Prof. Antonio Rangel

Behavioral Economics Expert

Ex. No.
PXRD004
1:20-cv-03010-APM
1:20-cv-03715-APM

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Assignment

Assignment 1: Offer expert opinion about the likely impact of a well-designed choice screen in reducing consumer bias in favor of Google.

Assignment 2: Respond to Dr. Murphy's opinion that allowing Google to retain the default and preinstallation agreements will not result in consumer biases in favor of Google.

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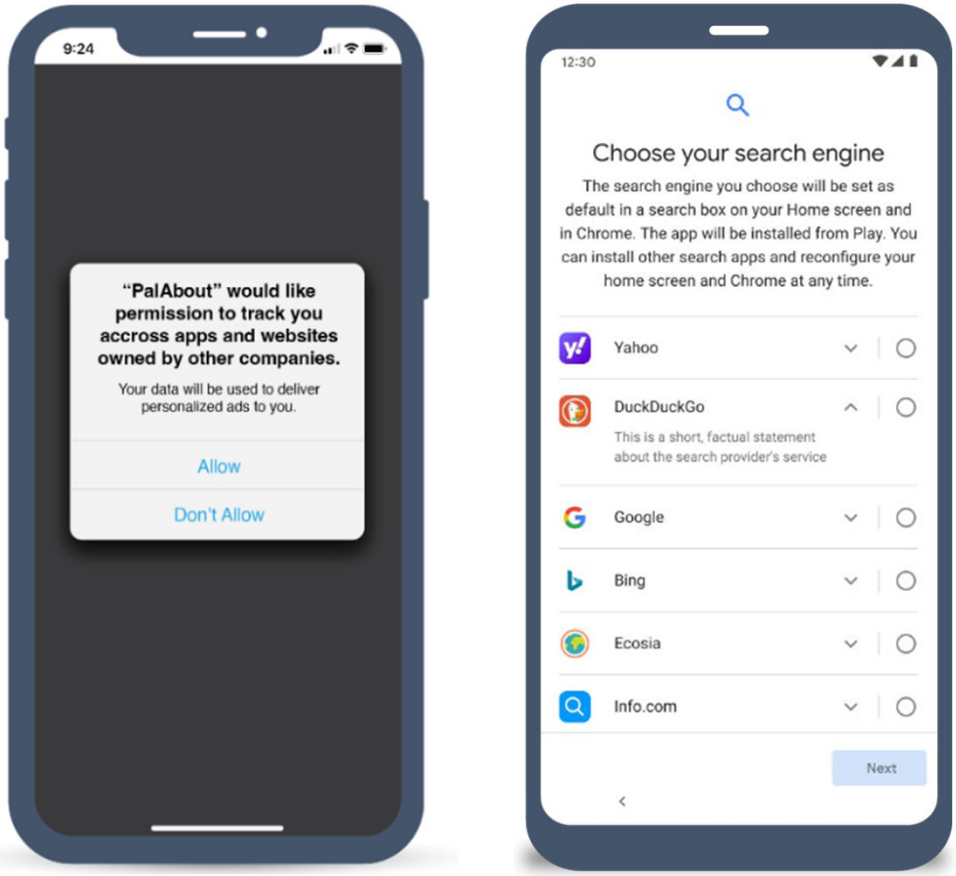
What is a Choice Screen?



A choice screen is a user interface that asks the consumer to make an explicit choice among a number of products.

Sources: Rangel Remedies Report, ¶ 22 & Figure 1; EC Android search engine choice screen introduced September 2021 (Android, "About the choice screen," https://www.android.com/choicescreen/).

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Key Conclusions

Conclusion 1: Choice screens help reduce biases in consumer choice in search, both in selecting search applications, and in selecting search engines within applications.

Conclusion 2: Even a well-designed choice screen, by itself, is unlikely to be sufficient to undo significant biases generated by previous Google defaults. Other remedies could enhance the effectiveness of choice screens.

Conclusion 3: The performance of choice screens depends on the details of the choice architecture.

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Key Rebuttal Conclusions

Rebuttal Conclusion 1: The introduction of choice screens, by themselves, is unlikely to harm consumer welfare.

Rebuttal Conclusion 2: Allowing Google to retain defaults and preinstallation agreements, even with some constraints, would continue to bias consumer choices in its favor.

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Conclusion 1

Choice screens help reduce biases in consumer choice in search, both in selecting search applications, and in selecting search engines within applications.

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Evidence from Recent Academic Studies

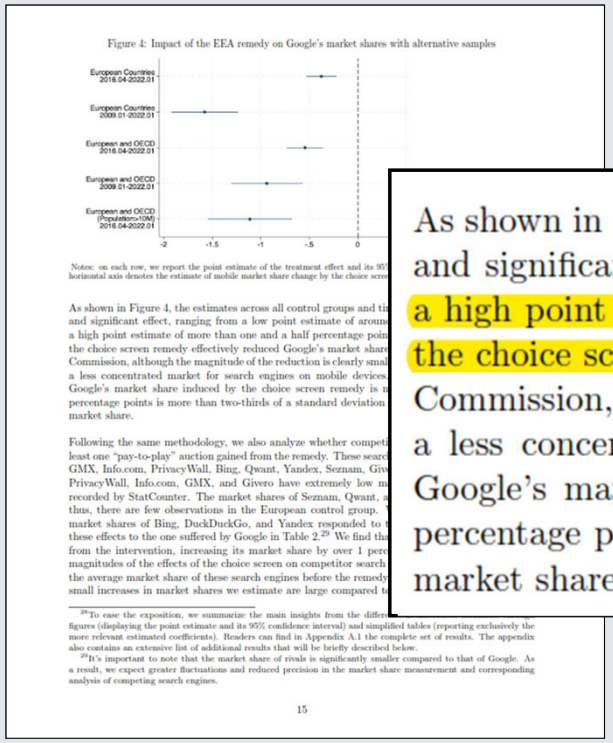

Figure 4: Impact of the EEA remedy on Google's market shares with alternative samples

European Countries 2016.04-2022.01
European Countries 2009.01-2022.01
European and OECD 2016.04-2022.01
European and OECD 2009.01-2022.01
European and OECD (Population>10M) 2016.04-2022.01
-2 -1.5 -1 -.5 0

Notes: on each row, we report the point estimate of the treatment effect and its 95% horizontal axis denotes the estimate of mobile market share change by the choice scre

As shown in Figure 4, the estimates across all control groups and ti and significant effect, ranging from a low point estimate of aroun a high point estimate of more than one and a half percentage poin the choice screen remedy effectively reduced Google's market share Commission, although the magnitude of the reduction is clearly smal a less concentrated market for search engines on mobile devices. Google's market share induced by the choice screen remedy is n percentage points is more than two-thirds of a standard deviation market share.

