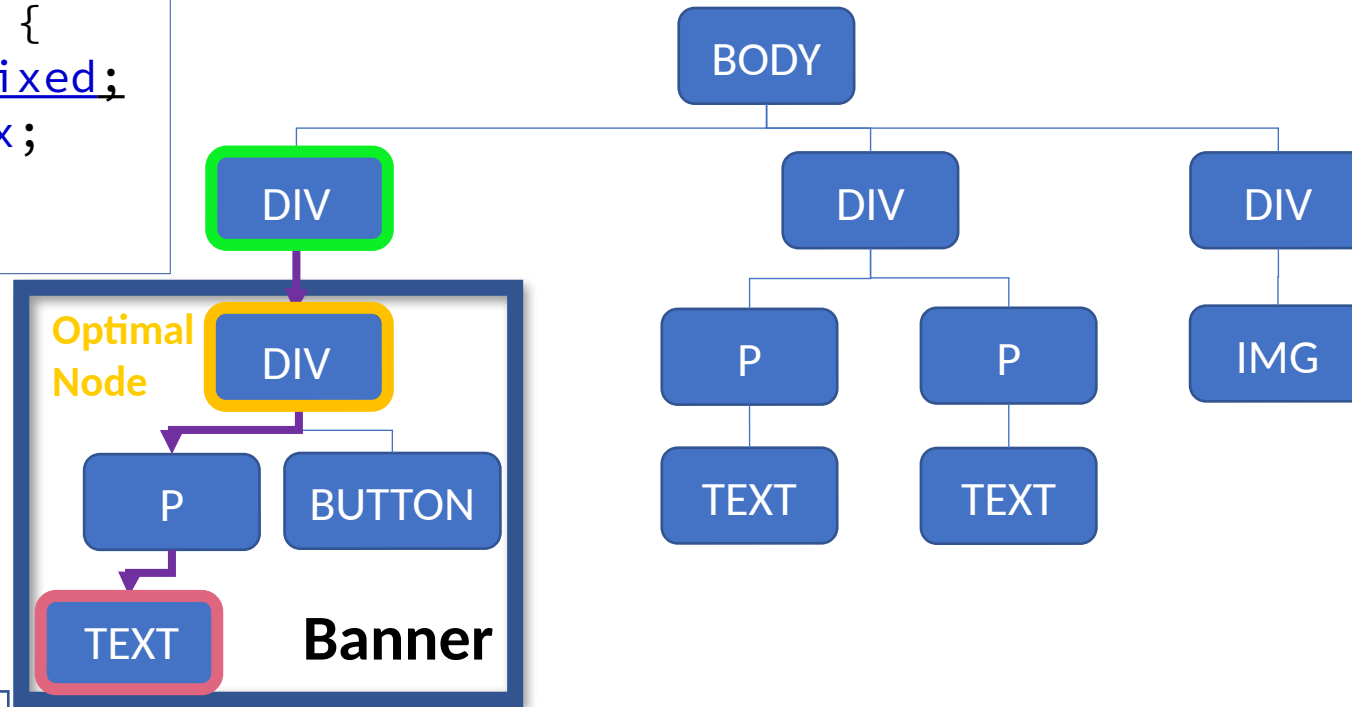
REJECT ALL COOKIES

ACCEPT ALL COOKIES

COOKIE CONSENT MANAGER

BannerClick – Detection

```
div.firstnode {  
  position: fixed;  
  width: 300px;  
  border: 3px  
}
```

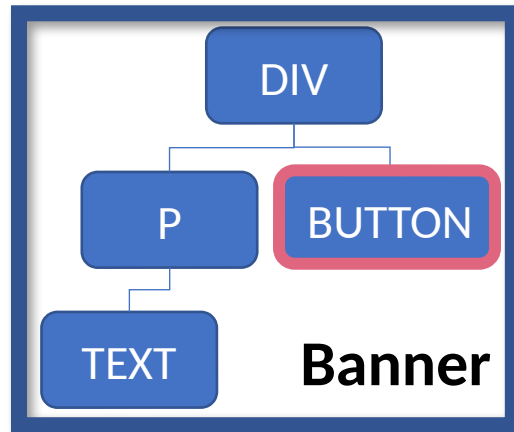


End Node

"Cookies"
"Accept" + "Legitimate Interest"
"Accept" + "Privacy Policy"
....

