Andreas Kvalsvik Remøy

Techno-Economic Analysis of the Google Antitrust Case

Master's thesis in Kommunikasjonsteknologi
Supervisor: Harald Øverby
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| **Student:** | Andreas Kvalsvik Remøy |

Problem description:

In 1998 Google launched an online search engine based on their PageRank algorithm, in which webpages are ranked by how many other webpages it links to. Two years later, Google Search had become the most used search engine in the world. Since then Google has grown from being a general online search engine to becoming one of the world's largest corporations.

The US DoJ filed, on October 22, 2020, a complaint regarding Google's anti-competitive business practices and possible infringement of U.S. antitrust laws. This complaint follows a series of concerns regarding business practices and concentration of power among the BigTech companies—Google, Facebook, Amazon, and Apple. These concerns are real and, according to leading scholars and governmental officials, have lead to significant slow-downs in innovations, hurting consumers in the U.S. and worldwide. The present case—US v. Google—is expected to have significant consequences for Google as a company and the tech industry in general.

Following a qualitative research approach, this thesis will use the ongoing case against Google as a motivation to further explore Google Search's monopolistic market domination. This thesis will examine the following:

– Analyze how Google's business practices impacts innovation in the general search engine market , using digital economic theory such as: Network-effects, lock-in, switching-cost, and M and A.
– Analyze how Google Search may be structurally separated.

Supervisor: Harald Øverby, IIK

Abstract

To "Google" has over the years become a synonym to accessing and searching the Internet. This is a consequence of Google Search being the dominant general search provider for over two decades. During the same time period, Google has grown into a multi-billion dollar company, today being one of the largest corporations worldwide. As Google Search has monopoly power in the general search engine market in most areas in the world, even established general search engine competitors owned by large tech-companies struggles to achieve market shares in the same markets, making the entry of new general search engines almost impossible. To make sure Google Search stays dominant, Google pay billions of dollars annually to manufactures to enable Google Search as the default search engine on various platforms and devices.

This thesis has taken a qualitative research approach to assess how Google's business practices impact innovation and competition in the general search engine market. Which factors that are important in order to succeed in the market, and looking into concepts potentially increasing competition and innovation have also been a major part of this study. A literature study involving relevant topics and a techno-economic analysis of Google Search have been conducted in order to get a greater basis for answering the research questions. A concept featuring Virtual General Search engines has been introduced.

I have found that by enabling Google Search as the default search engine on a substantial number of access points, combined with Google Search's already dominate position in the market, Google's business practices is hurting competition and slowing down innovation. Many users may not be aware on how to change its default search engine, yet alone what alternatives that exists. Important factors for success in the general search engine market, includes lower barriers of entry, gaining adequate scale and differentiation in the market. I have found that Virtual General Search Engines can potentially increase competition, through lowering barriers of entry by the removal of the investment needed to develop a fully functional search engine, allowing the organisation to focus more on services that can increase innovation in the market.

Sammendrag

Å Google"har i løpet av årene blitt et synonym til det å aksessere og søke på internett. Dette er en konsekvens av at Google Search har vært den dominerende generelle søkemotoren i over to tiår. I løpet av den samme perioden har Google vokst til å bli et selskap verdt milliarder av dollar, og er i dag et av verdens største organisasjoner. Da Google Search has monopol i det generelle søkemotor-markedet de aller fleste steder i verden, har til og med etablerte generelle søkemotorer eid av store tech-selskaper utfordringer med å skaffe markedsandeler i de samme markedene, som gjør inngangen til nye søkemotorer nærmest umulig. For å sikre at Google Search fortsetter å dominere, betaler Google produsenter billioner av dollar hvert år for å sørge for at Google Search er satt som standard søkemotor på en mengde plattformer og enheter.

Denne masteroppgaven har tatt for seg en kvalitativ forskningsmetode for å vurdere hvordan Google sin forretningspraksis innvirker på innovasjon og konkurranse i det generelle søkemotor-markedet. Hvilke faktorer som er viktige for å lykkes i markedet, samt å undersøke konsepter som potensielt kan øke konkurransen og innovasjonen har også vært en sentral del av forskningen. Et litteraturstudie som har involvert relevante temaer, og en teknisk-økonomisk analyse av Google Search har blitt gjennomført for å få et bedre grunnlag til å svare på forskningsspørsmålene. Et konsept som omhandler virtuelle generelle søkemotorer har blitt introdusert.

Jeg har funnet ut, at ved å la Google Search være standard søkemotor på en betydelig andel aksesspunkt, kombinert med at Google Search allerede har en dominant posisjon i markedet, vil Googles forretningspraksis svekke både konkurranse innovasjon. Mange brukere vet ikke hvordan de endrer standard søkemotor, eller at det i det hele tatt finnes alternativer. Viktige faktorer for suksess i det generelle søkemotor-markedet inkluderer å senke inngangsbarrieren, og få nok størrelse og differensiering i markedet. Videre mener jeg at virtuelle generelle søkemotorer potensielt kan øke konkurransen, gjennom å minske inngangsbarrierene ved å fjerne behovet for å investere i utviklingen av en fullt funksjonell søkemotor, og dermed tillatte organisasjoner til å fokusere mer på tjenester som kan øke innovasjonen i markedet.

Preface

This master thesis concludes a semester of hard work and long nights, researching lock-in during lock-down and the use of new general search engines. Googling may never be the same again, but that might after all be a good thing.

I would like to thank my supervisor Harald Øverby for invaluable help and guidance during this master thesis project. You have been a great support during the whole period, and I appreciate the opportunity I've had to work with you.

Last but not least, I would like to thank my family and my girlfriend for supporting me all these years. I am forever grateful.

Contents

List of Figures

Chapter 1

Introduction

General search engines are available on a growing number of platforms. We use general search engines on our computers, our smartphones, through our voice-assistants on our smart-speakers, or even when we drive a car. At the same time, "Googling" has become a synonym to searching and accessing the internet. Google's general search engine Google Search is represented on most platforms that enables a general search engine, as Google Search has monopoly power in the general search engine market in most countries in the world. For many of these platforms, Google Search is also set as a default search engine, as Google pays manufactures billions of US dollars every year in order to become the default search engine on the manufactures devices. The Department of Justice in the US has filed a lawsuit against Google, stating that how Google operates in the industry hurts the competition in the general search engine market. According to Deputy Attorney General Jeffrey A. Rosen, the lack of competition in digital markets leads to less investments in research and development which again leads to innovation slowing down [Ros].

Digital markets have not existed for longer than a few decades, and the exploration on how these markets evolve in terms of competition and innovation is still relatively unexplored. However, a US investigation of competition in digital markets that was published in October 2020, stated that there are many factors that often make digital markets prone to "winner-take-all economics". This includes, but is not limited to, factors like network effects, scale, data and switching costs. This often results in markets dominated by of one or two large companies, changing the focus from "competition *in* the market" to "competition *for* the market" [otj20].

For a new general search engine to enter the market, it must face high entry barriers. According to the 2020 complaint against Google from the American Department of Justice, the development of a general search engine is considered as a multi-million investment, as development of a functional search engine is a complex operation. Even if a fully functional search engine was successfully developed, competing with Google Search over market shares is considered very hard.

Having a monopolist like Google Search dominating the general search engine market, combined with high entry entry barriers for a new general search engine, can result in less innovation in the market. However, external factors like regulations in the market can affect the market shares and competition over time. Higher competition in the general search engine market could lead to better products and more options again leading to: 1) A better user experience, 2) Higher quality search and 3) An increase in consumer choice.

1.1   Assignment

The purpose of this thesis is to study whether Google's business practices affects innovation and competition in the general search engine market, and possibly come up with a suggestion on how competition in the market can be increased. Although the original problem description states that the thesis also will be focusing on analyzing how Google Search may be structurally separated, this focus was changed during the process, and the thesis will not focus on structural separation. Three research questions that have been selected as scope for the study:

1: How does Google's business practices impact innovation and competition in the general search engine market?

2: Which factors are the most important to succeed in the general search engine market?

3: What concepts can potentially lead to an increase in competition and innovation in the general search engine market?

