AN ANALYSIS OF POTENTIAL REMEDIES TO ADDRESS GOOGLE'S SEARCH MONOPOLY

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Summary

We consider five potential remedies to restore competition if Google is found by the court to have maintained its search monopoly illegally as alleged by the US DOJ (Department of Justice) in its 2020 lawsuit against Google.

The potential remedies we consider are requiring Google to supply syndicated results on fair reasonable and non-discriminatory terms (Section 2.2), requiring that Google provides access to click and query data (Section 2.3), constraining Google's default payments to Apple (Section 3.2), mandating choice screens on Android phones (Section 3.3), and requiring Google to divest Chrome (Section 3.4).

In our view any proposed remedies should be proportionate and targeted at the alleged illegal conduct, easily implementable and monitored given available resources and expertise, and timely and effective in restoring competitive conditions to the affected markets while avoiding unintended adverse effects on consumers.

Based on these criteria we recommend a combination of:

- Requiring Google to supply syndication contracts with improved terms and conditions which do not restrict the syndicators' ability to innovate, differentiate, and develop a unique offering (see Box 2 in section 2.2 for further details); **and**
- Restricting Google from making payments to Apple to be the default search engine on any search access point on Apple devices; **and**
- Mandating choice screens for Android phones covering all search access points including Chrome.

1. The general search market and alleged theories of harm

Google is by far the largest search engine – both in the US (with over 85% market share) and worldwide (with over 90% market share) across all platforms.[1] Google collects and processes billions of online search queries every day. This means that Google's ability to collect data on what users are searching for and get feedback on which results users find useful is unparalleled. For example, the DOJ's pre-trial brief states that Google has 16 times more fresh data than Bing, its nearest competitor.[2]

Google's much larger user base also means many more advertisers want to advertise on Google and are willing to pay more per impression than on competing search engines.[3] Google's search ad revenue in the US in 2023 was USD 58.14 billion compared to USD 5.88 billion for Bing.[4] Thus, Google's ability to monetize search is also unparalleled. In the US Google has around 70% of the search advertising market.[5]

The DOJ filed a lawsuit in 2020 alleging that Google unlawfully maintains this search monopoly.[6] This lawsuit went to trial in September 2023 and a judgment is expected later this year The DOJ alleges that Google erects barriers that artificially and illegally restrict competition in general search, and that it is these barriers that allow Google to maintain its dominance in search and related advertising services.[7]

We understand these barriers to work in the following way.

1. Google uses financial payments generated from its search advertising business and licensing conditions for Android to lock up various distribution channels for search engines. These channels include devices like mobile phones and services like web browsers that consumers use to search the internet. For example, Google reportedly

[1] Statcounter, Browser Market Share Worldwide. Accessed on February 6, 2024: https://gs.statcounter.com/search-engine-market-share

[2] DOJ's Pre-Trial Brief, August 28, 2023. Available here: https://www.justice.gov/d9/2023-09/416366.pdf

[3] For example, the UK CMA (Competition and Markets Authority) analysis finds that: "… for the same search queries across our one-week dataset, Google has higher prices than Bing on average. Google's prices are on average [30-40]% higher on desktop and [30-40]% higher on mobile for the sample of queries that we analysed." Para 5.90, CMA, *Online platforms and digital advertising Market study final report*, July 1, 2020. Available here: https://www.gov.uk/cma-cases/online-platforms-and-digital-advertising-market-study#final-report.

[4] Insider Intelligence | eMarketer, October 2023.

[5] Statista Market Insights, updated November 2023. Available here: https://www.statista.com/outlook/amo/advertising/search-advertising/united-states#key-players

[6] Justice Department Sues Monopolist Google For Violating Antitrust Laws, October 20, 2020. Available here: https://www.justice.gov/opa/pr/justice-department-sues-monopolist-google-violating-antitrust-laws

[7] The DOJ filed a separate lawsuit against Google alleging monopolization of digital advertising technologies in January 2023. This lawsuit is set to go to trial in September 2024. This paper does not discuss this lawsuit, but we note that Google's market power in search and digital advertising are interdependent.
Justice Department Sues Google for Monopolizing Digital Advertising Technologies, January 24, 2023. Available here: https://www.justice.gov/opa/pr/justice-department-sues-google-monopolizing-digital-advertising-technologies

paid USD 26.3 billion in 2021 to be the default search engine on most smartphones and browsers.[8]

2. Consumers seldom change their default search engine.[9] This means most consumers never try or switch to competing search engines.
3. This constrains the growth of competing search engines by making it difficult for them to acquire new users even if they offer a differentiated search experience. For example, DuckDuckGo offers a more private search experience and Neeva (no longer operational) offered new search features and a subscription-based business model.
4. The low user base of competing search engines means these services have access to less data on what users are searching for and which results they find useful. This potentially handicaps the development of these search engines and their ability to compete effectively with Google.
5. A lower user base also means that competing search engines are not able to attract as many advertisers as Google, leading to substantially lower advertising revenues for competing search engines.
6. The lower advertising revenues of competing search engines means that they are not competitive against Google when bidding to be the default search engine on device manufacturers like Apple. It also means that entrants with alternative business models like subscriptions cannot compete with Google in bidding for the default search position.
7. Google acquires the default position on key distribution channels for search engines and the cycle continues.

We consider potential remedies if Google is found to have maintained its search monopoly illegally and our analysis is structured as follows:

- Section 2 discusses two potential supply side remedies which address Google's advantage in size and scale. These potential interventions would enable more competition by providing access to inputs that are hard to replicate for entrants or competitors operating at a substantially smaller scale.
- Section 3 discusses three potential demand side remedies which address Google's lock on various distribution channels. These potential interventions would allow Google's competitors to more easily get consumers to try and potentially switch to their services.
- Section 4 concludes.

[8] Waters, Richard, *Google paid $26.3bn for search default deals in 2021, executive testifies*, Financial Times, October 27, 2023. Available here: https://www.ft.com/content/f22f5085-0e8f-46eb-b1de-55550651459f

[9] This is due to the status quo bias and the real or perceived difficulty in changing search engines. This is borne out by internal Google documents made available as part of the trial which, for example, acknowledge the benefits of setting Google as the default home page as well as extensive studies by other competition authorities.
Trail Exhibits: https://www.justice.gov/atr/us-and-plaintiff-states-v-google-llc-2020-trial-exhibits
CMA, *Online platforms and digital advertising Market study final report: Appendix H: default positions in search*, July 1, 2020.