Following the same methodology, we also analyze whether compet least one "pay-to-play" auction gained from the remedy. These searc GMX, Info.com, PrivacyWall, Bing, Qwant, Yandex, Seznam, Giv PrivacyWall, Info.com, GMX, and Givero have extremely low m recorded by StatCounter. The market shares of Seznam, Qwant, thus, there are few observations in the European control group. market shares of Bing, DuckDuckGo, and Yandex responded to these effects to the one suffered by Google in Table 2.[29] We find th from the intervention, increasing its market share by over 1 per magnitudes of the effects of the choice screen on competitor search the average market share of these search engines before the remedy small increases in market shares we estimate are large compared t

[28] To ease the exposition, we summarize the main insights from the differ figures (displaying the point estimate and its 95% confidence interval) and simplified tables (reporting exclusively the more relevant estimated coefficients). Readers can find in Appendix A.1 the complete set of results. The appendix also contains an extensive list of additional results that will be briefly described below.

[29] It's important to note that the market share of rivals is significantly smaller compared to that of Google. As a result, we expect greater fluctuations and reduced precision in the market share measurement and corresponding analysis of competing search engines.

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2024 Decarolis, et al. Study

As shown in Figure 4, the estimates across all control groups and time windows indicate a negative and significant effect, ranging from a low point estimate of around half of a percentage point to a high point estimate of more than one and a half percentage points.[28] This result indicates that the choice screen remedy effectively reduced Google's market share, as intended by the European Commission, although the magnitude of the reduction is clearly small relative to the goal of inducing a less concentrated market for search engines on mobile devices. Nevertheless, the change in Google's market share induced by the choice screen remedy is not negligible: the drop of 1.5 percentage points is more than two-thirds of a standard deviation of Google's pre-remedy mobile market share.

Source: Francesco Decarolis, Muxin Li, and Filippo Paternollo, "Competition and Defaults in Online Search," *American Economic Journal: Microeconomics*, forthcoming, at 15.

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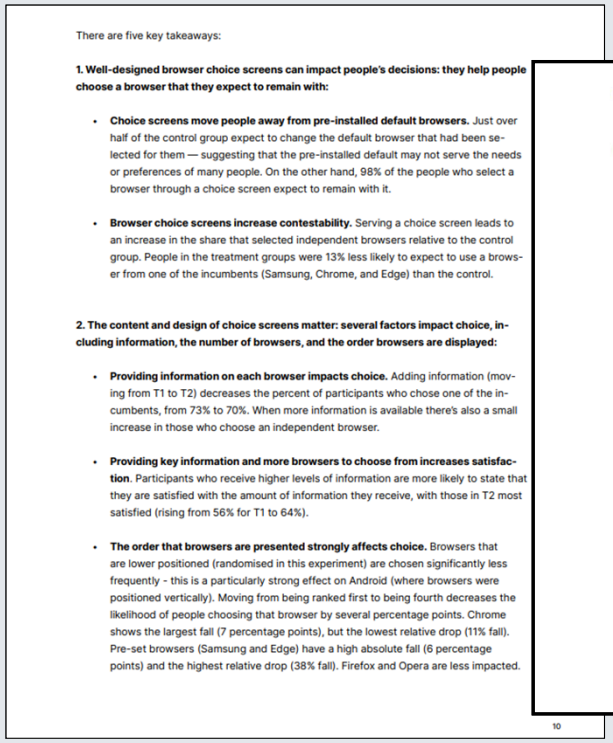
Evidence from Recent Industry Studies



There are five key takeaways:

1. Well-designed browser choice screens can impact people's decisions: they help people choose a browser that they expect to remain with:

- **Choice screens move people away from pre-installed default browsers.** Just over half of the control group expect to change the default browser that had been selected for them — suggesting that the pre-installed default may not serve the needs or preferences of many people. On the other hand, 98% of the people who select a browser through a choice screen expect to remain with it.
- **Browser choice screens increase contestability.** Serving a choice screen leads to an increase in the share that selected independent browsers relative to the control group. People in the treatment groups were 13% less likely to expect to use a browser from one of the incumbents (Samsung, Chrome, and Edge) than the control.

2. The content and design of choice screens matter: several factors impact choice, including information, the number of browsers, and the order browsers are displayed:

- **Providing information on each browser impacts choice.** Adding information (moving from T1 to T2) decreases the percent of participants who chose one of the incumbents, from 73% to 70%. When more information is available there's also a small increase in those who choose an independent browser.
- **Providing key information and more browsers to choose from increases satisfaction**. Participants who receive higher levels of information are more likely to state that they are satisfied with the amount of information they receive, with those in T2 most satisfied (rising from 56% for T1 to 64%).
- **The order that browsers are presented strongly affects choice.** Browsers that are lower positioned (randomised in this experiment) are chosen significantly less frequently - this is a particularly strong effect on Android (where browsers were positioned vertically). Moving from being ranked first to being fourth decreases the likelihood of people choosing that browser by several percentage points. Chrome shows the largest fall (7 percentage points), but the lowest relative drop (11% fall). Pre-set browsers (Samsung and Edge) have a high absolute fall (6 percentage points) and the highest relative drop (38% fall). Firefox and Opera are less impacted.

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2023 Mozilla Browser Choice Screen Study

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Source: Mozilla, "Can Browser Choice Screens Be Effective? Experimental Analysis of the Impact of Their Design, Content and Placement," at 10, https://research.mozilla.org/files/2023/09/Can-browser-choice-screens-be-effective_-Mozilla-experiment-report.pdf.

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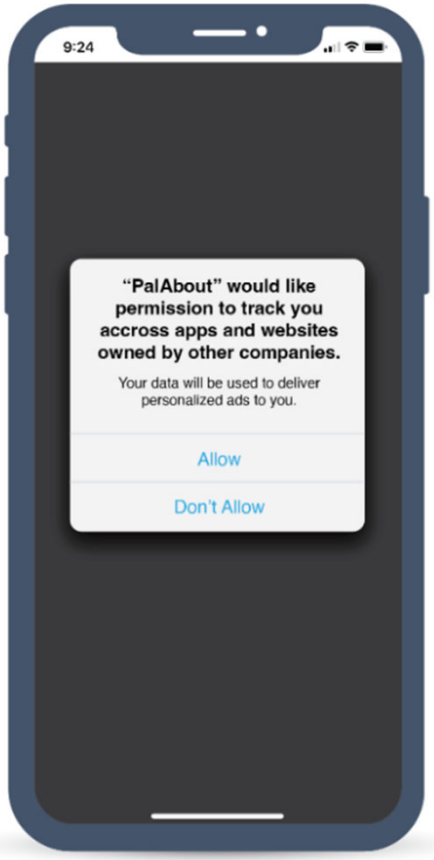
Other Examples in the Software Industry

- In April 2021, Apple introduced choice screen for data tracking by applications.
- "Don't Allow" selected by 80%+ after one year.