A qualitative research approach including a literature study and a techno-economic analysis has been conducted in order to address the research questions. Porters Five Forces has been used as a methodology to conduct the analysis. Additionally, based on the literature study and the analysis, a suggestion to how a Virtual General Search Engine can be modelled has been presented.

Much of the existing literature on competition in the general search engine market has been conducted by authors that has been naturally biased on the subject. As an example The Department of Justice's complaint against Google from 2020 gives an introduction to competition in the general search engine market, but has the agenda of weakening Google's position in the market. In this thesis I will however present an overview to the general search engine market and how competition possibly can be increased from an objective standpoint, as I push no agenda other than presenting my research on the matter.

1.2   Report outline

The rest of the report has the following structure:

Chapter 2 gives an overview on the general search engine industry, present market shares, explores some antitrust-cases, and concludes with relevant theory.

Chapter 3 details the research method, and explains how they were used.

Chapter 4 presents a techno-economic analysis of Google Search and the general search engine market.

Chapter 5 introduces the concept of Virtual General Search Engines.

Chapter 6 leads a discussion on the topics presented through the literature study, the analysis and the virtual general search engines in an attempt to answer the research questions.

Chapter 7 presents the conclusion for the project and suggests future work.

1.3   Limitations

As the scope of the research questions are relatively wide, some limitations was set initially.

A search engine provides a user the opportunity to enter a query and get a search results in return. A search engine can be either general or specialised. Specialised search engines are not the same as general search engines. Specialized search engines typically gives the user deeper topical results than general search engines. Examples of specialized search engines are Amazon's search engine for products, Hotel.com's search engine for booking a accommodation or Wikipedia's search engine for articles on Wikipedia's web-pages. Examples of general search engines are Google Search, Bing and Yahoo!. This thesis focused on the general search engine market.

General search engines exists in all countries in the world. Google Search has monopoly power in most markets, but there exists some regional differences. For example, in China, Baidu is the dominating search engine with over 70 percent market share [Glo]. This is however one of the few exceptions in terms of general search engine market shares. I have therefore chosen to limit my market area of focus to the US market, as this is considered a relevant general search engine market.

As getting the necessary overview and insight of the general search engine industry

and relevant topics, was more time consuming than I had thought, I also had to limit some of my research. In chapter 5, I chose to not focus on prices and security at all, and the business model should optimally have had more details. This is considered suggestions for further work.

1.4   Contributions

During the work done in this thesis, my opinion is that The US Department of Justice in its 2020 complaint against Google has a decent case. The exclusive agreements that Google have with other large tech-companies like Apple and Samsung are in fact hurting competition in the general search engine market. This combined with the fact that most Google acquisitions over the years have not been stopped or challenged, even when Google bought one of its biggest online advertisement competitors may tell us that there should be more regulation in the US general search engine market. The EU has stepped up, serving Google record-high fines for breaking antitrust law, and US regulators should be looking to the EU.

The idea of Virtual General Search engines has in my opinion potential. If the concept is further researched and investigated, a more detailed business model can lead to a more definitive assessment on its fully potential. The biggest challenge is how to make such a business model work in practices. Similar business models have emerged in the mobile virtual network operator industry, but it took years of hard work and a lot of research to get there.

Chapter 2
Background

This chapter will give an introduction to the industry background of general search engines. How the market has evolved into what it is today, and how general search work is also covered. Further, some relevant background on general search advertisement is covered in addition to an overview of the competitors of Google Search in the US market. The most relevant points from the American Department of Justice's 2020 complaint against Google is presented in chapter 2.3, followed by some relevant antitrust-cases. Finally, in chapter 2.5, some relevant theory is covered.

2.1 Industry background

The 1990s were the very beginning for how we later would be used to search and index various internet sites. Entrepreneurs and computer scientists explored how they could solve different methods of gathering, organizing and presenting information about internet sites. In 1990 the first computer program that was able to perform this task was designed by two students named Larry Page and Sergey Brinn at McGill University in Montreal as a part of a research project. 6 years later they launched their search engine Backrub on Stanford University's network. The algorithm running the search engine, PageRank, was the core of their search engine Google, and it is this algorithm that crawls the internet [Goob]. Over the years this computer program has evolved into the most advanced search engine in the market. As of June 2021, Google's parent company Alphabet has a market value of over 1,6 trillion USD[YCh].

But how does a general search engine work? Search engines *crawl* the internet, meaning that they index webpages and the information stored on them. When a user enters a query into the general search engine, algorithms index and evaluate the relevance of information on any given webpage to the user's query. The results of the query appear on the search engine result page (popularly shortened SERP), with links to and a short description of the webpages that the algorithms has ranked. Sometimes ads will also appear on the SERP along with the search results [Mai].

How good a search engines web-crawler works, is crucial for any company running a search engine. Without an algorithm that correctly and effective can evaluate the relevance of information on any given website to the query, a search engine company will not stand a chance in today's market [oJ20].

Google describe web-crawlers like: "The web is like an ever-growing library with billions of books and no central filing system. We use software known as web crawlers to discover publicly available webpages. Crawlers look at webpages and follow links on those pages, much like you would if you were browsing content on the web. They go from link to link and bring data about those webpages back to Google's servers." The index of Google Search is over 100,000,000 gigabytes in size and contains hundreds of millions of webpages [Gooc].

Most general search engines are accesses on a computer, either desktop or laptop, or a mobile device such as a smartphone or a tablet. The entry points for a general search engine on these devices are usually a web-browser, but it can also be entry points such as smart-assistants or widgets on mobile devices. In recent years new entry points have emerged as general search engines also have been implemented in the next generation of devices, being IoT-devices such as smart-speakers, voice-assistants or TVs.

Over the years, Google has has made some important acquirements, like YouTube and Android. In the early 2010s, Google acquired one company every 10 days. Some of these acquisitions have been direct competition to Google. Doubleclick being their main competitor in online advertisement and AdMob competing in the mobile advertisement market. Only one of Google's 270 acquisitions have been challenged by the federal government, being the acquisition of the travel search firm ITA, eventually ending in the governments approval after all [Tho19].

In 2005 Google purchased Android and two years later in 2007 Google made Android open-source. More developers was drawn to app-making on Android, and Android became more attractive to consumers. As Android grew, Google made a very important entry in the mobile device market with its search engine. Now that millions of users were using Android, their search engine naturally grew.

2.1.1   Advertisement

In order to sell ads on Google's SERP, Google launched its buying platform for search ads, AdWords, in 2000 [Good]. If an advertiser wanted to place an advertisement on the SERP he needed to bid on selected keywords, and if the selected keyword was selected through the search engine query, the winning bidder's ad was shown. Over time another model was introduced; cost-per-click pricing. In this model advertisers only pay when users actually click on the ad. Eventually Google started rating the
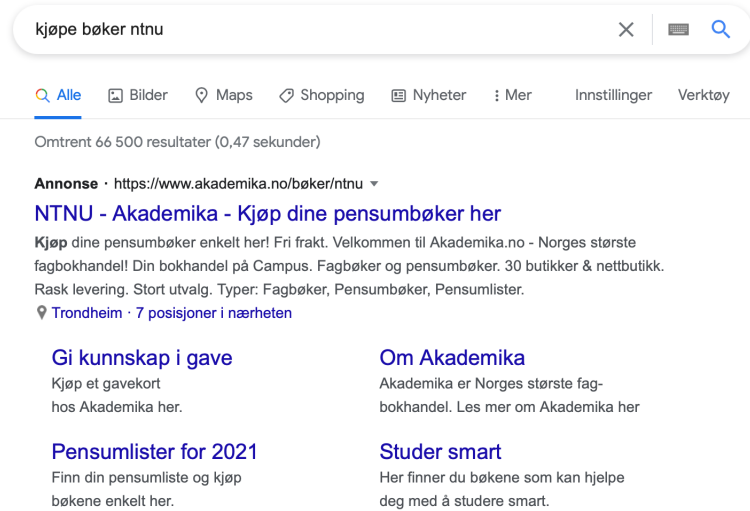
Figure 2.1: A general search text ad

ads, promoting those with greater relevance and expected click-through rates. In 2018, AdWords was rebranded into Google Ads [Ram]. Search ads enables advertisers to target potential customers who search for a specific keyword at the exact given time the user express interest in said keyword. To be able to target a specific customer at the exact time the customer has expressed interest is extremely valuable to an advertiser. Today there are a several options on how to advertise on Google Ads [Gooa]. The general search text ads were the first ads that appeared on the SERP, and is by Google referred to as "the 10 blue links". The ads resemble an organic search result, but are very subtle marked as an ad. See figure 2.1. The ad has three parts; a headline text, a display URL and a description text.