2. Supply side remedies –access to key inputs

We first discuss two key inputs that are required to develop a general search engine in section 2.1. Building on this discussion, section 2.2 discusses a remedy that would require Google to supply syndicated search results, and section 2.3 explores a remedy that would require Google to supply click and query data.

2.1 Key inputs to develop and supply a general search engine

There are two must have inputs required to develop a general search engine. The first is an up-to-date index of the world wide web,[10] and second a large number of user queries (what information users are looking for) and user clicks (the websites that a user finds useful when presented with different search results) – 'click and query' data. These inputs are required to develop and improve ranking algorithms that output appropriately ranked blue links to relevant websites based on a user query.

2.1.1 An index of the world wide web

The DOJ's complaint alleges that Google's illegal conduct stops competing search engines from growing and gaining users. As a result, Google's competitors currently operate at a substantially smaller scale. This smaller scale makes it unprofitable for most competing general search engines to incur the upfront and on-going cost of creating and maintaining an index of the world wide web of a similar size as Google.

Bing, the second largest search engine with around 7% of the US general search market,[11] is the only other search engine that maintains a large index of English language web pages comparable to Google. Based on submissions from Google and Bing, the UK CMA finds that Google's index contains around [500-600 billion] pages and Microsoft's index contains around [100-200 billion] pages.[12]

Most other smaller providers like DuckDuckGo and Yahoo syndicate search results from Bing and do not maintain comparable indexes. Some smaller providers maintain partial-web indexes that can be useful to differentiate search results and stand out from the competition. These are cheaper to maintain as they contain a smaller more focused set of webpages. For example, DuckDuckGo's Tracker Radar is an up-to-date index of trackers which powers DuckDuckGo's tracker protection privacy feature.[13] Others like Yandex in Russia and Baidu in China maintain local language web page indexes. Apple also has its own web crawler which it uses for products like Siri and Spotlight suggestions.[14]

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[10] This is an organized list of websites and information on the websites generated by crawling the world wide web.

[11] Statcounter, Search Engine Market Share United States Of America. Accessed on February 6, 2024: https://gs.statcounter.com/search-engine-market-share/all/united-states-of-america

[12] Para 75, CMA, *Online platforms and digital advertising Market study final report: Appendix I: search quality and economies of scale*, July 1, 2020.

[13] See https://spreadprivacy.com/duckduckgo-tracker-radar/ for more details.

[14] Information about the Applebot can be found here- https://support.apple.com/en-us/HT204683

It is possible in our view that if some of these smaller competing search engines gain market share it would become commercially feasible for them to develop their own web-indexes like Bing and/or further develop partial indexes to differentiate their service offerings.

2.1.2 Click and query data

Competitors operating at a smaller scale than Google have access to lower volumes of click and query data which may handicap the development of these search engines and affect the quality of their search results. The UK CMA investigation finds that: [15]

> *"…the greater scale of English-language queries seen by Google supports its ability to deliver more relevant search results compared to its competitors. We consider that this effect is more material for particular types of query, such as uncommon or 'tail' queries. Given the importance of search relevance to consumers, the lack of comparable scale in click-and-query data limits the ability of other search engines to compete with Google."*

These findings suggest that even for Bing, Google's nearest competitor, with around a 7% overall market share, a lower number of queries may be an issue when competing with Google on providing relevant search results for rare or unique ('tail') queries which are around 30% of overall search queries. For more common ('head' or 'torso') queries search engines with smaller market shares are likely to be able to provide search results of comparable quality.[16]

We note that during the CMA investigation Google acknowledged that while more click and query data may be useful for 'tail queries', it is in a similar situation to its rivals as 15% of traffic is new to Google as well,[17] and that the:[18]

> *… 'relevance of search results is not strongly correlated with access to large query datasets'. It also said that there are often more efficient approaches to improving the results for tail queries than increasing scale of data. It said that major improvements in the relevance of search results have come from technological and analytical developments that do not depend on having more data.*

Based on findings of the UK CMA and Google's response to the UK CMA our view is that more click and query data are likely useful to provide more relevant tail queries but it is unclear to what extent more data are essential. In any case the lack of adequate click and query data is not something that Google's competitors can remedy without growing their market share. This is unlike building and developing an index of the world wide web which requires large financial investment but is not dependent on acquiring users first.

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[15] Para 68, CMA, *Online platforms and digital advertising Market study final report: Appendix I: search quality and economies of scale*, July 1, 2020.

[16] Figure I.2, CMA, *Online platforms and digital advertising Market study final report: Appendix I: search quality and economies of scale*, July 1, 2020.

[17] Para 107, CMA, *Online platforms and digital advertising Market study final report: Appendix B: summary of responses to our interim report consultation*, July 1, 2020.

[18] Para 3.75, CMA, *Online platforms and digital advertising Market study final report*, July 1, 2020.

We discuss two potential supply side remedies to introduce more competition in the general search market below. The first is mandating that Google provides syndicated results on a **FRAND** (fair reasonable and non-discriminatory) basis in section 2.2, and the second is access to Google's click and query data in section 2.3.

2.2 Mandate supply of syndicated results with a focus on non-price terms

Without tens of billions of dollars to invest upfront[19] a commercially feasible option for an entrant to offer general search services is to syndicate search results from an existing search engine provider. Indeed, this is the business model of smaller search engine providers. DuckDuckGo explains this works as follows:[20]

> *Yahoo and DuckDuckGo (and any other search engines hoping to be competitive in the search engine market) sign search syndication contracts with Google and/or Microsoft to purchase their organic web links. In exchange, the purchasing company agrees to show search ads next to the organic web links. The parties split the revenue generated by the search ads (according to percentages stated in the contract).*

Currently Microsoft is the main provider of these syndicated contracts. For example, Yahoo!, DuckDuckGo, AOL, and Qwant all use Bing as their partner. Google does have some syndication contracts,[21] but it would seem that Microsoft is the only reliable syndication partner. DuckDuckGo reports that: [22]

> *Microsoft is currently the primary source of organic web links (and the associated ad feed) for most search engines trying to compete in the search engine market.*

In our view this reflects Microsoft and Google's incentives to syndicate search results to enable syndicators like DuckDuckGo to grow their market share. Microsoft has more to gain from syndication than Google because:

***First*,** Microsoft likely cannibalizes fewer of its retail users (users that use Bing as their primary search engine) to gain wholesale users (users that start using the syndicators' search engine). Hence Microsoft's wholesale revenues (the payments that Microsoft receives from syndicators

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[19] For rough estimates see paras 83-87, CMA, *Online platforms and digital advertising Market study final report: Appendix I: search quality and economies of scale*, July 1, 2020.