99% Accuracy

BannerClick – Interaction



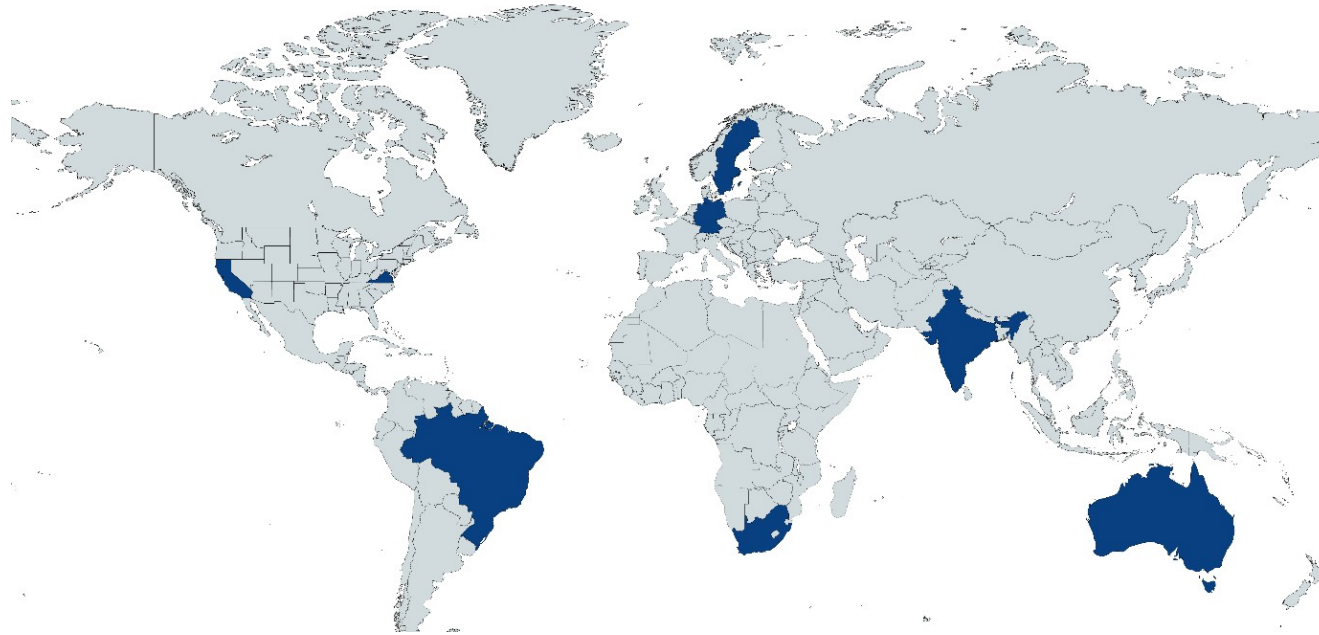
Word sets:

acc: ["accept", "agree", "confirm"]

rej: ["reject", "refuse", "decline"]

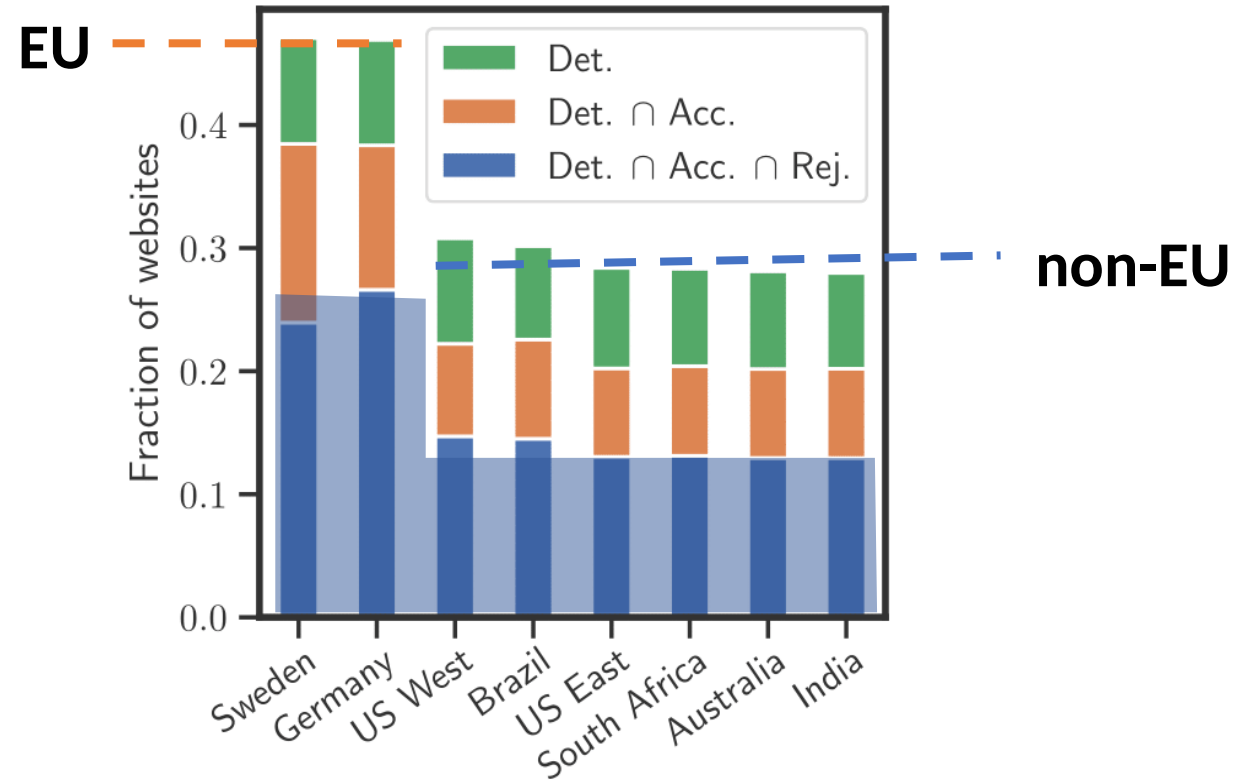
set: ["setting", "option", "choice"]