There are also specialized search ads, also known as shopping ads, on the SERP. These are ads that promote specific products categories based on the users search query. These ads are very visible and take up a relatively big space on the result page, see figure 2.2.

Other advertisement-options are display campaigns and video ads. Display campaigns use data collected on each user and display personalized ads based on their search history. The ads aren't necessarily only displayed on the SERP, but can be shown on any website. A recent survey made by YouGov on the behalf of Forbrukerrådet in Norway asked over 100.000 people on their view on personalized ads that are based on data collected on them. In this survey only 1 out of 5 was comfortable with personalized ads based on search data. 30 percent was very negative
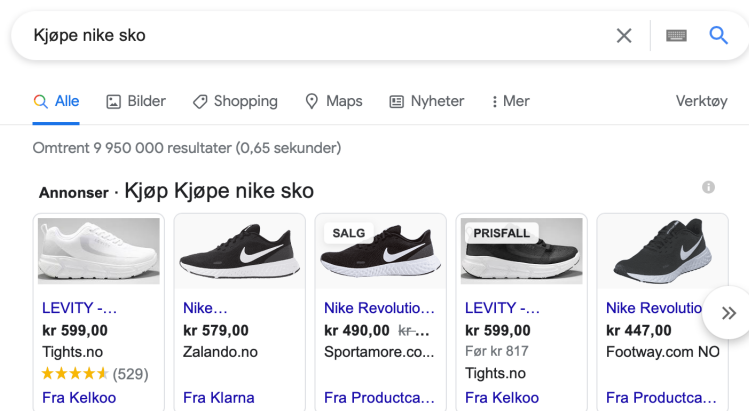
Figure 2.2: A specialized shopping ad

towards it and 6 out of 10 felt they had no choice but sharing their user data with the advertisement companies [For].

Video ads are mainly displayed on Google's own video-service YouTube.

The search advertising business in the US was in 2020 priced to around 58 billion USD[Stac]. For most online advertisers today Googles search ads are a "must-have". Google shares up to 40 percent of their advertisement revenues through their exclusive agreements.

2.2   Market shares

Google had, as of October 2020, a market value of 1 trillion USD and annual revenue exceeding 160 billion USD. Approximately 80 percent of all search engine channels in the United States are owned or controller by Google, either through their exclusionary agreements or through their own properties, like Google Chrome. In recent years, Google has in the United States accounted for 90 percent of all general search engine queries, and almost 95 percent on mobile devices [oJ20]. Over 70 percent of all mobile device usage worldwide comes from an Android-phone.

Currently there are four general search providers in the US market with substantial market share: Google, Bing, Yahoo! and DuckDuckGo. Google dominates the market with 88 percent market share and therefore has monopoly power in the US. Far behind Google is Bing with around seven percent, followed by Yahoo! with less than four percent and lastly DuckDuckGo with less than two percent. See figures 2.4, 2.5 and 2.6 for market shares in the US market.

Although Google Search is by far the most popular general search engine on the market it exist many competitors in the general search engine market. Here the top four competitors in terms of popularity in the US market as of June 2021 is presented. As Apple is an important player in the US market in general, a short section on the companies potential search engine plans is also included.

Bing

Bing was launched in 2009 and is Microsofts general search engine, and in the US the second most popular search engine behind Google. MSN Search, created in 1998, was Microsofts first general search engine which later was rebranded Bing. Just like Google, Bing has its own web-crawler making it independent of other search engines. Bing delivers search results and ads to both Yahoo! and DuckDuckGo [Wik].

Yahoo

In the early days of Yahoo!'s history the Not its own search engine. Does not have its own web-crawler and purchases its results from Bing. In the early 2000s Yahoo was the search engine on everyone's lips. As Google grew and gained popularity, Yahoo started using Google as its search engine provider. Yahoo eventually made an attempt to acquire Google for 3 billion USD, but Google declined the offer and meant they were worth at least 5 billion USD [Vog]. In 2017, Yahoo sold to Verizon for just under 5 billion USD [Staa].

DuckDuckGo

DuckDuckGo is an American-based general search engine that was founded in 2008. Over the years DuckDuckGo has made privacy for its users the most important key selling point. Unlike most general search engines DuckDuckGo does not profile its users. This means that all queries made on the search engine leads to the same results for all users, no matter a users previous search history. The search engine gets its results from over 400 hundred sources, combining results from specialized search engines, their own web-crawler DuckDuckBot and partners like Bing and Yahoo!. DuckDuckGo also advertise on their search engine showing ads from Bing, but there is no user-tracking involved [Duca]. Figure 2.3 shows the overall traffic of DuckDuckGo for the last decade.

Ecosia

Ecosia was founded in 2009 and describes themselves as a social business, but delivers the fifth most popular search engine in the US. They use the profit that they generate through ads on the search engine to plant trees. So far they have planted over 128 million trees [Eco].
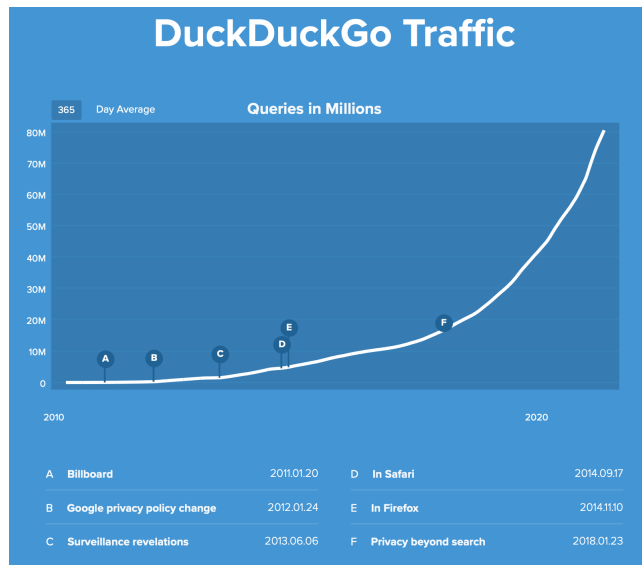
Figure 2.3: The overall traffic of DuckDuckGo [Ducb]

Apple

Although Apple is one of the most important access points for Google Search today, there is growing evidence that Apple is in the process of creating its own general search engine. In the US, their latest version of the mobile operating system, iOS 14, is using Apples own web-crawler Applebot to provide search results when users type queries from their home screen. To develop it's own general search engine may be even more important to Apple if the DoJ-case against Google results in a situation where Google no longer can pay Apple billions of dollars every year to make sure Google Search is the default general search engine on Apple's devices [TB].

2.3   Department of Justice 2020 complaint against Google

In October 2020 The Department of Justice (from now on shortened the DoJ), alongside 11 American states, filed a lawsuit against Google for unlawful practice in terms of competition in the markets they dominate. More specifically, the complaint states that they want to restrain Google "from unlawfully maintaining monopolies in the markets for general search services, search advertising, and general search text advertising in the United States through anti-competitive and exclusionary practices, and to remedy the effects of this conduct" [oJ20]. This section focuses on the complaint, and unless cited otherwise, factual information in this section is collected from the complaint.