[20] Page 5, *DuckDuckGo White Paper on the Search Engine Market, Features and Competitive Landscape*, March 2021. Available here: https://staticcdn.duckduckgo.com/press/DuckDuckGo-White-Paper-on-search_March-2021.pdf

[21] For example, Ecosia recently signed a syndication contract with Google reportedly in response to the development of ChatGPT and other large language models which are both a threat and opportunity for smaller search engines.
Guest, Peter, *A 'Green' Search Engine Sees Danger—and Opportunity—in the Generative AI Revolution*, Wired, October 16, 2023. Available here: https://www.wired.com/story/search-engine-ecosia-generative-ai-revolution/

[22] Page 5, *DuckDuckGo White Paper on the Search Engine Market, Features and Competitive Landscape*, March 2021.

like DuckDuckGo and Yahoo!) [23] likely exceeds the retail revenue it potentially loses from some of its current users switching to its syndication partner. This is because most users who switch to a Bing syndication partner are likely to switch from Google, the dominant provider.[24] This is the case for DuckDuckGo[25] and is also likely to be generally true in our view (see Box 1 below).

Box 1: Bing wholesale and retail revenue from syndication

Assume that an entrant using a syndication contract with Bing gains 100 users and that each current user in the market is equally likely to switch to the entrant. Then the entrant will gain users from existing search engine providers in proportion to their market shares. This means 85 of the entrant's users will come from Google (with a 85% market share), 7 from Bing (with a 7% market share), and 8 from other search engines (with a combined 8% market share). In this case Microsoft will gain wholesale revenues on 87 customers and lose retail revenues on 7 users.

If say Bing's average retail revenue per user is USD 10 and its wholesale revenue per user is USD 3 (30% of retail revenue) then it makes USD 255 in wholesale revenues and loses USD 70 in retail revenues. This incentive for Microsoft to provide wholesale access remains intact even its market share increases to say 20%.

Under the same assumptions if an entrant signs a syndication contract with Google then Google given its 85% market share loses more retail customers than wholesale customers it gains.

Note: These simple illustrative calculations abstract from modelling a number of other factors. These factors include, for example, the users that the entrant gains from other search providers (not Google or Bing), differences in wholesale and retail costs, and competitive responses. These factors become more important as Bing's market share increases. However, as a first pass we think these illustrative calculations explain the incentives faced by Microsoft and Google when deciding whether and how many syndication partners to sign-on and on what terms.

Second, syndication allows Microsoft to gain scale in click and query data. As discussed above Bing's smaller scale likely puts it at a disadvantage at least for tail queries. Google with its 85% plus market share does not need to gain scale.

With only one main provider of syndicated contracts there is insufficient competition at the wholesale level in the provision of syndication contracts. This means both Microsoft and Google are in a strong bargaining position vis a vis their potential syndication partners. This is reflected in the terms and conditions of syndication contracts. The UK CMA finds that:

> *…the provisions included in these agreements can restrict the ability of recipients to innovate and improve the services they offer consumers, therefore harming competition amongst search engines. For instance, clauses within some of these agreements impose constraints on the recipient's ability to change the ranking of search results or the use of third-party advertisements. These agreements can also require approval to be set as the default search engine on other devices or browsers. For instance, companies*

[23] These payments consist of Microsoft's share of the search ad revenue from digital advertising shown on its syndication partners like DuckDuckGo and Yahoo!. It some instances it can also include a fixed fee per 1000 queries that the syndicator sends to Microsoft and for which Microsoft (Bing) provides the search results.

[24] A user switching from search engine A to B can be understood as most of the search queries by the user are now conducted on search engine B instead of search engine A.

[25] Footnote 94, CMA, *Online platforms and digital advertising Market study final report*, July 1, 2020.

that have a syndication agreement with Google are not currently eligible to participate in Google's Android choice screen remedy.

A mandated wholesale must offer remedy imposed on Google with a focus on better terms and conditions would help address these issues. The court would:

- **Require Google to publish a syndication contract specifying non-price terms and conditions but not commercial terms for its syndication contracts; and**
- **Require that these non-price terms and conditions do not restrict a syndication partners' ability to innovate or compete in any way.**

Box 2 below provides examples of non-price terms that Google could be required to include in its syndication contracts to enable more innovation and competition.

Box 2: Non-price terms Google could be required to include in syndication contracts

Google's syndication contract should allow a syndicator to:

- partner with third parties to provide 'add-on' services that enhance the user experience like voice/image/local search or maps.
- enter into other syndication contracts.
- compete with Google in any product or service category.
- allow unrestrained distribution of products and services (e.g. competing for defaults).
- use data from its own users to monitor and measure the performance and usage of search results, develop its search services, or new services like one boxes.
- only require the sharing of data to the extent this is strictly necessary to provide syndicated results.
- allow some level of control over the quality and relevance of search results (e.g. indicating which product results are environmentally friendly, adding security ratings, removing privacy invasive websites from the search results, check marks to indicate legitimate banking websites etc.).

Note a full study of existing syndication contracts and how these might be improved is beyond the scope of this paper.

Such terms would in our view:

- allow smaller providers more room to innovate, differentiate their services, and develop a unique offering;
- spur more competition, innovation, and choice for consumers; and
- introduce more competition in general search syndication.