Measurement Setup



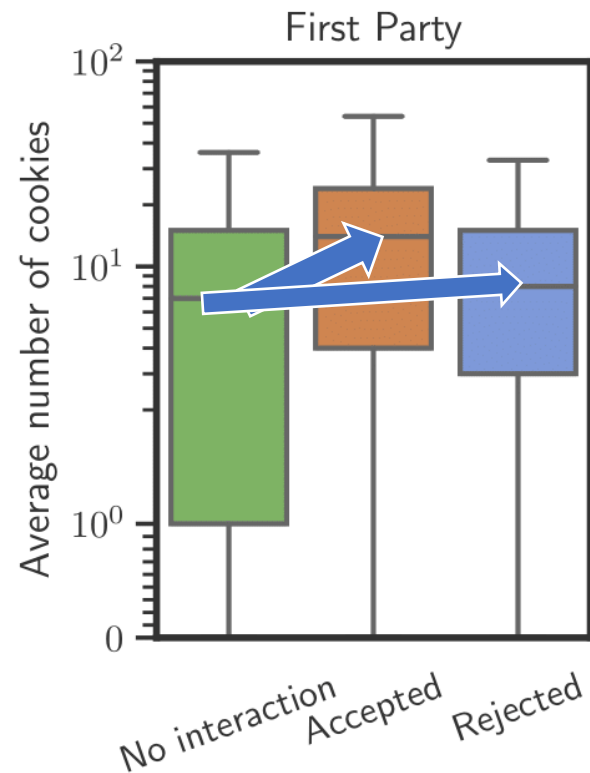
- **8 vantage points:** Germany, Sweden, US West, US East, India, Brazil, South Africa, Australia
- **Target list:** Tranco Top 10k domains

Banners detected, accepted, rejected



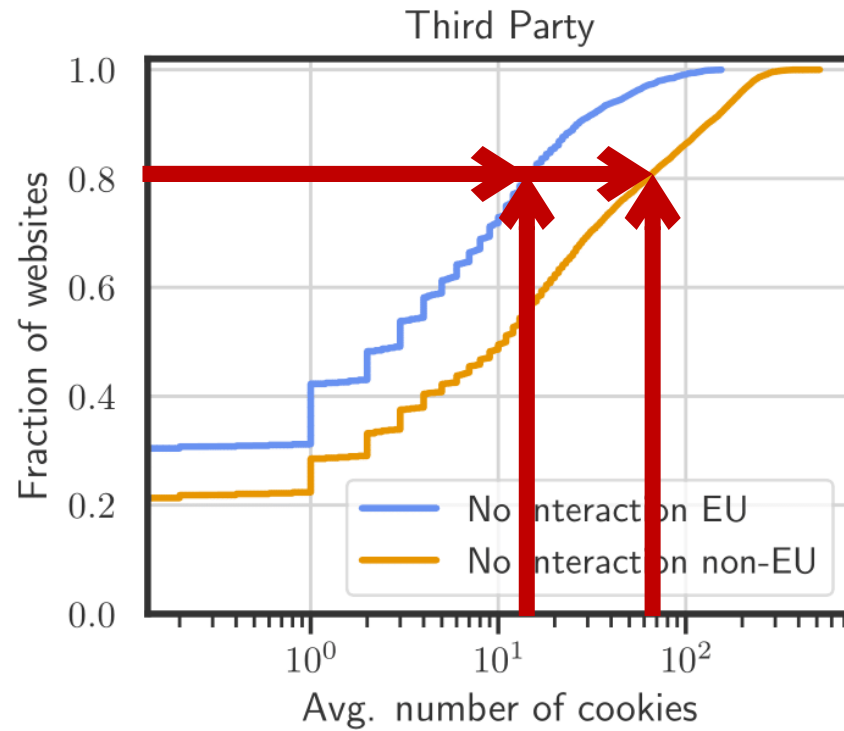
Half of the websites do not show easy Reject option
More banners in EU compared to non-EU countries