Source: Rangel Remedies Report, ¶ 22 & Figure 1.

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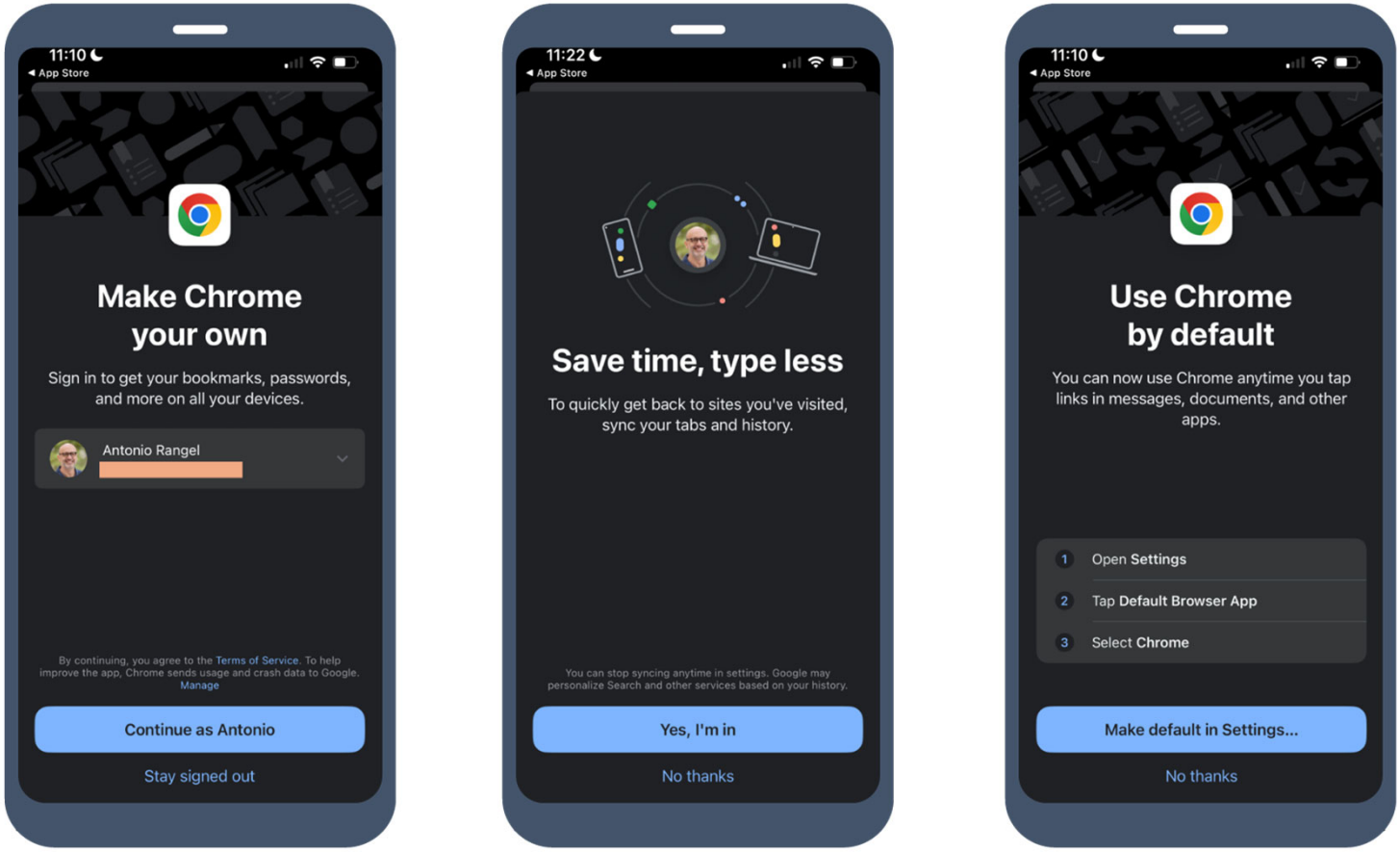
Google Uses Choice Screens in Chrome



Source: Rangel Remedies Rebuttal Report, Figure 5.

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Industry Participants Have Advocated for Choice Screens

"We proposed instead that users be prompted to select the default search provider the first time they use the inline search feature. This approach eliminates any company's own self interests and places control in the hands of the end user, where it belongs. It also helps to ensure that users understand they have a choice of search providers when using the new search box in IE7."

"Overall, well-designed choice screens have benefits – giving people an active choice allows them to select their browser default more easily and increases contestability."

"Choice screens and effective switching mechanisms are crucial tools that empower users and enable competition in the search engine and browser markets."

Sources: UPX0172, at -731; Mozilla, "Can Browser Choice Screens Be Effective? Experimental Analysis of the Impact of Their Design, Content and Placement," at 5; DDG, Ecosia, Qwant, "Open Letter from DuckDuckGo, Ecosia, and Qwant," https://spreadprivacy.com/choice-screen-principles/.

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Conclusion 2

- Even a well-designed choice screen, by itself, is unlikely to be sufficient to undo significant biases generated by previous Google defaults.
- Other remedies could enhance the effectiveness of choice screens.

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Impact of Consumer Habits

- Defaults lead to strong habits, and therefore to familiarity and branding.
- Other things being equal, consumers more likely to choose highly familiar options with strong brands.
- To “google” is a verb.
- Leads to advantage after default removed.

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Evidence from case materials



"The reason the financial impact is not shifting based on the placement of Google in the choice screen is because the assumptions we used in the model are based on brand recognition . . . ."



"Choice screen remedy is likely to be ineffective due to Google's higher quality/strong brand recognition and experience in other jurisdictions."



"When you are presented with choices of browsers… most of which you've never heard of, what we know as an experience for the users is they don't know what to pick. . . . And generally, they pick the one that they know . . . at the end of the day, they pick the one they know the most."

Sources: UPX1103, at -775; MOZ-LIT-0047857, at -872; Cue (Apple) Dep. at 88:9–89:3.