Figure 2.4: US market share general search engines 2020-2021 [Stab]

Figure 2.5: US market share general search engines 2009-2019 [oJ20]
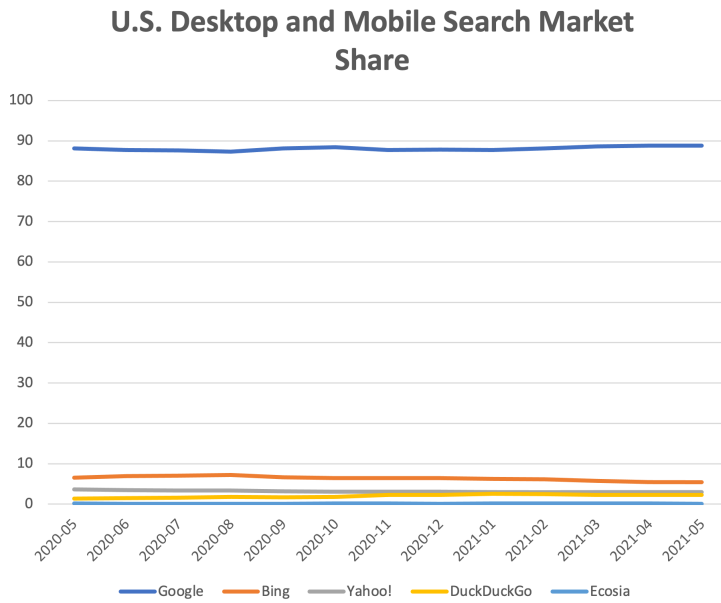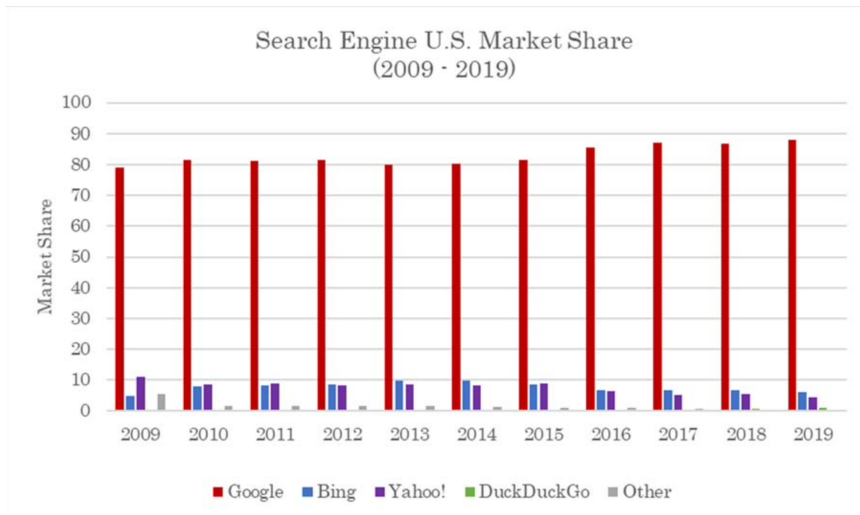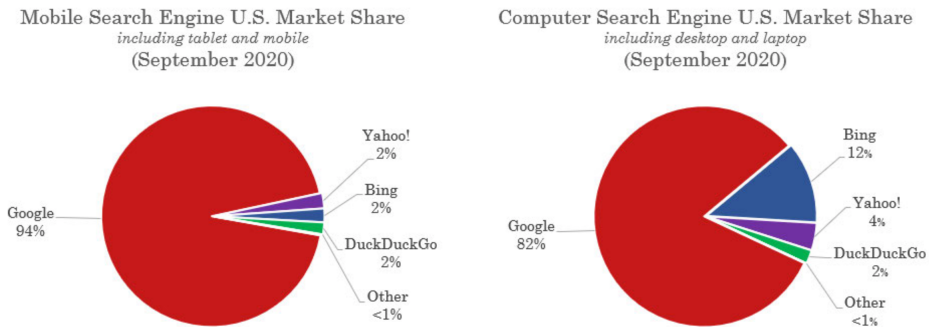
Figure 2.6: 2020 general search engine market share mobile and computer [oJ20]

The goal of delivering a court order is to reduce Googles position in the market and regulate what the DoJ sees as a anti-competitive business strategy. According to the DoJ, Google is with its business practises reducing consumer choice, slowing down innovation and hurting the competition in the market. The DoJ describes their motivation for the complaint as: "For the sake of American consumers, advertisers, and all companies now reliant on the internet economy, the time has come to stop Google' anticompetitive conduct and restore competition".

2.3.1   Exclusive agreements

One major problem that is a result of Googles monopoly in the recent years is how Google uses consumer search queries and information from consumers to sell advertising. Companies pay millions every year to place ads on Googles SERP and Google use this revenue to pay distributors like Apple and Samsung to set Google Search as the standard search engine in their products. The enormous payments combined with the fact that Google Search is the larges search engine in the world makes it an easy switch switch for the distributors. The case for most users is that they don't even know how to change the default search engine on their device and hence is locked-in with Google Search. Googles exclusionary payoffs combined with what the DoJ sees as anti competitive practices, Google has created a continuous and self-reinforcing monopoly in multiple markets.

Each year advertisers in the US pays around 40 billion USD to place ads on Google's SERP. These revenues are used to pay distributors for exclusive deals to favour Google's services and products. These distributors includes popular device-manufactures such as Apple, LG, Motorola and Samsung; U.S. wireless carriers such as AT and T, T-Mobile and Verizon; and web-browser developers such as Mozilla, Opera and UCWeb - to feature Google, including Google Search, as a default on the service or device. For the last ten years Google has accounted for nearly 90 percent

of all general search-queries in the United States, and almost 95 percent on mobile devices. In the US, Google's exclusionary agreements cover roughly 60 percent of all general search queries. For mobile search, the coverage is even higher, with around 80 percent. The DoJ strongly believe that it is these exclusive agreements combined with other anticompetitive business practices that allows Google to maintain its monopoly in general search.

As mentioned in chapter 2.1 general search engines are primarily distributed on desktop and laptops in addition to mobile devices such as smartphones and tablets. When using a computer most general search happens through a web browser either by entering the query directly into the address-bar or visiting a general search engine web page. The main search access points on mobile devices are browsers, widgets such as a quick search bar (QSB), a search app, voice assistants, and other apps that links to general search, such as smart keyboards. In the US, Chrome has approximately 60 percent market share, Safari has 16 percent share, Firefox has 7 percent share and Microsoft's Edge and Internet Explorer combined has around 15 percent share. Other small browser has less than 4 percent market share. Most of these browsers, except Microsoft, has exclusive agreements with Google to have Google Search as the default search engine. It is a huge advantage for a search engine to be enabled as the standard search engine on a chosen device. Even if a user can change the default search engine, they rarely do.

Google paying Apple for exclusive entry points on Apple's devices is nothing new. For many years Google's exclusive agreement with Apple has made Google the default search engine in several of their products. In addition to their web-browser Safari Google Search is also the default search engine on Apple's own voice assistant Siri. In the US, Apple's iOS devices (iOS being Apple's proprietary mobile operating system) account for roughly 60 percent of all mobile-device usage. Google pays Apple an amount of 8-12 billion USD annually to make Google Search the default general search engine for Safari and in Siri. The payment Apple receives from Google is estimated to make up around 15-20 percent of Apples worldwide yearly net income. For 2019 Google estimated that 50 percent of its search queries originated from Apple devices. Naturally, Google loosing this point of entry in Apple products would drastically impact Google's valuable scale.

Apple and iOS is naturally not the only mobile operating system competing in the US market. Around 40 percent of mobile-device usage comes from devices running Android, the Google owned open-source mobile operating system. Android being open-source means that the operating system is licensable, allowing third party mobile-device manufactures to use it as their mobile operating system. In the early years of Android, Google needed to achieve critical mass and enforce its network effects. In order to do so, Google shared the advertisement and app-store revenues

with the manufactures that used Android as their mobile OS. This made the mobile platform even more attractive, and Google already back then started its behaviour of exclusive deals to lock-in distributors. In order to access all important features of Android, manufactures need to use a proprietary layer named Google Mobile Services (GMS). GMS include the six core apps; Google Play, Google's search app, YouTube, Chrome, Gmail and Google Maps. In order to use standard features such as push-notifications, enabling in-app purchases through Google's app store Google Play or use data from Google Maps, the manufactures need to use GMS. Removing access to basic features like this leads to most manufactures having no choice in using GMS or not. Also, in order to get maximum payments from the advertisement revenue, which there are own deals for, Google search needs to be default for all search access points on the devices. Figure 2.7 illustrates how Android-users get to Google Search.