Cookies differences after interaction



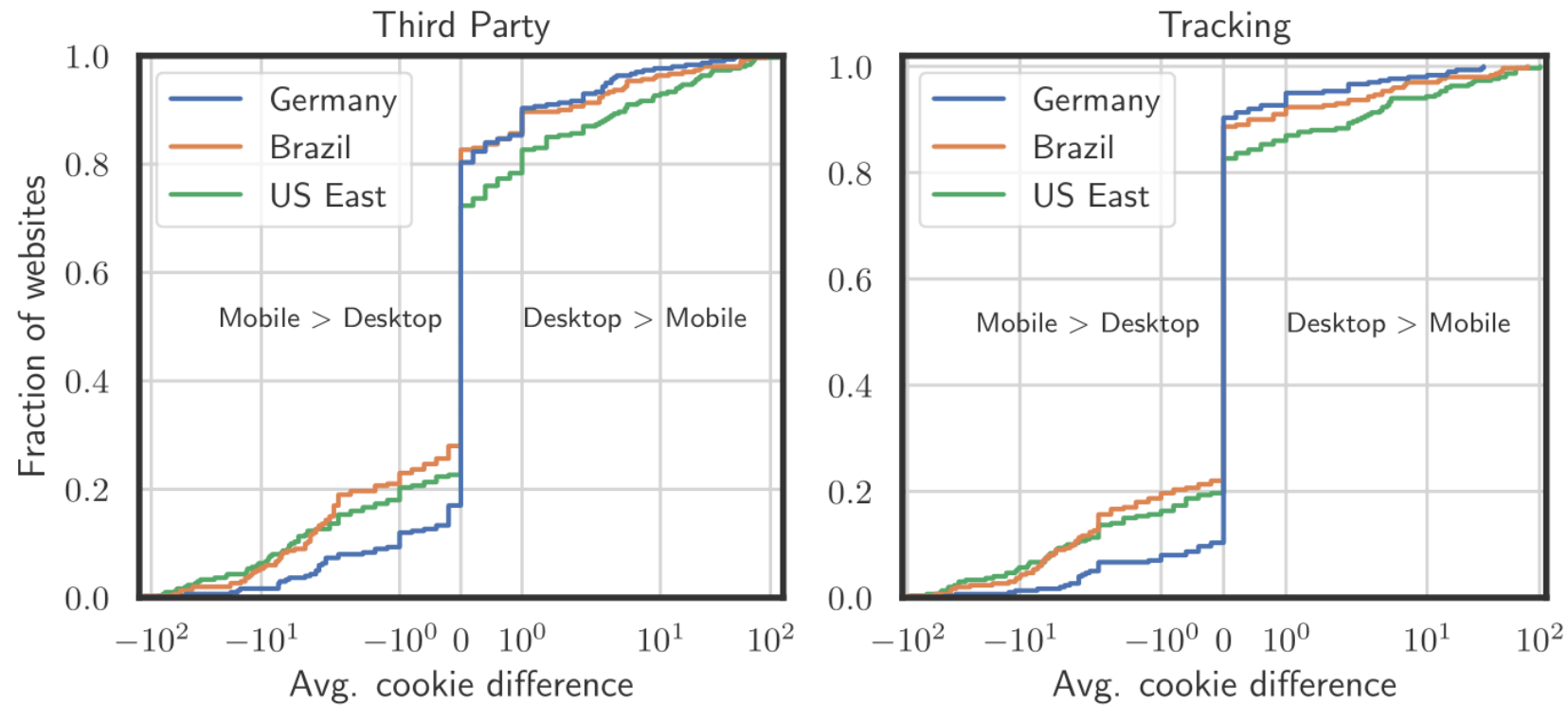
Interacting with banners impacts cookie distribution