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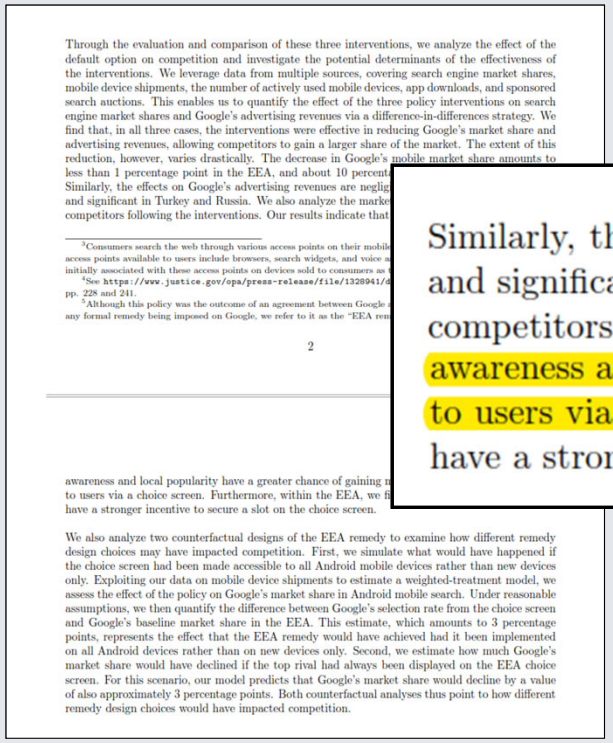
Evidence from Recent Academic Studies



Through the evaluation and comparison of these three interventions, we analyze the effect of the default option on competition and investigate the potential determinants of the effectiveness of the interventions. We leverage data from multiple sources, covering search engine market shares, mobile device shipments, the number of actively used mobile devices, app downloads, and sponsored search auctions. This enables us to quantify the effect of the three policy interventions on search engine market shares and Google's advertising revenues via a difference-in-differences strategy. We find that, in all three cases, the interventions were effective in reducing Google's market share and advertising revenues, allowing competitors to gain a larger share of the market. The extent of this reduction, however, varies drastically. The decrease in Google's mobile market share amounts to less than 1 percentage point in the EEA, and about 10 percent
Similarly, the effects on Google's advertising revenues are negli
and significant in Turkey and Russia. We also analyze the marke
competitors following the interventions. Our results indicate that

[3]Consumers search the web through various access points on their mobil
access points available to users include browsers, search widgets, and voice a
initially associated with these access points on devices sold to consumers as
[4]See https://www.justice.gov/opa/press-release/file/1328941/d
pp. 228 and 241.
[5]Although this policy was the outcome of an agreement between Google
any formal remedy being imposed on Google, we refer to it as the "EEA rem

2

awareness and local popularity have a greater chance of gaining
to users via a choice screen. Furthermore, within the EEA, we f
have a stronger incentive to secure a slot on the choice screen.

We also analyze two counterfactual designs of the EEA remedy to examine how different remedy design choices may have impacted competition. First, we simulate what would have happened if the choice screen had been made accessible to all Android mobile devices rather than new devices only. Exploiting our data on mobile device shipments to estimate a weighted-treatment model, we assess the effect of the policy on Google's market share in Android mobile search. Under reasonable assumptions, we then quantify the difference between Google's selection rate from the choice screen and Google's baseline market share in the EEA. This estimate, which amounts to 3 percentage points, represents the effect that the EEA remedy would have achieved had it been implemented on all Android devices rather than on new devices only. Second, we estimate how much Google's market share would have declined if the top rival had always been displayed on the EEA choice screen. For this scenario, our model predicts that Google's market share would decline by a value of also approximately 3 percentage points. Both counterfactual analyses thus point to how different remedy design choices would have impacted competition.

2024 Decarolis, et al. Study

> Similarly, the effects on Google's advertising revenues are negligible in the EEA but are negative and significant in Turkey and Russia. We also analyze the market share gains enjoyed by Google's competitors following the interventions. Our results indicate that search engines with higher brand awareness and local popularity have a greater chance of gaining market share when made available to users via a choice screen. Furthermore, within the EEA, we find that these search engines also have a stronger incentive to secure a slot on the choice screen.

Source: Francesco Decarolis, Muxin Li, and Filippo Paternollo, "Competition and Defaults in Online Search," *American Economic Journal: Microeconomics*, forthcoming, at 2–3.

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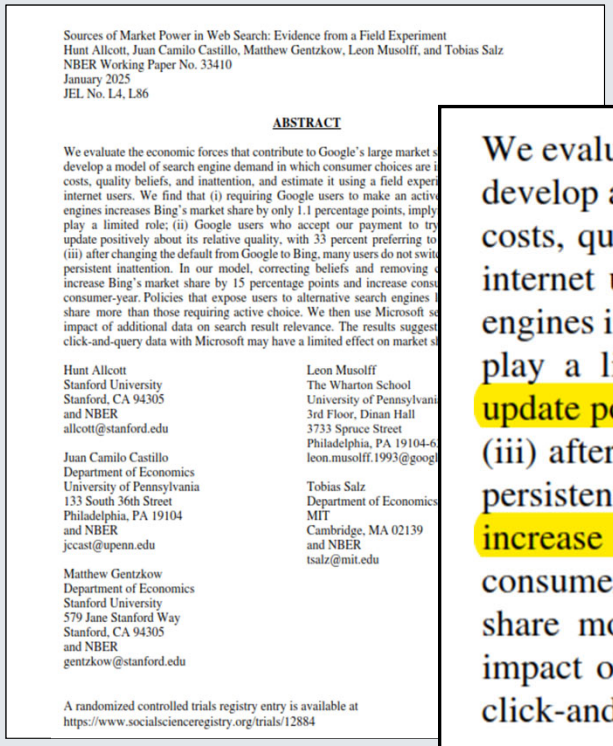
Evidence from Recent Academic Studies



Sources of Market Power in Web Search: Evidence from a Field Experiment
Hunt Allcott, Juan Camilo Castillo, Matthew Gentzkow, Leon Musolff, and Tobias Salz
NBER Working Paper No. 33410
January 2025
JEL No. L4, L86

ABSTRACT

We evaluate the economic forces that contribute to Google's large market s
develop a model of search engine demand in which consumer choices are i
costs, quality beliefs, and inattention, and estimate it using a field experi
internet users. We find that (i) requiring Google users to make an activ
engines increases Bing's market share by only 1.1 percentage points, imply
play a limited role; (ii) Google users who accept our payment to try
update positively about its relative quality, with 33 percent preferring to
(iii) after changing the default from Google to Bing, many users do not swit
persistent inattention. In our model, correcting beliefs and removing
increase Bing's market share by 15 percentage points and increase const
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share more than those requiring active choice. We then use Microsoft se
impact of additional data on search result relevance. The results suggest
click-and-query data with Microsoft may have a limited effect on market sh

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A randomized controlled trials registry entry is available at
https://www.socialscienceregistry.org/trials/12884

2025 Allcott, et al. Study

We evaluate the economic forces that contribute to Google's large market share in web search. We develop a model of search engine demand in which consumer choices are influenced by switching costs, quality beliefs, and inattention, and estimate it using a field experiment with US desktop internet users. We find that (i) requiring Google users to make an active choice among search engines increases Bing's market share by only 1.1 percentage points, implying that switching costs play a limited role; (ii) Google users who accept our payment to try Bing for two weeks update positively about its relative quality, with 33 percent preferring to continue using it; and (iii) after changing the default from Google to Bing, many users do not switch back, consistent with persistent inattention. In our model, correcting beliefs and removing choice frictions would increase Bing's market share by 15 percentage points and increase consumer surplus by $6 per consumer-year. Policies that expose users to alternative search engines lower Google's market share more than those requiring active choice. We then use Microsoft search logs to assess the impact of additional data on search result relevance. The results suggest that sharing Google's click-and-query data with Microsoft may have a limited effect on market shares.