There are three types of Google's distribution agreements on Android, although the specifics of the agreements depends on the counterpart:

1) If Android device manufactures (like Samsung, Sony and Huawei) want to preinstall Google's proprietary apps, they need to sign a anti-forking agreement. These agreements set very clear restrictions on technical and design-related standards, that needs to comply with the standards that Google has set.

2) For the manufactures that includes Google's proprietary apps and sign the anti-forking agreement, they also need to bundle other Google apps, also making some of these apps undeletable and finally giving Google the mos valuable real estate on the default home screen. More specifically need to include the Google search bar.

3) In order to get a share of the advertisement revenues from Google, the manufactures need to set Google Search as their main general search engine. Some agreements also prohibit the installation of competitive general search engines.

The agreements which Android-manufactures need to deal with, combined with the exclusive agreements Google has with companies like Apple, gives Google a massive opportunity to further scale their search engine.

2.3.2   Entry barriers for a search engine company

Google's former CEO Eric Schmidt was once asked to name Google's biggest strength in search, to what he replied that "Scale is key. We just have so much scale in terms of the data we can bring to bear"[Fai11]. In order to improve a general search engines algorithm, expand the audience reach of search advertisers and generate greater revenues and profit, scale is crucial. In terms of search engine advertisement scale is important to get a larger audience of potential customers which the advertisers

benefit from. This is a major issue for competitors of Google Search. According to the DoJ, Googles practices are anti competitive which leads to rivals being denied to scale properly. Complex algorithms are a crucial component behind a successful search motor. General search services, search advertising and general search text advertising require complex algorithms in order to analyze the input of data and learn which organic results that best respond to user queries. In order for the algorithms to get smarter they depend on the volume, variety and velocity of data. Competitors are denied much needed input data in order to grow their search engines because of Google's distribution agreements, hence Google is unlawfully maintaining its monopolies, the DoJ states in its complaint.

There are several factors that make the barriers to entry the general search engine market high. First of all, the capital needed to create, maintain and grow a general search engine is substantial. Googles search index contains billions of websites, and is well over 100,000,000 gigabytes in size. In other words, the costs of maintaining a search engine of this size can reach hundreds of billions of dollars annually. It requires developers capable of developing incredibly complex technology, marketing campaigns to make the search engine visible to users and advertisers and last and not least scale. Scale is a necessity in order to deliver quality results and grow the engine.

Although there are innovative new search engines appearing on the market, the DoJ states that they are denied the tools needed to become true rivals. As mentioned earlier it exists companies that try to differentiate themselves from Google. DuckDuckGo focuses on the users privacy being protected. Although this is a search engine that would be a great fit for a lot of users, most people have never heard of DuckDuckGo. The lack of effective paths to market and access, at scale, to consumers, advertisers or data makes it nearly impossible for new general search engine companies to co-exist with Google. The DoJ states in its complaint that "For both mobile and computer search access points, being preset as the default is the most effective way for general search engines to reach users, develop scale, and become or remain competitive".

2.4   Relevant antitrust-cases

Antitrust laws were created by governments to make sure that users have access to markets with fair competition, free of predatory business practices. These laws can also be seen as competition laws, and they are necessary to make sure that users don't pay higher prices for services and have few alternatives to choose from. Monopolies are an example of what can be handled by antitrust laws. As Google Search is a monopolist in the general search engine market, antitrust laws are essential. In this section I will present some cases that are relevant to antitrust laws [Che].
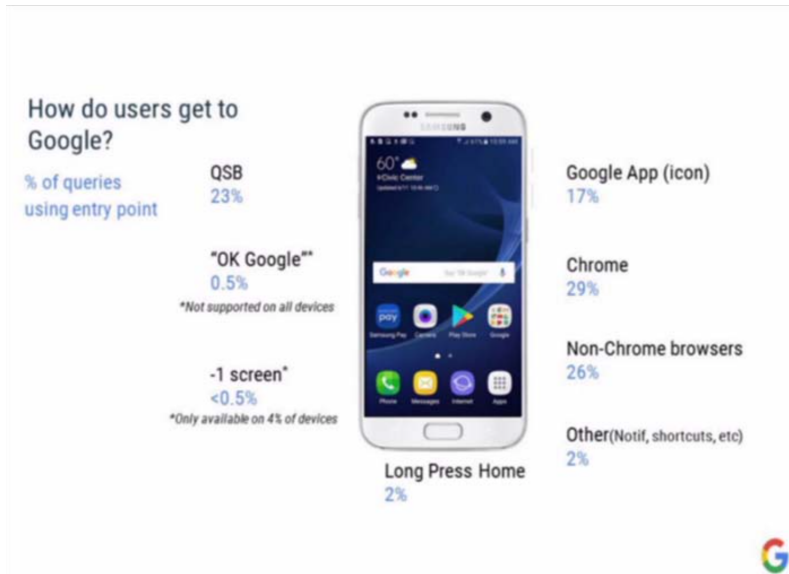
Figure 2.7: Google entry points [oJ20]

2.4.1   United States v. Microsoft

In 1998 the American DoJ filed a complaint against Microsoft as a response to bundling software with Microsoft's operating system Windows. This meant that customers who wanted some specific Microsoft-software needed to buy Windows. Microsoft also distributed their web-browser Internet Explorer for free, leading to an increase in market shares and their biggest competitor at the time Netscape exiting the market. The DoJ then alleged that Microsoft made it difficult for users to install competitive software on Windows and hard to uninstall bundled software like Internet Explorer. Microsoft lost the case, as the judge ruled that the company broke antitrust laws [Ins]. United States v. Microsoft is an important case in regards to antitrust law. According to the DoJ in their complaint against Google from 2020 there are clear similarities in how Google act now compared to how Microsoft acted during the case. The comparisons are that both Microsoft and Google required preset default status, making software undeletable and making distribution for rivals difficult [oJ20].

2.4.2   EU against Google Search

Antitrust laws differ depending on which region or country you are in. Many will argument that European antitrust laws are more invasive than US antitrust laws. The European Commission is a executive branch of the European Union and is responsible
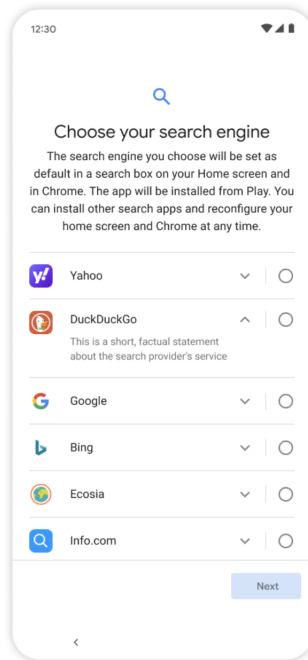
Figure 2.8: Android choice screen [And]

for the "EU's overall strategy, proposing new EU laws and policies, monitoring their implementation and managing the EU budget.." [Comc]. In 2017, Google was fined with 2.42 billion euros by the European Union for breaking antitrust law. The European Union found Google guilty in abusing its dominance in the general search engine market, by giving advantage to its own comparison shopping service. The issue was that when users searched for shopping comparison services on Google Search, the search results was manipulated to prioritize Google's own service Google Shopping [Coma]. In 2018 the European Commission fined Google 4.34 billion euros for imposing illegal restrictions on Android device manufactures and mobile network operators to strengthen dominance of Google's search engine. [Comb]. A consequence was that Google needed to make a option screen for default general search engine on Android phones in Europe.[Lom] When a user configures their Android device today in Europe, they are presented with a choice-screen to set the default general search engine on the device. On the list are up to 12 different general search engines [And]. See figure 2.8.