We note that in order to be competitive a general search engine needs to supply more than just the ranked organic search results (blue links) that Google would supply under its syndication contract. It also needs to provide a number of additional features such as maps, local business answers, news, images, videos, products/shopping, sports scores, weather, airplane flight information etc.[26] This, in our view, plenty of room for innovation and differentiation by both

[26] As DuckDuckGo explains: *When DuckDuckGo launched in 2008, not all these features were required for successful search engines, and arguably just one item was mandatory: organic web links (sometimes referred to as*

Google and its syndication partners. Better syndication terms would benefit end-users by enabling syndication partners to experiment more freely with different search features leading to more choice and innovation for consumers. For example, a syndicator could leverage its own or third-party data sources or content to enhance its search results, such as integrating social media posts or sign partnerships with third-party reviews for shopping results etc.

Mandating that Google offers FRAND terms in its syndication contracts should also enable more competition at the wholesale level for general search syndication. This is because it would increase the competitive pressure on Microsoft to improve its syndication terms. Microsoft's syndication partners like DuckDuckGo and Yahoo! and other entrants would have an alternative syndication partner, Google. This would increase the syndicators' bargaining power. More vigorous competition between Google and Microsoft at the wholesale level should make it easier for syndicators to get better price and non-price terms in their syndication contracts. [27] Next we discuss access to Google's click and query data.

2.3 Mandate wholesale access to click and query data

General search engines that compete with Google operate at a much smaller scale which means they receive a lower number of queries and have less data on how users interact with search results. This, as discussed in section 2.1.2, is likely a disadvantage for these competitors when competing with Google on search results for rare or unique ('tail') queries.

Access to Google's click and query data could help smaller competitors overcome the data disadvantages they face. For example, these competitors could use these data to offer more relevant results to tail queries and improve their search algorithms.

However, one would need to carefully design any such remedy taking into account privacy concerns and how such a remedy might affect competition and innovation over time.

2.3.1 Privacy concerns

Providing detailed access to individual users' click[28] and query data raises privacy and data protections issues. This is because it is not clear that such data can be anonymized. For

"the ten blue links"). Over time, online search innovated, and consumers came to expect the other features (often referred to collectively as "instant answers," "one boxes," or "info boxes")
Page 3, DuckDuckGo White Paper on the Search Engine Market, Features and Competitive Landscape, March 2021.

[27] The wholesale price for general search syndication is usually a combination of revenue share of advertising and in some cases a fixed price per 1000 queries served. More robust competition between Google and Microsoft could mean that syndicators get to keep a larger share of advertising and/or are offered more flexible contracts that lower entry risks.

[28] These data include clicks, click backs, previous searches, and other user Interactions like click duration, hovers, scrolls, attention, location, language, in-session search history etc.
Slide 39, DOJ presentation, United States, et al. v. Google LLC Redacted Public Version, September 8, 2022. Available here: https://www.justice.gov/atr/case-document/407129

example, when AOL published 20 million web queries for unnamed users in 2006, researchers could easily follow the data trail to individual users. The New York Times reported at the time:[29]

> *But the detailed records of searches conducted by Ms. Arnold and 657,000 other Americans, copies of which continue to circulate online, underscore how much people unintentionally reveal about themselves when they use search engines — and how risky it can be for companies like AOL, Google and Yahoo to compile such data.*

While anonymization techniques may have gotten better since 2006, so have the computing power and tools to deanonymize data. For example, advances in machine learning based on deep neural networks and algorithms to find patterns and relationships in unstructured data.

The privacy risks associated with providing access to individual click and query data are recognized by Google and a number of search engines that compete with Google. For example, in their response to the UK CMA's investigation into online markets and digital advertising in 2020, Verizon Media, Cliqz, Ecosia, and DuckDuckGo all recognize that providing access to click and query data raises privacy risks. The companies make various suggestions that may help alleviate some privacy concerns such as aggregating user data (Google suggests this) or stripping out any personally identifiable data (some of Google's competitors suggest this).[30]

We remain skeptical that individual click and query data can be truly anonymized. This would require that no actor could reidentify individuals or small groups using these data even if they were sufficiently motivated to do so.

There are also additional challenges in anonymizing click and query data and providing access to these data. For example, these data are dynamic and change over time as user interests and behaviors change – what users search for and how they search changes over time. So, implementing such a remedy would require mechanisms to ensure the privacy, security, and anonymity of any click and query data supplied by Google while ensuring the accuracy, completeness, and timeliness of these data. This will be a difficult balance and will require careful design and, in our view, oversight by an independent monitoring agent. It would also require Google to design and implement a system to deanonymize data (to the extent this is possible) and set up and run a secure and private system to transfer these data to its competitors.

Aggregating click and query data across users, depending on the level of aggregation, could help protect individual privacy. However, the more aggregated the data the more limited its use in helping Google's competitors improve their own search products. This trade-off between protecting privacy by aggregating data and the usefulness of these data for Google's competitors is not a trivial problem to resolve in our view.

Another possible trade-off is in the frequency of data sharing – whether data are shared in real time or intermittently. If data are provided intermittently then click and query data could also be aggregated across time, for example over 8 or 16 or 24 hours, which could be better for privacy.

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[29] Barbaro, Michael and Zeller Jr., Tom, *A Face Is Exposed for AOL Searcher No. 4417749*, The New York Times, August 9 2006. Available here: https://www.nytimes.com/2006/08/09/technology/09aol.html

[30] Paras 103-104, CMA, *Online platforms and digital advertising Market study final report: Appendix B: summary of responses to our interim report consultation*, July 1, 2020.

However, for competing firms trying to improve their search services, real time or close to real time data is likely to be more useful as these data will better capture changes and trends in user queries.