Source: Hunt Allcott et al., "Sources of Market Power in Web Search: Evidence from a Field Experiment" (NBER Working Paper No. 33410, Cambridge, MA, January 2025), at 1.

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Conclusion 3

- The performance of choice screens depends on the details of the choice architecture.
- Choice screen effectiveness could be improved by having it reviewed by behavioral experts prior to deployment.

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Google Has Designed Its Choice Architecture to Increase the Use of Its Products

- Google has tracked the amount of choice friction associated with changing search defaults and privacy preferences

- Google has enforced contractual provisions to prevent defaults from being easily switched away

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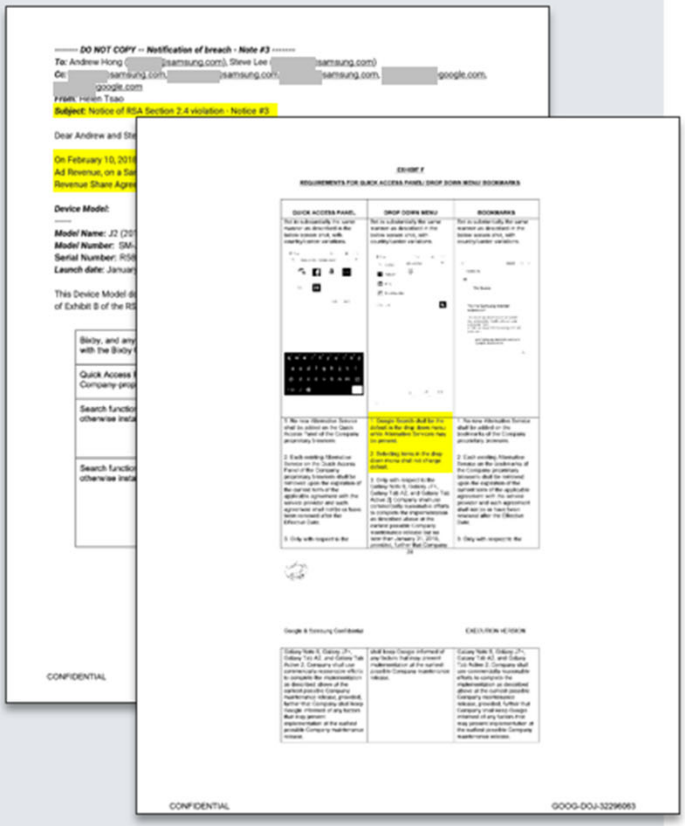
Google Stopped Samsung From Lowering Choice Friction to Change the Google Default in the S Browser (2018)



------- DO NOT COPY -- Notification of breach - Note #3 -------

To: Andrew Hong [redacted]samsung.com), Steve Lee [redacted]@samsung.com)

Cc: [redacted]samsung.com, [redacted]@samsung.com, [redacted]@samsung.com, [redacted]@google.com, [redacted]@google.com

From: Helen Tsao

Subject: Notice of RSA Section 2.4 violation - Notice #3

Dear Andrew and Steve,

On February 10, 2018, we discovered that Samsung used a Client ID, of which Google pays Samsung Shared Net Ad Revenue, on a Samsung device not qualified for revenue share in violation of Section 2.4 of the Google Mobile Revenue Share Agreement ("RSA") dated July 1, 2017. The details of the Device Model are below:

1. Google Search shall be the default in the drop down menu while Alternative Services may be present.

2. Selecting items in the drop down menu shall not change default.

Source: UPX0149, at -062.001–.003

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Elements of Successful Choice Screen Architecture

- No option preselected as a default
- Options in random order
- Easily accessible useful information about the different options
- Avoid “fear messaging”
- Require scrolling through all the options before making a selection
- Minimize the number of required clicks