Cookies – EU vs. non-EU



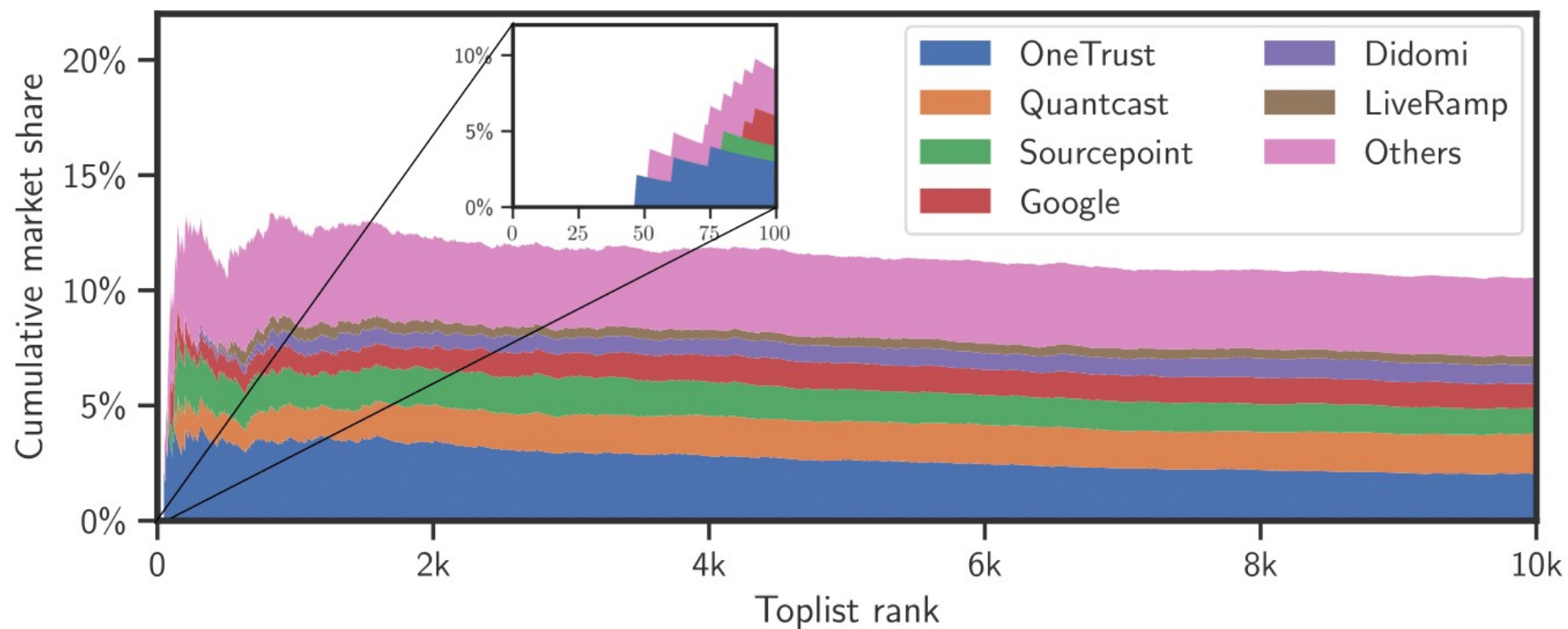
Fewer cookies in EU compared to non-EU

Mobile vs Desktop



User agent impact the number of cookies.

Consent Management Platform



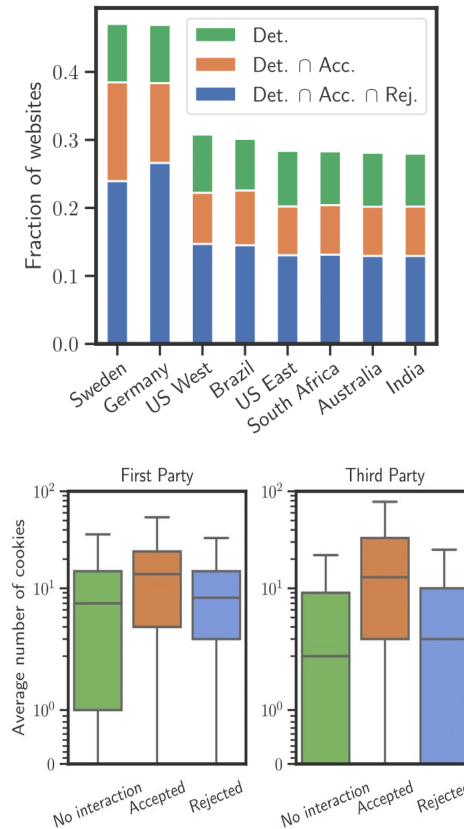
Discussion

- Banners
 - Straight way to comply with laws
 - Not an optimal solution
 - Annoying, too much effort and attention
 - Dark patterns -> biased decision
- No future in utopia
 - Application layer support
 - Google stops TP for Chrome by 2024
 - One click for opt out all



Conclusion

- Impact of
 - Geographical location of users
 - Interaction with banner
- Check out the paper
 - CCPA impact
 - Landing vs. Inner pages
 - Mobile vs. Desktop
 - Consistency analysis
- Source code available
 - BannerClick
 - Analysis data for reproducibility



Backup: Measurement Setup

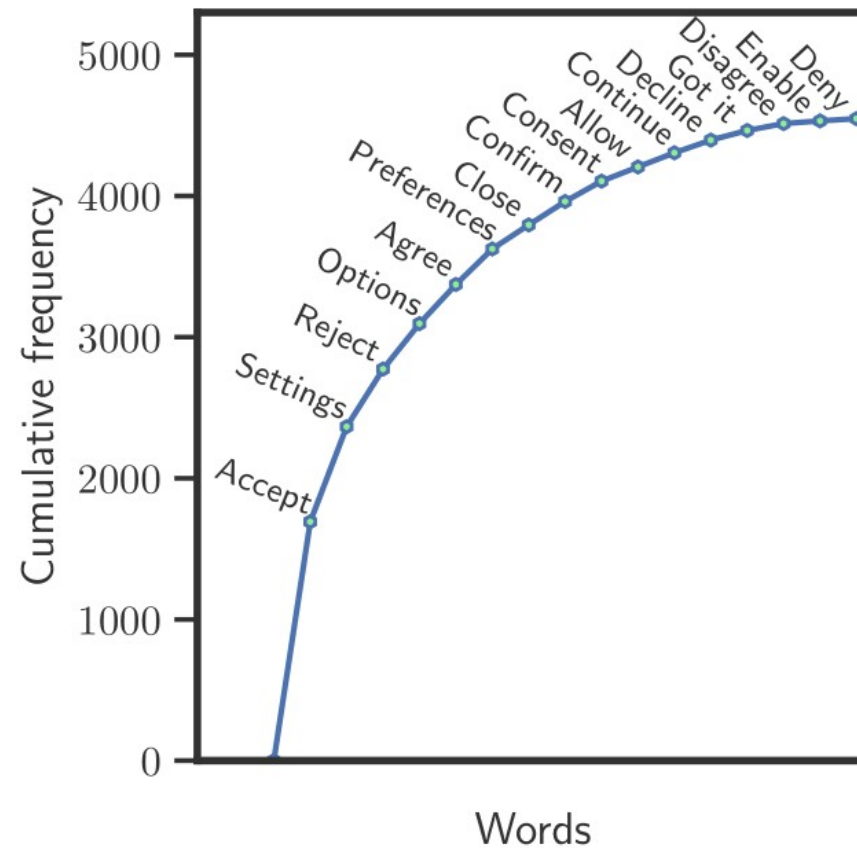
- Main run
 - TrancoTop10kList domains □ 9020 totally reachable
 - 5 iteration for each mode of interaction
- Desktop vs. mobile (and others)
 - Tranco tiered 300 □ top-100, 1001–1100, and 9901–10k
 - User Agent
 - Mobile: “Mozilla/5.0 (Android 12; Mobile; rv:68.0) Gecko/68.0 Firefox/93.0”
 - Desktop: “Mozilla/5.0 (X11; Linux x86_64; rv:95.0) Gecko/20100101 Firefox/95.0”
 - Screen size
 - Mobile: 340x695
 - Desktop: 1366x768