Wholesale access to *aggregated* click and query data (across users and time) may be more privacy protective but will still require careful design and oversight by an independent monitoring agent. We note that Google offered providing data from Google trends to other search engines via bespoke APIs in its discussion with the UK's CMA. Though the access offered by Google would have excluded uncommon or tail queries making such access less useful.[31]

2.3.2 Effects on dynamic competition and innovation

Providing competitors access to Google's click and query data also risks undermining both Google and its competitors' incentives to invest and innovate which might undermine long run competition. The UK's CMA recognizes this risk and reaches the conclusion that the design of any wholesale access remedy should take these trade-offs into account:[32]

> *We recognise that if such an intervention included a requirement to disclose the outputs of proprietary search algorithms, which is the result of investments in search and associated infrastructure, this could enable free riding which may dampen Google's incentives to innovate and invest.*
> *……*
> *We would want to avoid a scenario in which other market participants simply use this data to reverse engineer Google's search results and present these to users.*
> *…*
> *In seeking to strike the right balance between overcoming barriers to entry and expansion and creating a risk of free riding, the DMU would need to pay careful attention to design, including precisely which data should be within scope and, potentially, whether third parties should be required to pay for access to the data*

In our view, careful attention would also need to be paid to how wholesale access to Google's click and query data affects Microsoft Bing's incentives to maintain and improve its web index, develop its search technology, and its incentives to syndicate search results to gain scale in click and query data. As noted in section 2.2 Microsoft is currently the main provider of syndicated contracts for smaller search engines.

The world wide web is constantly evolving with more data and information generated every day. For example, voice, video, IoT data, augmented reality etc. This provides Google and its competitors an opportunity to experiment and innovate with new formats and interfaces for web indexing and search. The development of stand-alone generative AI and large language models like Chat GPT also provide potential alternatives to click and query data to understand the meaning of a query and the construction of logical relationships among queries to recommend

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[31] Para 113, CMA, *Online platforms and digital advertising Market study final report: Appendix V: assessment of pro-competition interventions in general search*, July 1, 2020.

[32] Para 124, 127, CMA, *Online platforms and digital advertising Market study final report: Appendix V: assessment of pro-competition interventions in general search*, July 1, 2020
Para 8.43, CMA, *Online platforms and digital advertising Market study final report*, July 1, 2020.

related searches. Wholesale access to Google's click and query data should not undermine incentives or slow the development and use of these new technologies.

We note that in markets where Google is not dominant alternative search providers can innovate. For example, Baidu the leading search engine in China[33] has developed a visual search engine,[34] and Yandex the leading search engine in Russia[35] has developed a neural network-based ranking algorithm called Korolyov which can better understand the meaning and intent of complex queries.[36]

In the next section we discuss demand side remedies to address Google's lock on various distribution channels for general search. These potential interventions would allow Google's competitors to more easily get consumers to try and potentially switch to their services.

[33] Baidu has over 65% of the general search engine market in China. Statcounter, Search Engine Market Share China. Accessed on February 6, 2024: https://gs.statcounter.com/search-engine-market-share/all/china)
[34] https://image.baidu.com
[35] Yandex has over 65% of the general search engine market in Russia. Statcounter, Search Engine Market Share Russian Federation. Accessed on February 6, 2024:https://gs.statcounter.com/search-engine-market-share/all/russian-federation
[36] https://yandex.com/company/blog/new-intelligent-search-algorithm-korolyov/

3. Demand side remedies – access to distribution channels

We first describe the main search distribution channels on which Google is the default search engine in section 3.1. Building on this discussion, section 3.2 discusses a remedy which would constrain Google's payments to Apple to be the default search engine on Apple devices. Section 3.3. discusses the introduction of choice screens on Android phones, and section 3.4 the divestment of chrome.

3.1 Search distribution channels on which Google is the default

Google is the default search engine on three main search distribution channels:

1. Apple's Mac desktops and iPhones that Google pays to be the default search engine for various search access points like Safari.
2. Android phones for which Google uses a combination of licensing agreements and revenue sharing agreements to be the default search engine for various search access points like Google's Chrome browser and search widgets.
3. Other browsers like Mozilla, Samsung Internet, and Opera that Google pays to be the default search engine. Some of these companies might also have search apps.

Google's default search position on both Android and iPhones is reflected in its market share on mobile phones – around 95%,[37] and the share of Google's ad revenues from mobile – around 65%.[38] Google is also the dominant search engine on desktops though its market share is somewhat lower at around 75%.[39] This lower market share reflects that Bing not Google search is set as the default on Microsoft Windows – around 63% of all desktops in December 2023.[40] On Apple Macs – around 25% of all desktops in December 2023, Google is set as the default search engine.[41]

[37] Statcounter, Mobile Search Engine Market Share United States Of America. Accessed on February 6, 2024: https://gs.statcounter.com/search-engine-market-share/mobile/united-states-of-america

[38] Insider Intelligence | eMarketer, October 2023.

[39] Statcounter, Desktop Search Engine Market Share United States Of America. Accessed on February 6, 2024: https://gs.statcounter.com/search-engine-market-share/desktop/united-states-of-america

[40] Statcounter, Desktop Operating System Market Share United States Of America. Accessed on February 6, 2024: https://gs.statcounter.com/os-market-share/desktop/united-states-of-america
Many users on Windows desktops change their search engine to Google or browser to chrome. This likely reflects Google's position as the market leader, and because it is easier to change defaults on a desktop compared to a mobile phone. One reason for this is likely screen size – the larger screen size of a desktop makes it easier to change settings. This is also reflected in the market share of smaller general search engines like Yahoo! and DuckDuckGo. These search engines are not installed as the default on either mobile phones or desktops and have a higher market share on desktops.

[41] Google is set as the default search engine on Safari, the main search access point on Macs.

iPhones and Android phones are particularly important because mobile's share of organic search engine visits in the US has been increasing and was over 60% as of 2021.[42] Google being set as the default search engine on virtually all mobile phone search access points is a significant impediment to its competitors. As the UK CMA finds:

> *…we consider that the extent of Google's default positions is a very significant current barrier to entry and expansion in search and addressing concerns in relation to defaults could have a significant positive impact on competition in search. While Google's default payments may be passed on to consumers to some extent by device manufacturers, this is likely to be outweighed by the costs imposed on consumers due to weaker competition in search, such as increased prices for the goods and services that use search advertising.*

We note that the combined market share of Mozilla, Samsung Internet, and Opera browsers that Google pays to be the default search engine is less than 10% across mobile phones and desktops as of December 2023.[43] In our view these browsers do not have a meaningful market impact when considering Google's default search positions, and we do not recommend any remedies for these distribution channels.

In the following sections we discuss interventions to address Google's ability to capture the default search position on Apple devices in section 3.2, and Android phones in section 3.3. We also discuss a remedy that would require Google to divest Chrome in section 3.4.