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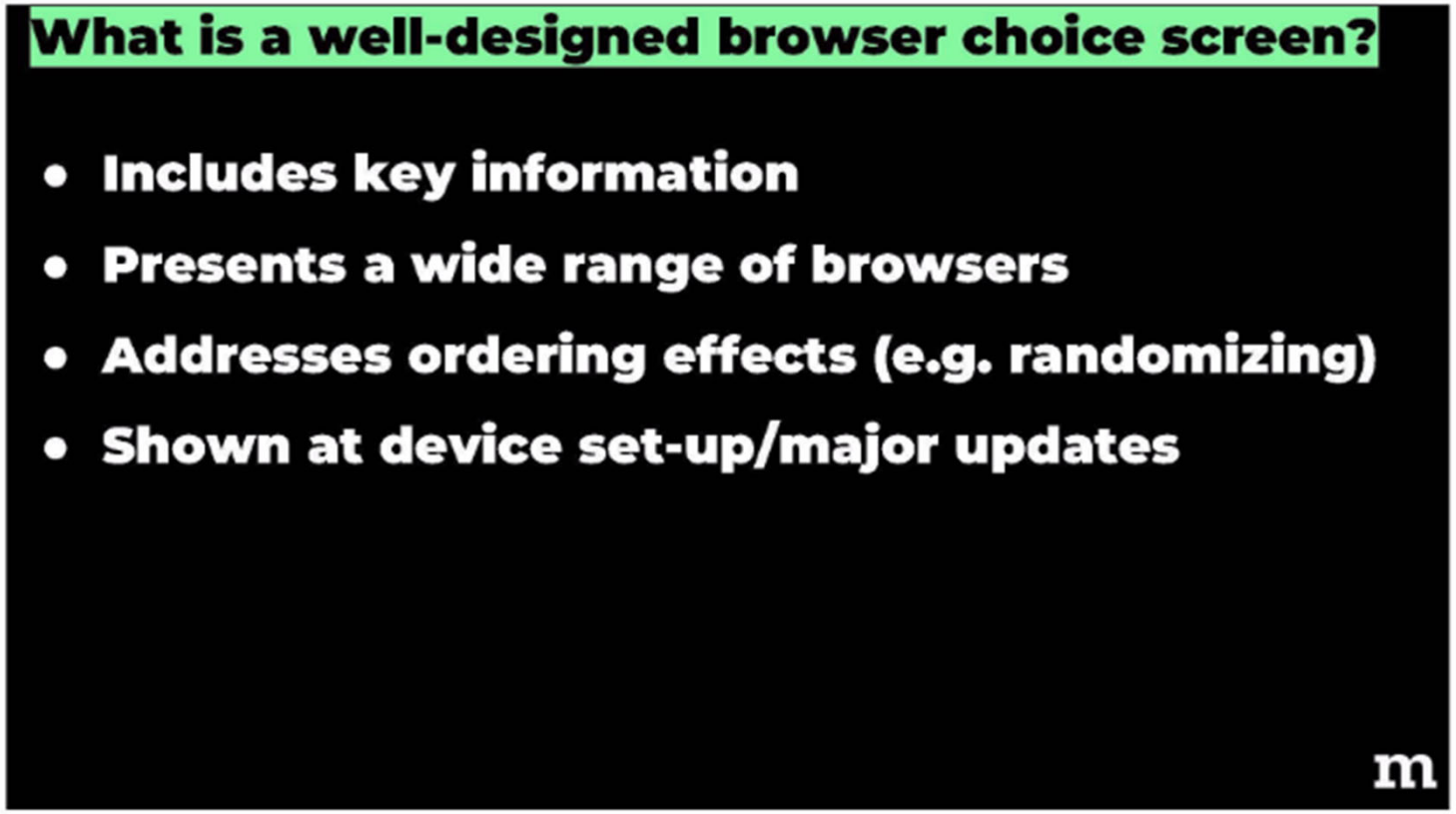
Mozilla Criteria for Effective Choice Screen Implementation



Source: PXR0064, at -079.

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Criticisms of Apple's iPhone Browser Choice Screen



"Apple's current user flow introduces significant friction by forcing users to take the additional step of opening the App Store to select their default browser."

"Apple's choice screen does not force the user to view all options."



"Apple's poor design means that over [redacted]% of users who select Firefox in the choice screen do not follow through and download the app."

"Third party apps are listed in alphabetical order, but Safari is listed first."

"Apple hides the browser default setting option when Safari is the default."



"The Commission . . . [has] concerns that Apple's design of the web browser choice screen, may be preventing users from truly exercising their choice of services."

Sources: GOOG-DOJ-33810853, at -856–857 (emphasis omitted); MOZ-LIT-047008 at -011; MOZ-LIT-046885, at -885, -888–889 (emphasis omitted); European Union Press Release, "Commission opens non-compliance investigations against Alphabet, Apple and Meta under the Digital Markets Act" (March 24, 2024).

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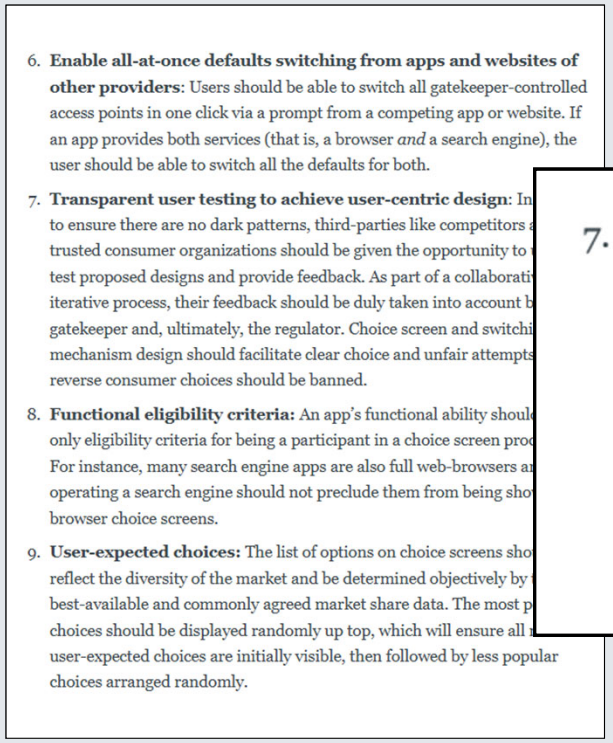
Industry Participants' Choice Screen Comments



6. **Enable all-at-once defaults switching from apps and websites of other providers**: Users should be able to switch all gatekeeper-controlled access points in one click via a prompt from a competing app or website. If an app provides both services (that is, a browser *and* a search engine), the user should be able to switch all the defaults for both.
7. **Transparent user testing to achieve user-centric design**: In
to ensure there are no dark patterns, third-parties like competitors
trusted consumer organizations should be given the opportunity to
test proposed designs and provide feedback. As part of a collaborati
iterative process, their feedback should be duly taken into account b
gatekeeper and, ultimately, the regulator. Choice screen and switchi
mechanism design should facilitate clear choice and unfair attempts
reverse consumer choices should be banned.
8. **Functional eligibility criteria:** An app's functional ability shoul
only eligibility criteria for being a participant in a choice screen proc
For instance, many search engine apps are also full web-browsers a
operating a search engine should not preclude them from being sho
browser choice screens.
9. **User-expected choices:** The list of options on choice screens sho
reflect the diversity of the market and be determined objectively by
best-available and commonly agreed market share data. The most p
choices should be displayed randomly up top, which will ensure all
user-expected choices are initially visible, then followed by less popular
choices arranged randomly.

2022 Open Letter from CEOs of DuckDuckGo, Ecosia, and Qwant

7. **Transparent user testing to achieve user-centric design**: In order to ensure there are no dark patterns, third-parties like competitors and trusted consumer organizations should be given the opportunity to user test proposed designs and provide feedback. As part of a collaborative, iterative process, their feedback should be duly taken into account by the gatekeeper and, ultimately, the regulator. Choice screen and switching mechanism design should facilitate clear choice and unfair attempts to reverse consumer choices should be banned.

Source: "10 Principles for Fair Choice Screens and Effective Switching Mechanisms," DuckDuckGo, July 5, 2022, https://spreadprivacy.com/choice-screen-principles/.