2.5   Theory

2.5.1   Multi-sided platforms

In a multi-sided platform (MSP), two or more distinct user groups interact to produce mutual benefits for each other [OA18]. In many cases only two user groups exist, and the multi-sided platform then becomes a two-sided platform. There is a lot of value in connecting different user groups, and some of the largest companies in the world enable MSPs in their business-models, such as Google, Facebook, Uber and eBay. According to Zeng et al. such firms can be defined as multi-sided platform companies (MPCs) [ZKD19]. In their paper, Zeng et al. describe these firms as companies "that, from their inception, are primarily focused on providing infrastructure, information, and technology - intangible assets that enable direct transactions or value creation over virtual platforms by linking different user group and complementors, extracting a significant proportion of their revenue from this process". Today, we find platform-based firms in most industries and they play an important role in the expansion and fostering of digital innovation [HW15]. A MSP can be *asymmetric*, serving two or more user groups with different motives at the same time through a mutual mediation[OA18].

We categorize MSPs into two different main types: **digital MSPs** and **tangible MSPs**, Øverby and Audestad[OA18] giving the following definition: "Digital MSPs mediate the exchange of digital goods and services, while tangible MSPs mediate the exchange of physical goods and non-digital services." An example of a digital MSP is the online professional networking platform LinkedIn. The platform offers job-seekers to post their resumes and employers to post jobs. Through a paid-subscription, you are able to access additional information about members on the network and this is where LinkedIn gets most of its revenue. Airbnb and Uber are examples of tangible MSPs, offering physical goods and non-digital services. What is particularly interesting is that, compared to traditional firms, the value creation of MPCs is primarily based on input from external customers to drive demand and direct customer interaction to generate economic value through the use of platforms [ZKD19]. Value is exclusively generated by maintaining and channeling the exchanges that take place between various participants[CSYL19]. In other words, the platform has no value on its own, but rely on the user groups to interact with another thus creating value through the offering of services. For example, AirBnb owns no lodging, and depends on people listing their homes and other people renting them. This leads to the demand side effect being stronger in multi-sided markets as more value can be generated as more users joins a platform [ZKD19]. A dynamic where users and complementors produce complements that enhance platform value is something a MPC rely on [AK10]. This dynamic leads to network effects playing a huge role in multi-sided markets.
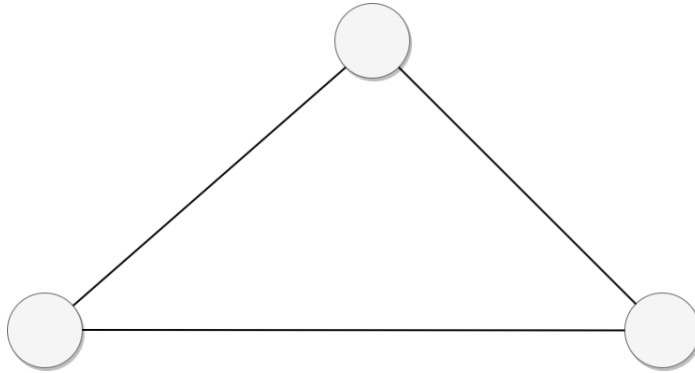
Figure 2.9: Network A

2.5.2 Network effects

Øverby and Audestad defines network effects as "the effect that the number of users or amount of usage of a service has on the value of that service as perceived individually by each user in a network."[OA18] A common way to visualise network effects it the use of undirected graphs. In figure 2.9 and figure 2.10 we have two examples of undirected networks. In both networks we have nodes and links. The nodes may be the users of a service or platform, and the links the interaction between users in form of communication or trading. The size of the networks may vary from small networks like 2.9 and 2.10 or larger network consisting of millions of nodes and links. Social networks like Facebook or trading platforms like eBay are examples of larger networks connecting millions of users. The number of links in the network is a way to measure the value of the network effects and is the essential mechanism in creating network effects[OA18].

As stated in chapter 2.5.1, a two-sided platform is a MSP which mediates between two user groups. If the network effects only impact one of these groups, it is a *same-side network effect*. If the network effects affect both sides it's a *cross-side network effect*. Further, the network effects can be positive, negative, direct and indirect[OA18]. I will now present an overview of the various types of network effects:

Positive and negative network effects

A network effect is positive if the increased number of users in the network results in a perceived value-increase. On the other hand, if the number of increased users in the network results in a value-decrease, the network effect is negative. In a case where the number of users decreasing results in an increase of the value of the network, the network effects are also negative[OA18].
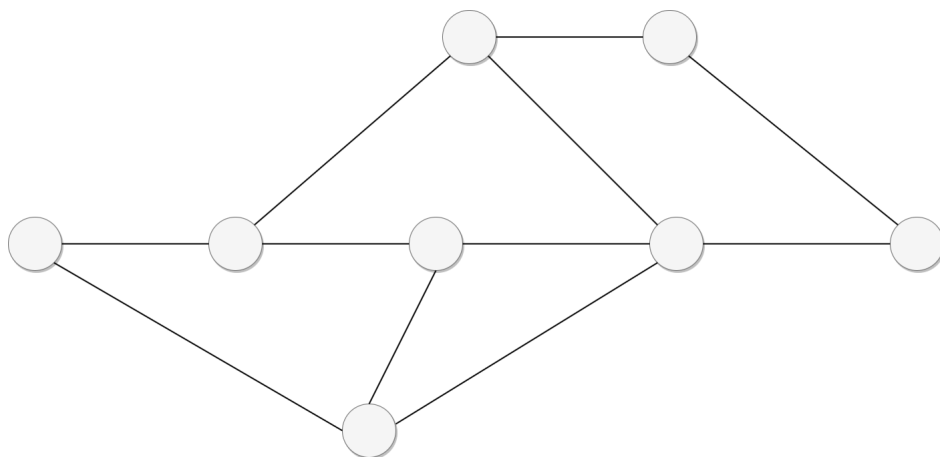
Figure 2.10: Network B

Positive feedback will amplify the network effects. If new users adopt a digital service resulting in other users to adopt it, positive feedback is the result of positive network effects increasing the value of the service. In the end most users have adopted the service and it cannot longer grow hence the market is saturated. According to Øverby and Audestad "positive feedback means that the strong gets stronger and the weak gets weaker."[OA18] This could lead to markets with strong positive network effects and positive feedback producing monopolistic markets.

Direct and indirect network effects *Direct network effects* take place when direct interaction between users affect the value of the service. In indirect network effects users affect the value of the service without having direct contact. Examples of indirect network effects are restaurant reviews and bandwagon effects. Examples of direct network effects are social media platforms and buyers and sellers in multi-sided markets.

Same side and cross-side network effects Same side network effects happens when an increased number of users affect only the value of the same user group. Social media platforms and online gaming are same-side network effects where the interactions are both direct and indirect. Cross-side network effects is the case where an increase in number of users in one group results in a value-increase in other groups. Examples of this is software and hardware, more specifically computers and software or smartphones and apps. If more people buy iPhones there will also be an increase in persons using apps found only on the iPhone, like Snapchat for iOS.

Data network effects Data network effects are network effects where data collected from users of a service is used to improve this service [OA18]. Audestad

and Øverby also state that Google Search is such an example, where the Google algorithm will get better as more users are entering queries on the network.

Path dependence Path dependence is a theory where external factors like positive feedback events or stakeholders decisions are affecting the evolution of a service [OA18]. Meaning that not only conventional economic theory like network effects and positive and negative feedback shapes the future of a service, but external random factors.

2.5.3   Lock-in and switching costs

The mechanisms companies use to keep consumers from leaving their service is defined as *lock-in*. Usually there are high costs related to getting new users to join a service, like advertising campaigns. It is therefore crucial for companies to make sure that their existing costumers doesn't leave their service. Øverby and Audestad defines defines *churning* as "when a consumer leaves a service offered by a company to go to a competing service". Companies want to keep churning to a minimum, in other words leaving switching costs high. The same authors, also defines switching costs as "the direct and indirect costs for a company to capture consumers from a competitor and for consumers to switch to a new supplier of a digital service." [OA18]

Chapter 3

Research method

This chapter describes the research approach. When I started out working on the master thesis, my knowledge on general search engines, antitrust, and surrounding topics was very limited. I therefore started with a literature study on relevant topics to increase my knowledge and gather new insights. As relevant topics included a lot of different areas of expertise, like technology, economics-theory, politics and law, the literature study started very wide, and ended up being very time-consuming. In order to gain insights in the general search engine market I also changed my default general search engine on my smartphone and in my web-browser. This was done in order to research the quality of the services and the user-experience of other general search engines than Google Search. This was meant to help me get a better understanding of the competition, and how different points of entry affect the accessibility of different search engines. As a part of my research I wanted to analyse the general search engine market, and how Google's position in this market impact innovation and competition. In order to systematically make use of the information that I had accessed, the analysis model Porters Five Forces was used.