3.2 Restrict Google's default payments to Apple

Google made USD 142 billion in search revenues worldwide in 2023,[44] and reportedly pays around USD 18 billion per year to Apple to set Google search as the default search engine on its Mac computers and iPhone, including on Apple's Safari web browser.[45]

Google's closest general search competitor is Microsoft. Microsoft's worldwide search ad revenues in 2023 were USD 6.92 billion,[46] much less than Google's payments to Apple. So even if Microsoft gave Apple 100% of its search ad revenues it could not compete with Google. Microsoft was willing to go further and lose up to USD 15 billion a year to be set as the default search engine on Apple's iPhone according to Microsoft CEO Satya Nadella but even this was not enough for Apple to set Bing as the default search engine.[47] For smaller search engines the

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[42] Merkle (March 2022), Mobile share of organic search engine visits in the United States from 3rd quarter 2013 to 4th quarter 2021, In *Statista*, https://www.statista.com/statistics/297137/mobile-share-of-us-organic-search-engine-visits/

[43] Statcounter, Mobile Browser Market Share United States Of America. Accessed on February 6, 2024: https://gs.statcounter.com/browser-market-share/mobile/united-states-of-america

[44] Insider Intelligence | eMarketer, October 2023.

[45] Pierce, David, *Google reportedly pays $18 billion a year to be Apple's default search engine*, The Verge, October 26, 2023. Available here: https://www.theverge.com/2023/10/26/23933206/google-apple-search-deal-safari-18-billion

[46] Insider Intelligence | eMarketer, October 2023.

[47] Pierce, David, *Satya Nadella tells a court that Bing is worse than Google — and Apple could fix it*, The Verge, October 2, 2023. Available here: https://www.theverge.com/2023/10/2/23900233/microsoft-ceo-satya-nadella-us-google-antitrust-trial-testimony

option of spending billions of dollars to get better distribution for their service is commercially infeasible.

So effectively, in our view, no one can displace Google as Apple's default search engine under current conditions. Without intervention Google will always be able to pay substantially more to Apple to be the default search engine, locking down distribution on approximately 50% of mobile phones in the US[48] and on Apple's Mac computers. This will continue to constrain the growth of competing search engines by making it difficult for them to acquire new users even if they offer a differentiated search experience and allow Google to continue to dominate the search market.

A remedy that restricts Google from making payments to Apple to be the default search engine on any search access point on Apple devices would be simple to implement and effective in opening up distribution to alternative search engines on Apple devices. Such a remedy could play out in a number of different ways.

3.2.1 Apple could develop its own search engine and set that as the default on its iPhones and Mac desktops

Apple has over a hundred billion dollars of cash in hand[49] and could invest and develop its own comprehensive search index, search capabilities, and distribute its search service via its iPhones. It did this for mapping services and Apple Maps now competes with Google Maps. Reporting suggests Apple is making some investments in search,[50] and Apple has its own web crawler which it uses for products like Siri and Spotlight suggestions.[51] But Apple's ambition to develop its own general search service is likely tempered by the USD 18 billion per year (around 14-16% of Apple's annual profits) it receives from Google to set Google search as the default search engine on Apple devices.[52]

Without these large payments from Google, Apple could be incentivized to develop its own search engine. Entry by Apple into the search engine market would be a positive development for consumers. It would destroy the tacit agreement between Apple and Google to not compete with each other on search[53] and lead to more competition among three big companies –

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[48] Statista, *U.S. smartphone subscriber share by operating platform 2012-2023, by month*, October 4, 2023. Available here: https://www.statista.com/statistics/266572/market-share-held-by-smartphone-platforms-in-the-united-states/

[49] Apple Investor Relations, Capital Return History: Return of Capital and Net Cash Position. Available here: https://s2.q4cdn.com/470004039/files/doc_earnings/2023/q4/generic/Q4-23-Return-of-Capital-Timeline.pdf

[50] Bradshaw, Tim and McGee, Patrick *Apple develops alternative to Google search*, Financial Times, October 28, 2020. Available here: https://www.ft.com/content/fd311801-e863-41fe-82cf-3d98c4c47e26

[51] Information about the Applebot can be found here- https://support.apple.com/en-us/HT204683
It is unclear to what extent Apple has developed its own search technology.

[52] Kunert, Paul, *Google pays Apple $18B to $20B a year to keep its search in iPhone*, The Register, October 10, 2023. Available here: https://www.theregister.com/2023/10/10/google_pays_apple_18_20_claims_bernstein/

[53] This tacit agreement is based, in our view, on the $18 billion yearly payment that Apple receives from Google, and an understanding between the companies not to step on each other's toes in search or search distribution. For example, according to reporting, Google not promoting as aggressively as it could its Chrome browser on iPhones, and Apple largely staying away from commercial queries which feature ads in its spotlight tool.
See: Grant, Nico, *Inside Google's Plan to Stop Apple From Getting Serious About Search*, New York Times, October 26, 2023. Available here: https://www.nytimes.com/2023/10/26/technology/google-apple-search-spotlight.html

Google, Apple, and Microsoft. This will create more choice and innovation for consumers and potentially another syndication partner for smaller search engines.

3.2.2 Apple could introduce choice screens for search engines, including Google search as one of the options

Apple recently announced that it is introducing choice screens for browsers in Europe in response to the Digital Markets Act,[54] and it could introduce a similar choice screen for search engines in the US. We discuss choice screens in greater detail in section 3.3.

Apple might raise some revenue via auctioning participation in its choice screen in the US. The revenue raised will depend on the auction design, but these revenues will likely be lower than what Apple currently receives from Google. The auction mechanism will also have to be more open and transparent than the commercial and tacit agreements between Apple and Google today. Finally, compared to the situation today with Google search set as the default on iPhones, more users will try and potentially switch to one of Google's competitors.

3.2.3 Apple could sign a default agreement with another search engine provider

If Apple signed a default agreement with another search engine, it would provide a valuable distribution channel for one of Google's competitors. This would help that competitor grow and introduce more competition in the market.

With Google not being allowed to pay Apple to be the default search engine, the payment that Apple could get from Google's competitors would be lower. For example, Bing's worldwide search ad revenues in 2023 were USD 6.92 billion.[55] Assuming Bing pays 36% of this to Apple, the same percentage that Google currently pays to Apple, Apple would receive USD 2.49 billion. This is much less than the USD 18 billion that Apple reportedly currently receives from Google every year. This will affect Apple's incentives to develop its own search engine as discussed above.