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Rebuttal Conclusion 1

The introduction of choice screens, by themselves, is unlikely to harm consumer welfare

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Choice Screens Would Have Negligible or Positive Impact for Three Classes of Consumers

- Negligible impact for consumers choosing Google products before and after choice screen due to:
  - History of use and preference for Google
  - Habits, familiarity, branding (and not necessarily preference)
- Positive impact for consumers selecting an alternative preferred product after choice screen

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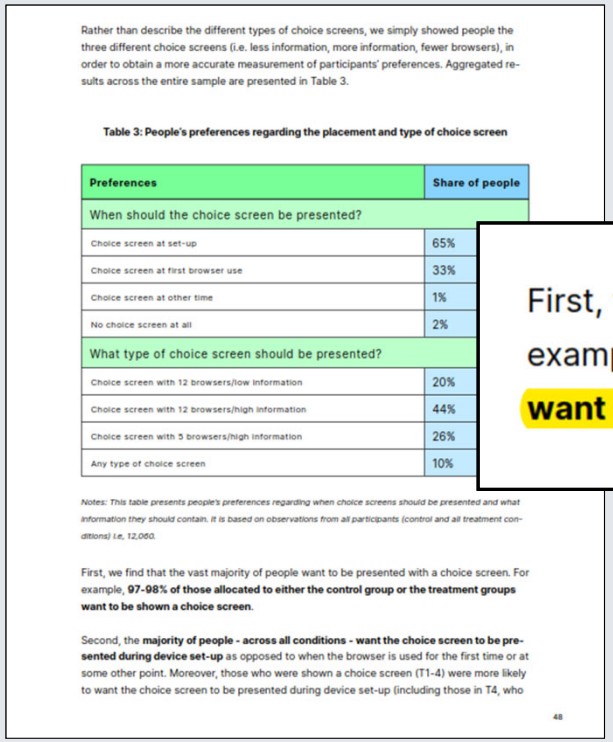
Evidence from Recent Industry Studies



Rather than describe the different types of choice screens, we simply showed people the three different choice screens (i.e. less information, more information, fewer browsers), in order to obtain a more accurate measurement of participants' preferences. Aggregated results across the entire sample are presented in Table 3.

Table 3: People's preferences regarding the placement and type of choice screen

Preferences	Share of people
When should the choice screen be presented?	
Choice screen at set-up	65%
Choice screen at first browser use	33%
Choice screen at other time	1%
No choice screen at all	2%
What type of choice screen should be presented?	
Choice screen with 12 browsers/low information	20%
Choice screen with 12 browsers/high information	44%
Choice screen with 5 browsers/high information	26%
Any type of choice screen	10%

Notes: This table presents people's preferences regarding when choice screens should be presented and what information they should contain. It is based on observations from all participants (control and all treatment conditions) i.e, 12,060.

First, we find that the vast majority of people want to be presented with a choice screen. For example, **97-98% of those allocated to either the control group or the treatment groups want to be shown a choice screen**.

Second, the **majority of people - across all conditions - want the choice screen to be presented during device set-up** as opposed to when the browser is used for the first time or at some other point. Moreover, those who were shown a choice screen (T1-4) were more likely to want the choice screen to be presented during device set-up (including those in T4, who

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2023 Mozilla Browser Choice Screen Study

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Source: Mozilla, "Can Browser Choice Screens Be Effective? Experimental Analysis of the Impact of Their Design, Content and Placement," at 48 (bold emphasis in original), https://research.mozilla.org/files/2023/09/Can-browser-choice-screens-be-effective_-Mozilla-experiment-report.pdf.

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Rebuttal Conclusion 2

Allowing Google to retain defaults and preinstallation agreements, even with some constraints, would continue to bias consumer choices in its favor

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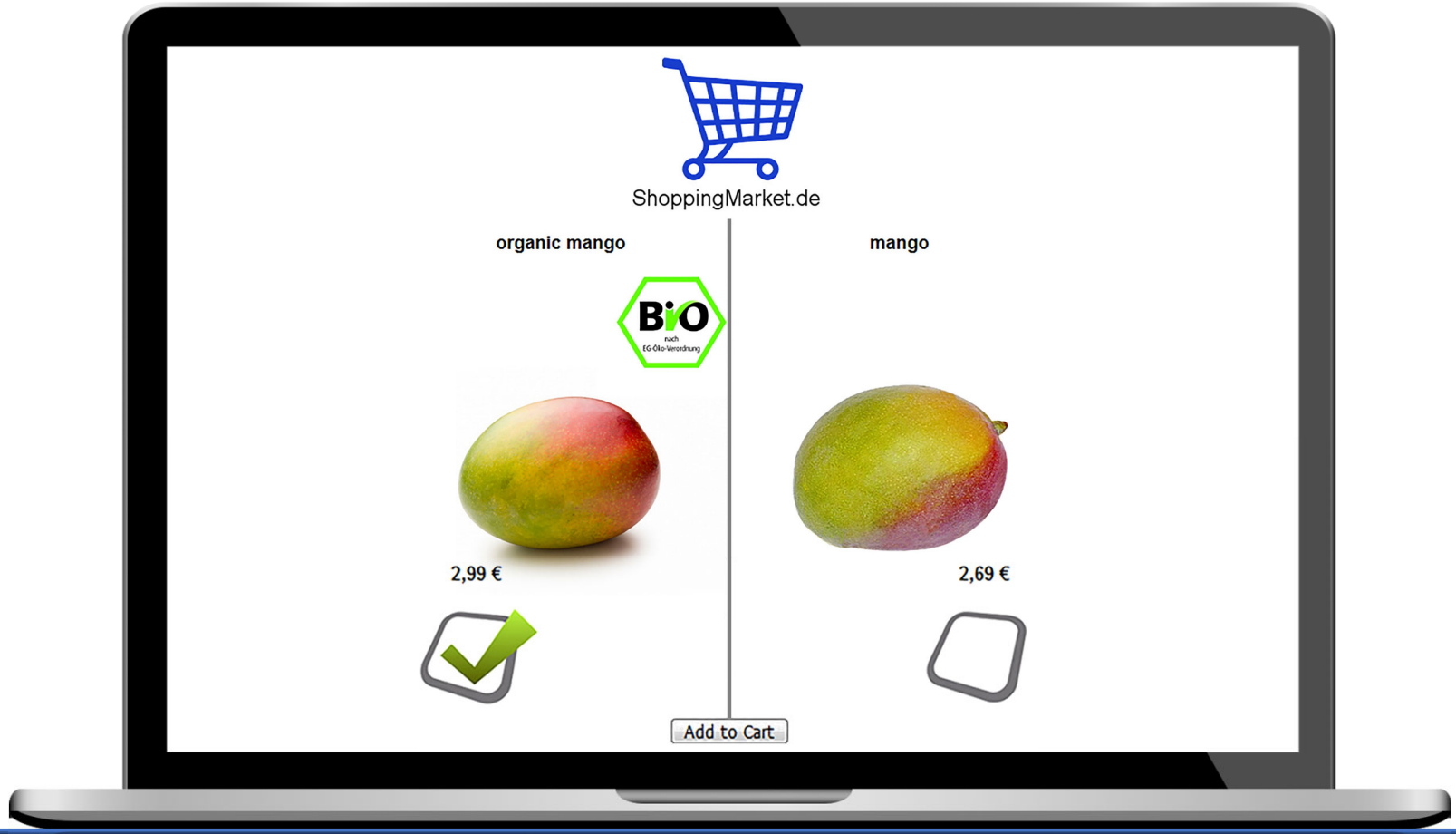
Defaults Matter Even With Salient Third-Party Distribution



Source: Rangel Liability Expert Report, ¶ 40 & Figure 2 (citing Kuhn et al., "Organic defaults in online-shopping: Immediate effects but no spillover to similar choices," *Journal of Consumer Behavior*, 2021, 20:271-287).