3.1 Literature study

A traditional literature study has been conducted. The purpose is to get a wide understanding and overview on a selected topic or in a special field [JML11]. A literature study is defined as "the comprehensive study and interpretation of literature that relates to a particular topic" [Ave18]. In order to start the review of literature, one or several research questions should be defined. I used the 2020 DoJ complaint against Google as a motivation for defining my research questions. This made it easier to my when narrowing down that areas I should be focusing most on in the wide search of information. One of the advantages of using a literature study as a research approach is that it is relatively easy to increase knowledge in the chosen research field because of the access of information. Being thorough in search and analysis of new literature is important to get new insights, and is most effective only

when all available literature has been reviewed together and put into context of other information. Google Search and Google Scholar was my main access points to find literature, although other search engines also was used. A disadvantage of using this method of research is that it can be harder to come up with new ideas and new insight based on what one reads.

3.2   Porters Five Forces

Porters Five Forces provides a framework for the analysis and evaluation of a organisation's strength and position in terms of competition in the market. By using this framework a organisation can achieve a in-depth analysis of the industry which it exists in, helping the organisation get an overview of its competitive strengths and weaknesses, assisting them in planning for a strategy that aligns with the organisations position in the market[CGM].

The five forces are defined as:

Bargaining power of suppliers How easy is it for suppliers to drive up prices? How dependant the organisation in on various suppliers, and how many suppliers they can choose from are important factors in the assessment of bargaining power. Is it a high switching cost from one suppliers to another?

Bargaining power of buyers How easy is it for buyers to drive prices down? If there are few buyers in the market, it is easier for them to affect the prices in comparison to if there are a lot of buyers. Is the switching cost for changing supplier high for the buyer?

Rivalry among existing competitors How many competitors that exist in the market and how unique each competitor is, are important factors in this force. Each organisation naturally want to be the most competitive one. If there are many competitors that offer little undifferentiated services or products, their attractiveness in the market will be lowered.

Threat of substitutes If a market has products or services that are easily substituted, the buyers more easily can change from one product or service to another. In this case their attractiveness in the market is decreased.

Threat of new entrants There are several reasons that could make barriers of entry high for a competitors that wants to enter a specific market. This could be the need to develop a specific algorithm or technology, high capital requirements, government regulation, the lack of access to market or patents. In market where barriers of entry are low, new entrants in the market could challenge market shares and eventually profits [Vis].
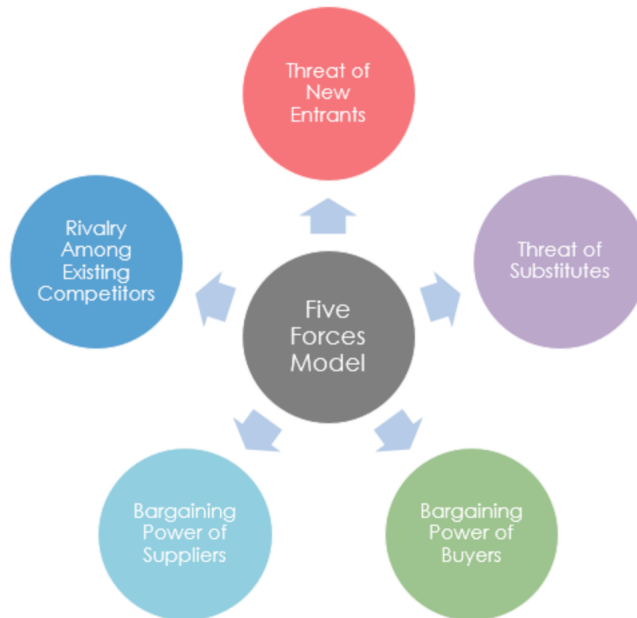
Figure 3.1: Porters 5 Forces[Vis]

Porters five forces was a powerful tool for me to to conduct a environmental analysis of the general search engine market, and further investigate the position of Google Search in this market. By understanding the position of Google Search in the market, I more easily can make an assessment on how the organisation is impacting competition and innovation in the general search engine market. Before I could use the framework and implement a model, I had to make sure that my knowledge of both the market and the organisation was sufficient to do a analysis like this. As I conducted my literature review I got new insights on the field, and this was necessary in order to understand how different forces affect the general search engine market.

In order to understand how Google's business practices impacts innovation, a techno-economic analysis of Google and its position in the search engine market is necessary. The first part of this chapter will therefore focus on how Google's business practices and how the nature of the search engine market has made Google the de-facto monopoly it is today. This analysis is important in order to gain insights on how Google's business practices are affecting innovation and competition in the general search engine market, and in order to suggest what initiatives that can increase competition and lowering Google's domination in the market. As a research method to help my analysis, Porters Five Forces will be used as a tool. The analysis is also based on literature that I have reviewed in earlier chapters.

4.1 A techno-economic analysis of Google Search and the general search engine market

In chapter 2.5.1 multi-sided platform companies were described as companies that create value in linking two or more user groups creating mutual benefits for each other. Google Search can be seen as a two-sided platform where the two users groups are the advertisers providing ads on the SERP and the users performing queries on the search engine. The platform is *asymmetric* as the two user groups have different motives to use the service. Both advertisers and users of Google Search is necessary users groups in order for Google to make money. Google Search main source of income is from its paid advertisers.

4.1.1 Network effects

In terms of network effects they are positive in both user groups, meaning that an increase of users in either user groups leads to a perceived value-increase for Google Search as a service. Further it exist no cross-side network effects from advertisers to users, since more advertisers on Google Search does not increase the service's
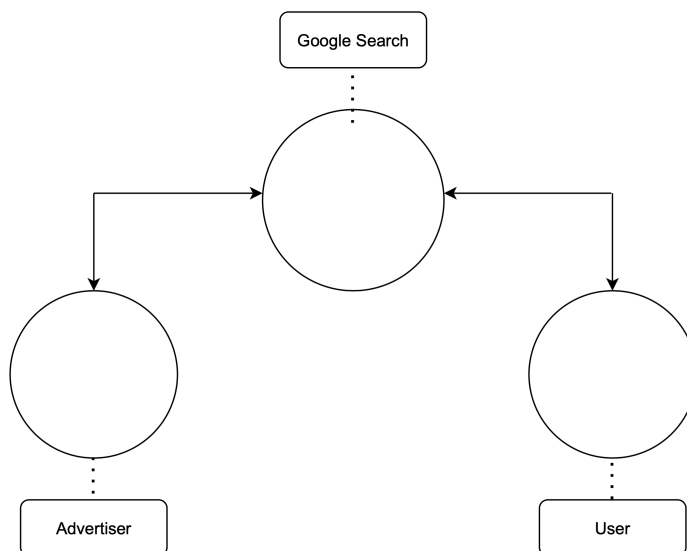
Figure 4.1: Google Search modelled as a multi-sided platform

value for Google Search's users. However, cross-side network effects exist from user to advertiser, as the advertisers prefer many users of Google Search so that their advertisement can reach as many potential customers as possible. Amongst the advertisers there are some negative same-side network effects. This is a result of advertisers competing over the same advertising space, but also because of Googles auction model leading to a price increase for ads when there are competing advertisers. There are no same-side network effects among Google Search users. That is because there are no direct interactions between users of Google Search. According to Øverby and Audestads, Google Search is an example of data network effects, arguing that the PageRank algorithm improves as users perform queries on the platform, hence providing better search results for future users[OA18]. However, there is no documentation available that backs up the assumption that queries made by users on the service actually improves the algorithm. This is, for now, considered classified information within the company and not publicly known details. Mainly, Google Search provides search results based on its web-crawling algorithms and not by the input of user searches.

Network effects alone would not be enough to increase and maintain its number of users. For Google Search, early events triggered them being the market leader. Although there were plenty of other search engine companies at the end of the 90's,

Google's patented PageRank-algorithm was superior compared to the competition. The PageRank-algorithm is still unmatched in today's market, and Google's effort to maintain and further develop the algorithm is a crucial part of their service keeping its users.