Bidding to be the default search engine on Apple's iPhones will also be more competitive because the winner will not be a foregone conclusion like it is today. With Google not in the bidding, other search providers may be able to compete with Bing to be the default search engine on iPhones. It may also be in Apple's interest to choose a search provider other than Bing. For example, if Apple sets a privacy first search engine like DuckDuckGo as the default search engine, Apple could further differentiate its products by bolstering its claims that it puts privacy front and center in its products.

Next, we discuss the introduction of choice screens on Android phones.

Pierce, David, *Satya Nadella tells a court that Bing is worse than Google — and Apple could fix it*, The Verge, October 2, 2023.

[54] See Apple *Update on apps distributed in the European Union* announced on January 25, 2024. Available here: https://developer.apple.com/support/dma-and-apps-in-the-eu/#browser-alt-eu

[55] Insider Intelligence | eMarketer, October 2023.

3.3 Introduce choice screens on Android phones covering all search access points including Chrome

As explained in the DOJ's complaint[56] and noted previously by the European Commission,[57] Google uses financial payments and various licensing conditions to be the default search engine on various search access points on Android phones.

A choice screen remedy would require Google as the Android operating system provider to offer a choice screen to users. Google already offers this remedy in Europe where the choice screen operates as follows:[58]

- The five most popular search services are displayed at the top, ordered randomly each time the choice screen is shown. Up to seven remaining eligible general search services are shown below, similarly ordered randomly.
- The selected search provider is installed in the home screen search box, as the default search provider in Chrome, and the selected search provider's search app is also installed.
- Eligible general search services are not charged for participating or when a user selects the service.

We note that the design and implementation of a choice screen remedy will have significant impact on its effectiveness. Any such remedy will need to be carefully designed and tested before it is implemented.

For example, Google's European choice screen remedy initially required competing search engines to pay Google via an auction to participate in the choice screen. As Michael Ostrovsky points out in his recent paper, the particular auction design used by Google made it less likely that an alternative to Google would be chosen, and the auction gave an advantage to search engines that generated a higher revenue per user.[59] Under pressure by European Commission Google made changes to its choice screen design and now eligible services are not charged for participating in the choice screen or when a user selects a service.[60]

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[56] Available here: https://www.justice.gov/opa/pr/justice-department-sues-monopolist-google-violating-antitrust-laws

[57] European Commission, *Antitrust: Commission fines Google €4.34 billion for illegal practices regarding Android mobile devices to strengthen dominance of Google's search engine*, July 18, 2018. Available here: https://ec.europa.eu/commission/presscorner/detail/en/IP_18_4581

[58] See https://www.android.com/choicescreen/ for further details.

[59] Ostrovsky, Michael. 2023. "Choice Screen Auctions." American Economic Review, 113 (9): 2486-2505. DOI: 10.1257/aer.20220699
The paper also suggests an alternative auction design for a choice screen which would make it easier for search engines generating a lower revenue per user to participate.

[60] See reporting by Google, Hausfeld, and CNBC
https://blog.google/around-the-globe/google-europe/changes-android-choice-screen-europe/
https://www.hausfeld.com/en-us/what-we-think/perspectives-blogs/google-finally-amends-choice-screen-remedy-to-prevent-non-compliance-proceedings-in-eu-android-case/
https://www.cnbc.com/2021/06/08/google-just-made-a-key-concession-to-smaller-search-rivals-in-europe.html

Another recent empirical study of different choice screen remedies implemented in Russia and Europe found that the choice screen intervention was effective in reducing Google's market share by enabling better distribution for rivals but the effectiveness of the remedy depended on the number of alternatives shown on the choice screen and the popularity of the alternative search engines shown on the choice screen.[61]

This is in line with ongoing experimental work in the US which suggests that: [62]

> *…consumers' misperceptions about Google alternatives' quality are an important obstacle to their market penetration. This effect is clear for Bing yet not for Yahoo. Despite both having the same search algorithm only Bing benefited from a substantial increase in its perceived quality after the study participants experimented with it. This may imply that only defaults that users regard as a high-quality option may stick in the long term. The preceding findings suggest that the potential anticompetitive effect of Google's strategy is to prevent users from exploring competing search engines that could satisfy the users' quality threshold to stick.*

Other reviews like that by the UK CMA have found additional factors that determine the effectiveness of a choice screen remedy.[63] These include, for example, whether the selected option applies to all search access points (the default browser, search box, search app etc.), when the choice screen is shown to a user (only at initial set-up of the device or more often), which users is the choice screen shown to (only new users or new and existing users), the descriptive text that competitors are allowed to include in the choice screen, Google's positioning in the choice screen list (whether Google is always listed first or whether the ordering is random for example).

Hence any choice screen remedy will need to be carefully designed considering various factors and behavioral insights on consumers.[64] Such a remedy, in our view, should allow better distribution for Google's competitors by allowing them to gain market share and increase their user base.

3.4 Require Google to divest Chrome

Another potential remedy would be to require Google to divest Chrome. But such a remedy would be complicated to implement, may have unintended adverse effects on consumers, and require additional restrictions to be imposed on Google's dealings with the independent Chrome

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[61] Decarolis, F, M Li and F Paternollo (2023), 'DP17779 Competition and Defaults in Online Search', CEPR Discussion Paper No. 17779. CEPR Press, Paris & London. https://cepr.org/publications/dp17779
The paper also mentions a number of other factors and also discusses the remedies imposed on Google search in Turkey.

[62] Vásquez Duque, Omar, The Potential Anticompetitive Stickiness of Default Applications: Addressing Consumer Inertia with Randomization (April 6, 2022). Available at SSRN: https://ssrn.com/abstract=4077132

[63] Paras 37-59, CMA, *Online platforms and digital advertising Market study final report: Appendix V: assessment of pro-competition interventions in general search*, July 1, 2020.