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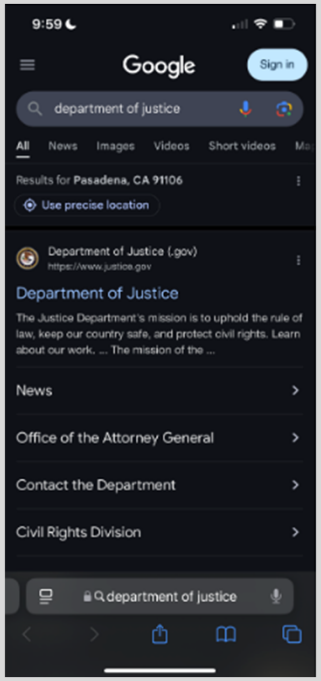
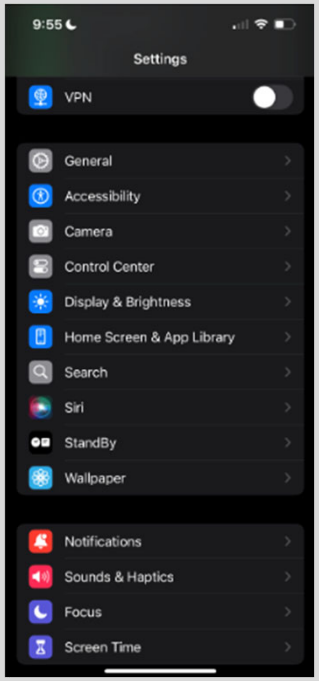
Defaults Biases Stronger in Existing Search Interfaces



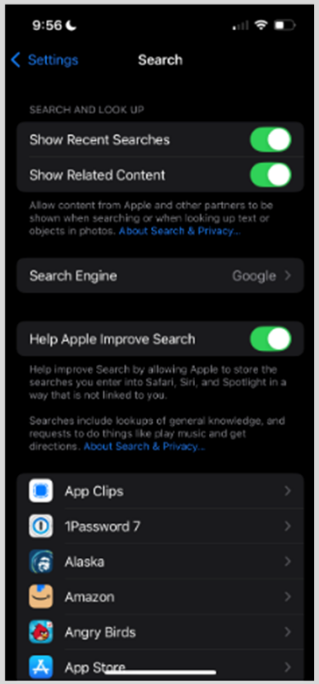
Leave browser app



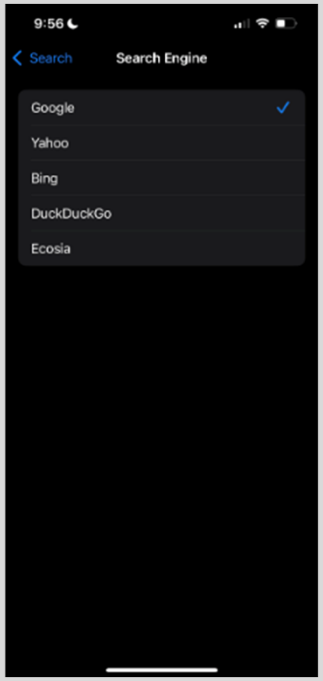
Open settings app



Scroll to Search tab



Tap on search engine option



Select desired search engine

Source: Rangel Remedies Rebuttal Report, Figure 3.

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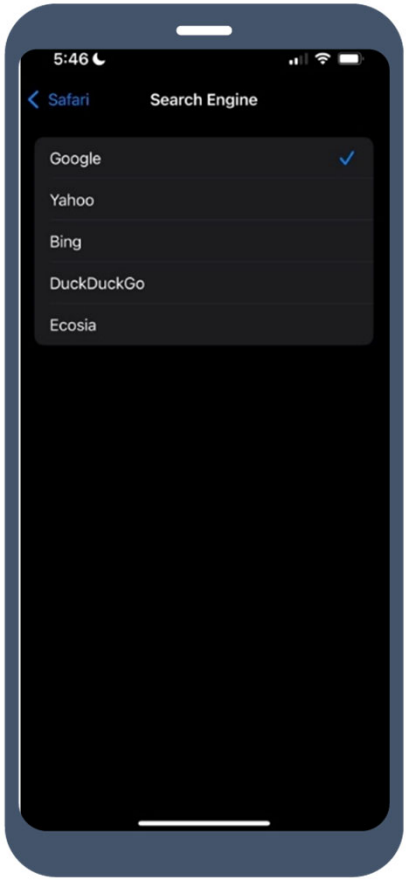
Market Evidence About Search Engines

- Google's contracts with companies like Apple have historically allowed for some third-party distribution of competing search engines
- Mozilla Firefox browser also promotes non-default search engines in the search bar



Source: Rangel Remedies Rebuttal Report, ¶¶ 18, 20 (citing DX0963, at -404–405, -407; DX0924, at -259, -261; MOZ-LIT-0047857).

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Case and Market Evidence About Search Applications

- Google has stated that "Safari is a deeply ingrained habit" and changing the default browser to Chrome "is a challenging one from a behavioral perspective."

- Apple's Maps introduction led to a [redacted]% drop in Google Maps usage.

Source: Rangel Remedies Rebuttal Report, ¶¶ 27–28 (citing UPX1049, at -232; GOOG-DOJ-27095033, at -034; Trial Testimony of Mike Roszak (September 20, 2023) 1622:1–10).

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Key Conclusions

Conclusion 1: Choice screens help reduce biases in consumer choice in search, both in selecting search applications, and in selecting search engines within applications.

Conclusion 2: Even a well-designed choice screen, by itself, is unlikely to be sufficient to undo sufficient biases generated by previous Google defaults. Other remedies could enhance the effectiveness of choice screens.

Conclusion 3: The performance of choice screens depends on the details of the choice architecture.

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