Backup: Measurements

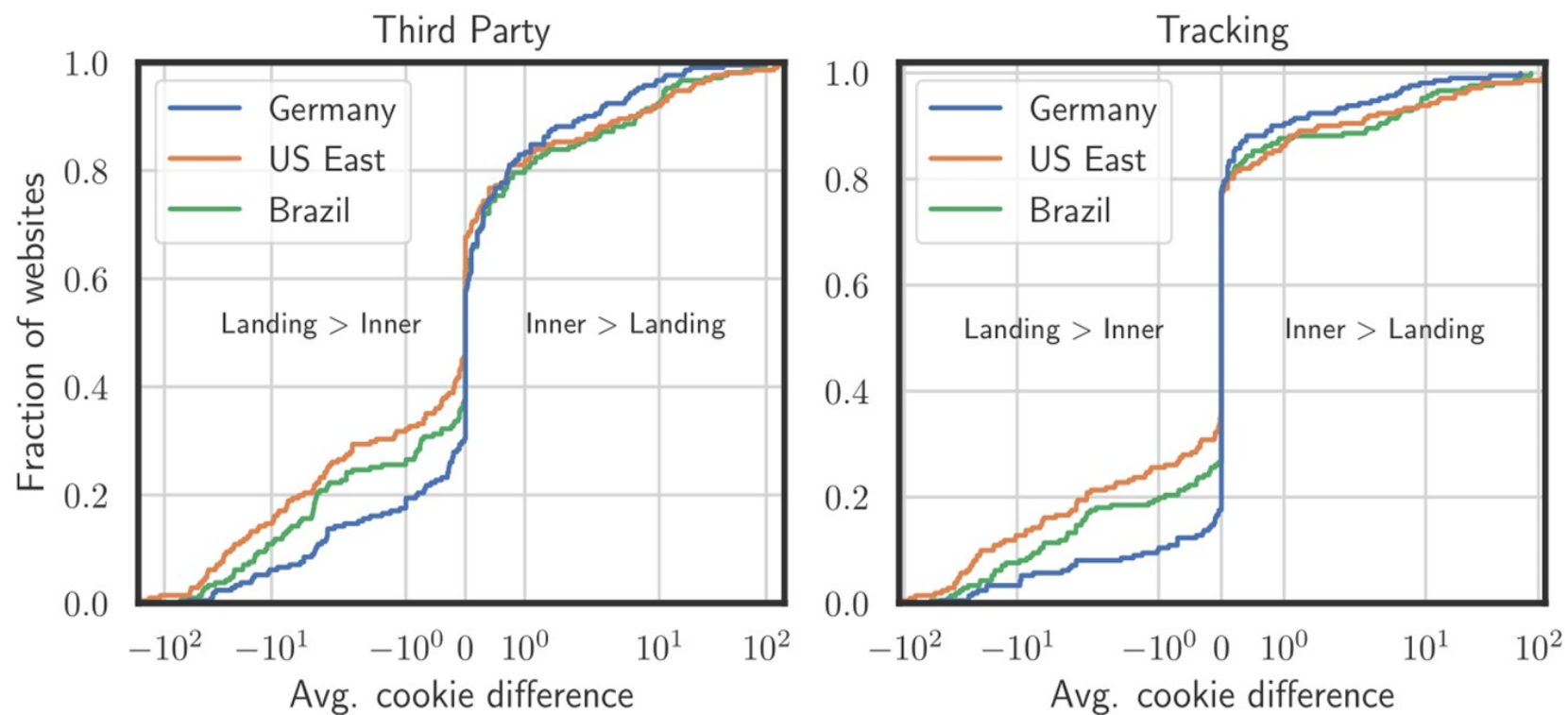
Table 1. Overview of different measurement types.

Measurement Type	Start Date	Duration	Target Websites
Banner Interaction	Jan 20, 2022	20 days	Tranco Top 10k
Consistency Tests	Feb 9, 2022	10 days	Tranco tiered 300
Landing vs. Inner	Mar 8, 2022	4 days	Tranco tiered 300
Desktop vs. Mobile	Feb 27, 2022	10 hours	Tranco tiered 300
Impact of CCPA	Mar 13, 2022	10 hours	Tranco tiered 300