[64] For example saliency effects, ranking effects, framing effects, information overload, obfuscation and shrouding (quality of information presented) etc.
See Fletcher, Amelia and Vasas, Zita, Implementing the DMA: The Role of Behavioural Insights (July 5, 2023). Available at SSRN: https://ssrn.com/abstract=4501429

owner. Moreover, a search engine choice screen which sets the search engine chosen as the default on Chrome, if installed, could help achieve better distribution for rival search engines without these complications.

Any divestment of Chrome would be complicated because it would require decisions to be made about which functions should a stand-alone Google Chrome include. Chrome today includes a variety of functions in addition to browsing and integration with its search engine. For example, Chrome incudes a password manager, the ability to use a Google account to sync bookmarks, passwords and history across different devices, integration with other Google products and services like Gmail, Google Drive, Google Photos, Google Translate, and Google Assistant. Chrome also supports the Chrome Web Store[65] from which users can download a number of extensions that add further functionality to Chrome.

Vertical integration into Chrome also allows Google to introduce more easily what it claims to be more privacy protective technology like the Privacy Sandbox,[66] and new features like generative AI.[67] These integrations and extensions to Chrome's functionality benefit consumers and any requirement to divest Chrome would need to consider how these functionalities might be affected and an independent Chrome owner's ability to continue developing these features.

We note other web browsers also integrate additional functionalities that benefit users. For example, Firefox provides a number of enhancements to make browsing more private and secure, a password manager, a PDF editor, ad tracker blocking etc.[68] Apple's Safari integrates with its hardware to, Apple claims, provide better performance, a number of privacy features, and customizations such as a reading mode.[69] Microsoft Edge integrates with Microsoft's products and services, such as Bing, OneDrive, Office, and Cortana, and has features such as collections, vertical tabs, and immersive reader.[70]

In our view there are benefits to companies like Google, Firefox, DuckDuckGo, Microsoft, Apple etc. being able to vertically integrate into supplying browsers. This integration allows these companies to introduce and distribute a variety of innovative and differentiated services including search. A more practicable solution to Google's control of Chrome as a distribution channel would be to require Google to set a competing search engine as the default search engine in Chrome via a choice screen as discussed in section 3.3.

[65] See https://chromewebstore.google.com for details.

[66] See https://privacysandbox.com for details.

[67] See https://blog.google/products/chrome/google-chrome-generative-ai-features-january-2024/#custom-themes for details.

[68] See https://www.mozilla.org/en-US/firefox/features/ for details.

[69] See https://www.apple.com/safari/ for details.

[70] See https://www.microsoft.com/en-us/edge/features for details.

4. Conclusion

The US DOJ's antitrust complaint against Google requests structural relief, enjoining Google from engaging in the alleged anticompetitive practices, or any other appropriate relief to restore competitive conditions in the affected markets. [71]

We do not know which remedies the DOJ may propose and which of these may be supported by the legal findings in the case. But in our view any such remedies would need to be:

1. Proportionate and targeted at the alleged illegal conduct.
2. Practicable by which we mean remedies that are easily implementable and monitored given available resources and expertise.
3. Timely and effective in restoring competitive conditions to the affected markets while avoiding unintended adverse effects on consumers.

The table below summarizes the five potential remedies we discuss and analyze in sections 2 and 3 and how each of these remedies performs based on the three criteria above.

Potential remedies	Proportionate and targeted	Practicable	Timely and effective while avoiding unintended effects
Mandate Google supplies syndicated results on FRAND terms with a focus on non-price terms (**Section 2.2**)	Yes – only requires improvement to non-price terms of existing commercial contracts	Yes – simple injunctive remedy prohibiting certain terms in contract	Yes – this is the model used by smaller competitors. It will allow them to better differentiate and innovate to grow their market share
Mandate Google supplies wholesale access to click and query data (**Section 2.3**)	Maybe – if data are sufficiently aggregated	Maybe – unclear if individual click and query data can be anonymized	Unlikely – given privacy concerns and potential to undermine incentives to invest and innovate for both Google and its competitors
Restrict Google's default payments to Apple (**Section 3.2**)	Yes – addresses one of two main distribution channels that Google controls	Yes – simple injunctive remedy prohibiting a contract	Yes – will allow competing search engines to reach more consumers
Mandate choice screens to set the default search engine across all search access points on Android phones (**Section 3.3**)	Yes – addresses one of two main distribution channels that Google controls	Yes – but will require iterations to carefully design choice screen	Yes – will allow competing search engines to reach more consumers

[71] Available here: https://www.justice.gov/opa/pr/justice-department-sues-monopolist-google-violating-antitrust-laws

Potential remedies	Proportionate and targeted	Practicable	Timely and effective while avoiding unintended effects
Require Google to divest Chrome (**Section 3.4**)	Unlikely – not directly related to alleged conduct resulting in illegal monopoly. Can use a less interventionist remedy - choice screens can be used to set the default search engine on Chrome	Unlikely – difficult to draw product boundaries for internally developed products like Chrome which includes many functionalities not just browsing and search	Unlikely – removing functionalities could leave consumers worse off and lose efficiencies and product innovations made possible by vertically integration

Based on our analysis a combination of supply side and demand side remedies are required to undo the competitive harm caused by Google's monopoly and enable a more competitive market. In our view the following combination of remedies would address the main impediments to effective competition while minimizing unintended effects that might leave consumers worse off.

1. Require Google to provide syndicated results with better non-price terms (Section 2.2); **and**
2. Restrict Google from making payments to Apple to be the default search engine on any search access point on Apple devices (Section 3.2); **and**
3. Mandate choice screens for Android phones covering all search access points including Chrome (Section 3.3)

Given the impact of defaults on consumer choice and the consequent exclusionary effects on Google's competitors, restricting Google's ability to capture the default position on Apple devices and Android phones will allow competing search engines to reach more consumers.

This better distribution in combination with the ability to provide innovative and differentiated search services using better syndication terms should allow smaller search providers to grow their market share over time and become more effective competitors. A larger market share will also enable these competitors to get access to more click and query data and increase their investments in developing proprietary search databases and technology.

In conclusion, based on the available evidence our view is that while Google with over 90% of general search market share worldwide is a monopoly, general search as a service need not be a monopoly. Targeted remedies that remove barriers for competing search engines to grow – gain scale and users – could help undo the competitive harms caused by Google's search monopoly and lead to a more competitive general search market.