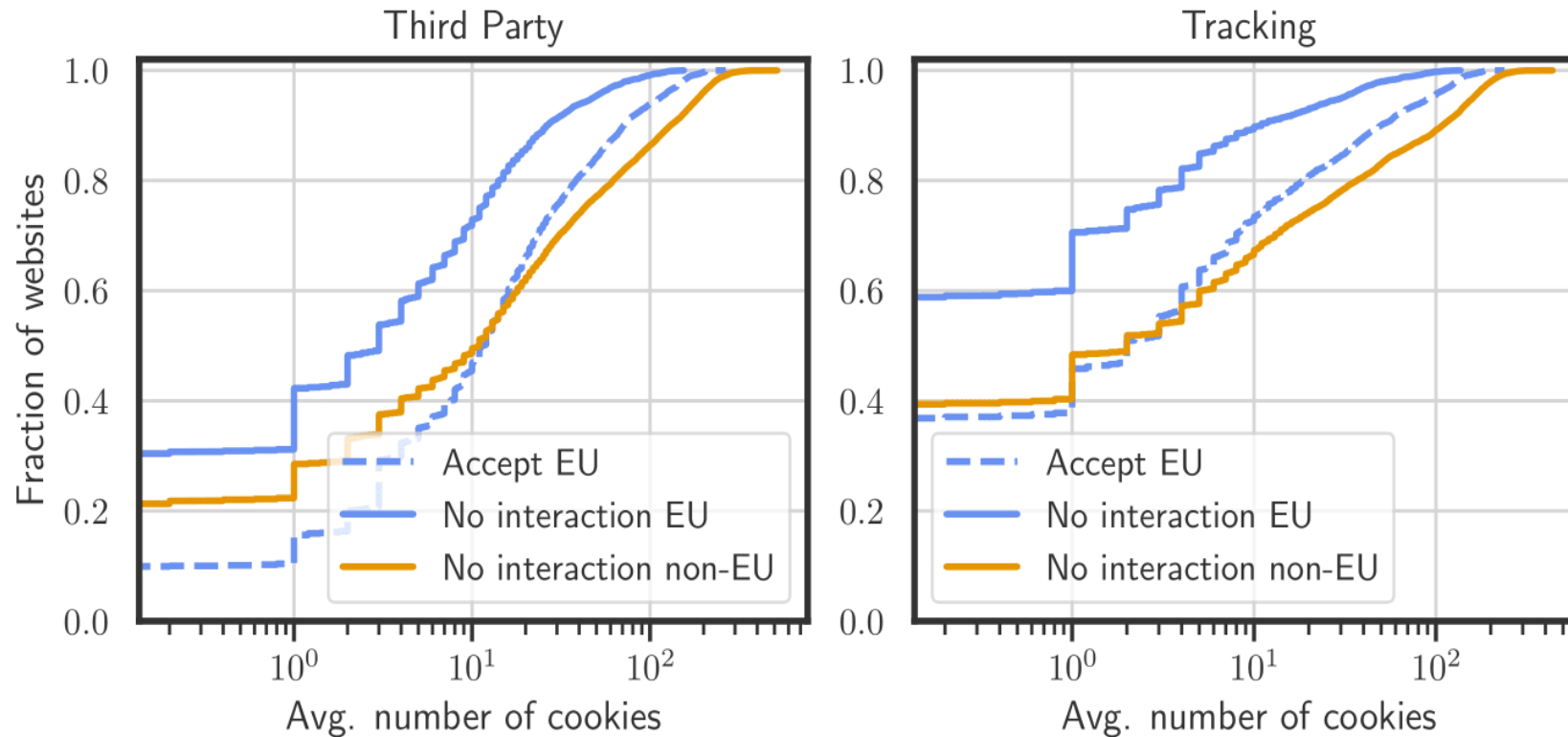
Backup: Words Frequency



Backup: Inner vs Landing

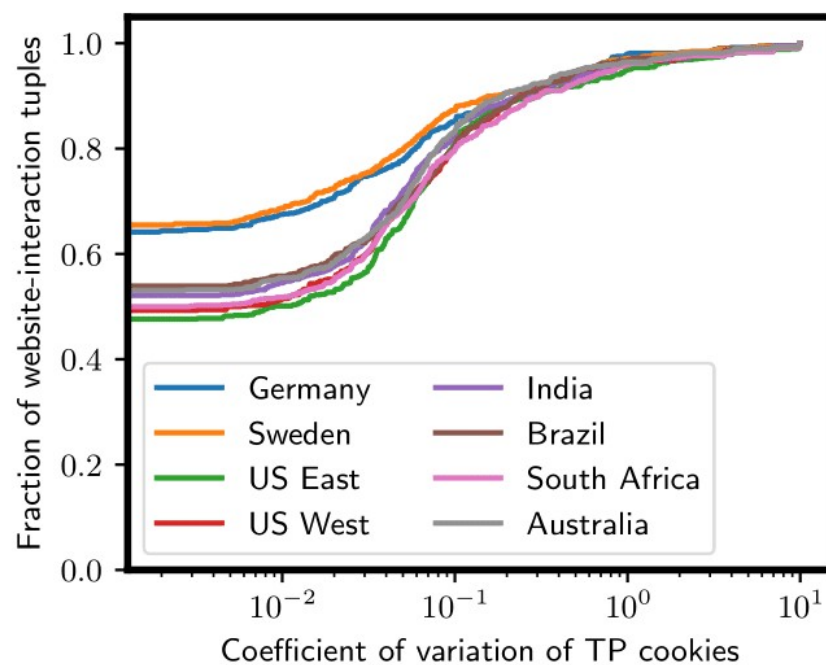


Backup: Cookies – EU vs non-EU

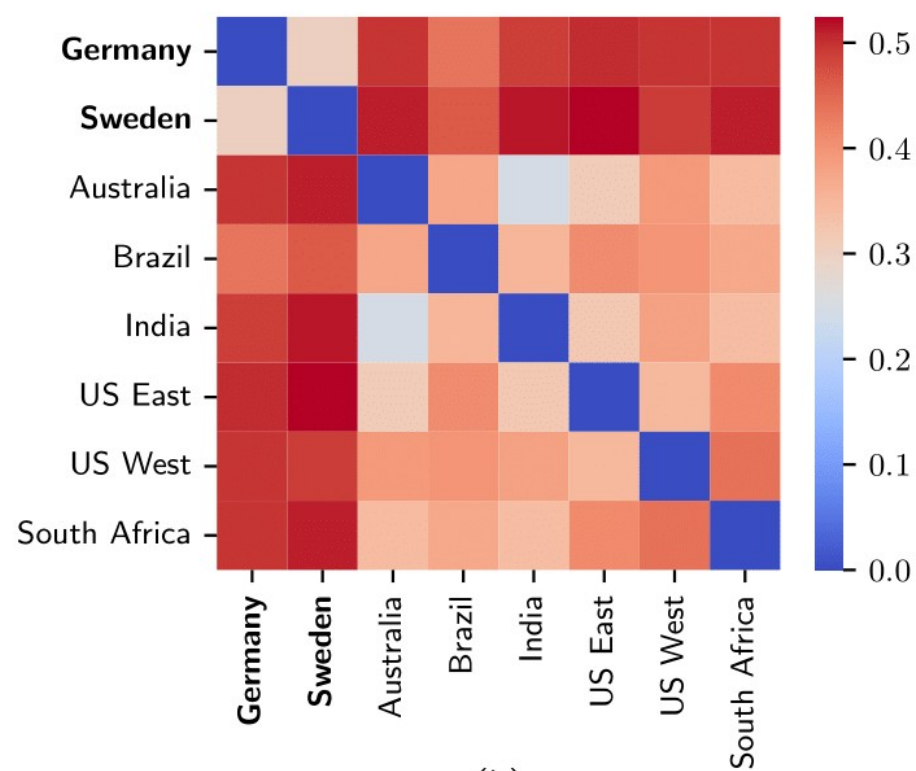


Less cookies in EU compared to non-EU

Backup: Consistency

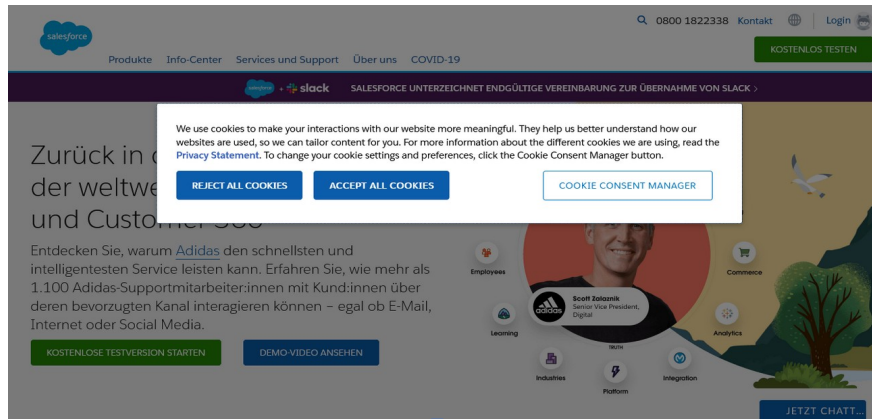


(a)



(b)

Backup: Explicit vs. Implicit

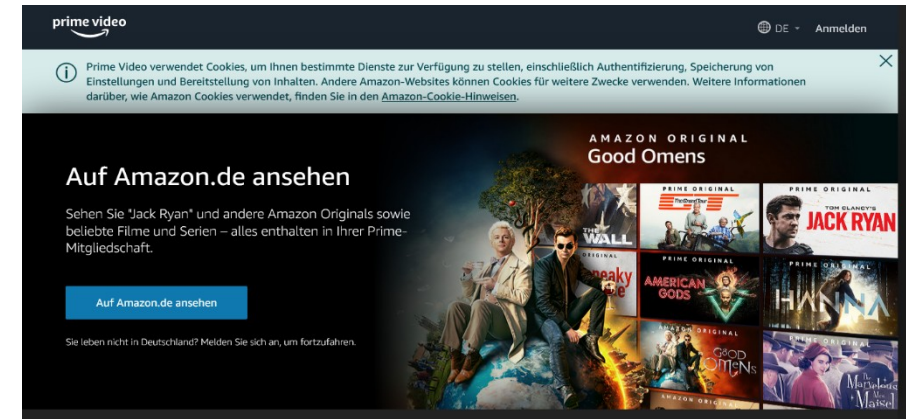


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REJECT ALL COOKIES

ACCEPT ALL COOKIES

COOKIE CONSENT MANAGER



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