For Google Search, network effects like positive feedback from the market plays a huge part in the platforms lock-in mechanisms. As mentioned earlier, Googling has become a synonym to searching the internet. As of today, it is very challenging for a competing general search engine to offer a similar or better service than Google Search, although not impossible.

4.1.2   Porters Five Forces

As a tool to further investigate the general search engine market and Google's position in this market in terms of market power I use Porters Five Forces. The research method is described in more detail in chapter 3.2. The use of Porters Five Models in this analysis will be helpful in providing insights to answer the thesis' research questions. In this section I will assess each force individually. The scale on how the forces perform is: Low, moderate and high.

The bargaining power of suppliers: Low As Google is one of the biggest companies in the world, naturally a great deal of suppliers depend on them as a customer. Most of Google's services are built and maintained in-house by Google's highly competent developers, using its advanced technology. This makes them less dependent on suppliers in comparison to organisations that does not have this high level of in-house competence and resources. Some of Googles suppliers, like Apple and LG, are also compensated by Google annually through its exclusive deals. On the other hand, Samsung and Apple are also some of the biggest companies in the world and provide Google Search with important access points for Google Search through the same exclusive deals. But as Google Search is the best general search engine in the world, the suppliers depend more on Google than Google depends on them, ultimately making the suppliers bargaining power low.

The bargaining power of buyers: Low Google Search has two groups of buyers: Advertisers and Google Search users. In both user groups the number of users are surpassing billions. If there were fewer buyers, the bargaining power of buyers would be higher. In addition to a large user group, Google Search is highly differentiated. No other general search engine on the market provides the quality and robustness as Google Search. For advertisers, Google Ads has also become a "must have" for online advertising. It is from advertising Google makes most of its profits, and it is with the revenue from advertisement that Google pay suppliers like Apple and Samsung to make Google Search the default search engine on their devices. When customers buy devices where Google Search is pre-installed, Google

Search is highly accessible. The process that users must go through on many devices to change the default search engine, makes the lock-in effect high. At the end of the day, as Google Search is the most powerful search engine on the planet and the default search engine on so many devices, the bargaining power of buyers are low.

Threats of new entrants: Low To enter the general search engine market today, a organisation has to make a multi-billion dollar investment in order to end up being a viable competitor to Google Search. In order to provide a general search engine, an algorithm that effectively indexes internet sites and provide users with relevant search results must be developed. In addition there are high costs related to areas like maintenance and marketing. Even if a new entrant had a high degree of differentiation, and could target customers with a unique service, the cost of research and development alone to develop a search engine would still be of very high cost. As Google Search is the most powerful search engine on the market and has monopoly power in addition to a great reputation for its quality, the customer loyalty is very high. The consequence is that even if the lock-in effects were low, and it was an easy switch for a user to start using other search engines, they most probably wouldn't as they wouldn't trust the new entrants to deliver a search experience as good as Google Search. A new competitor on the market also would have to run their business for a long time to achieve adequate scale.

Threats of Substitutes: Low To general search engines it exists no substitutes. Specialised search engines are different from general search engines, and do not compete over the same customers in the same market. At the time being, real substitutes to search advertisement is also few. Obviously companies may choose to advertise in other ways than on a search engines SERP, but when it comes to delivering advertisement after the entering of a query on a general search engine, no substitutes makes a threat. The threat of substitutes is low.

Competition among existing competitors in the industry: High Very few businesses offer similar products and services as Google. Google Search is far superior with its high quality search engine compared to its biggest competitors like Microsoft and Yahoo!. As Google has monopoly power in the general search engine market, and even though companies like Microsoft and Yahoo! are multi-billion companies, they are not close to offering the service that Google Search delivers. As Google has so much access to scale, its search engine also gets better every day. The competition among existing competitors in the industry is therefore high, as huge tech-companies like Microsoft and Yahoo! tries to compete with Google Search in the general search engine market.

Regulation: Even though there are only five forces in Porters model, additional relevant forces can be added to the analysis. In Google's case, the regulation of its

monopoly power may affect many of its most important business aspects. In the
EU, Google has been fined with multi-billion fines because of breaking European
antitrust-law. The ongoing case that the US Department of Justice has filed against
Google most probably will last for years, and can have a huge impact on Googles
business model. If their exclusive deals with suppliers like Apple and Samsung are
regulated, Google Search may loose its valuable default search engine status. That
may lead to less points of access, which again will give them less scale. In the EU,
Google Search already must provide new users of Android with a choice-screen to
choose their default search engine as they configure their Android-phone. Although
European antitrust-law by many is seen as years ahead of US antitrust law, it is not
unreasonable to assume that what happens in the EU will affect antitrust-law in the
US.

Chapter 5

Virtual General Search Engines

5.1 Virtual General Search Engine

5.1.1 Motivation

In the analysis in chapter 4 it became clear to me that the barriers of entry for a new general search engine provider is high. One of the first and biggest barriers for a new entrant in the market is the capital needed to develop and maintain a web-crawler and a search engine providing users with high quality search results. The technology and numbers of developers needed to develop an algorithm indexing relevant web-pages, comparing and ranking them, and eventually providing the end user with the desired result require huge investments. And these investments must be running for a long time, since gaining adequate scale is important in order to compete in the general search engine market. If the barriers of entry was lowered, by for example providing new general search engines the technology and infrastructure they need in order to deliver relevant search results to the end user, more actors could enter the market, eventually increasing competition.

In today's market, if a search engine provider wants to access data from a competitive search engine provider, a deal must be negotiated between the actual organisations. This often includes a time-consuming and expensive process with many involved parties. Negotiations on price, what data to access, how to access the data and a bunch of legal and technical questions must be handled. If you are a small organisation making deals with one of the worlds largest corporation in the world, the new entrants are not the ones dictating the terms. It is not easy for a search engine provider to negotiate such a deal today, yet alone not necessarily even possible. We have also seen previously that deals may not work out the way one expected it to. The nature of Yahoo's agreement with Microsoft and its search engine Bing led to a situation where Yahoo had difficulties with parts of the deal, more specifically revenue per search (RPS)[Sula]. There are in other words need for a regulated and established framework enabling new search engine companies to buy

necessary services from a already established competing search engine company to start their business. This is the basis for the *virtual general search engine.*

5.1.2   The concept

A proposed solution to lower the barriers of entry for new general search engine providers and increase competition and innovation in the market is a regulated framework for Virtual General Search Engines (shortened VGSE). With a framework like this, a new entrant in the market could develop its own general search engine, using the infrastructure of already established general search engines, like Google Search or Microsoft's Bing. The idea is that it exists a limited number of general search engines (shortened GSE) on the market, which VGSE can lease infrastructure from. The business model should be regulated by the state, providing a standard agreement for deciding price models, how to access data, what data to access, security, which would be available for new entrants. This would allow new entrants to focus on differentiation and further innovation in the general search engine market, being more able to offer services that differentiate themselves from the existing players on the market, like Google Search and Microsoft's Bing. A VGSE can use this framework to consider which services to run internally, and which to outsource to the GSE it has an agreement with, in order to grow and reach its potential customers.

5.1.3   Inspiration

Mobile Virtual Network Operators

A mobile virtual network operator is different from a standard network operator, as the virtual operator provides telecommunication services to its end users without owning or maintaining any infrastructure or radio frequencies. Any company can become a mobile virtual operator, as access to infrastructure is easily accessible and regulated in each country or region[SV]. The idea of a virtual general search engine have similarities to the way a mobile virtual network operator buy traffic capacity and infrastructure from a network operator and resell it through subscriptions. In the same way we would have a few general search engines which the virtual general search engines could buy services and data from. In Norway it exists three mobile network operators: Telenor, Telia and ICE.

Yahoo!

With its deal from 2015, Yahoo must pay Google per request if it uses algorithmic search results for web results and images. Google pays Yahoo a percentage of the gross revenues from ads displayed on Yahoos sites[Sulb].

5.2 How it works

In this section I will cover some business-aspects of how a virtual general search engine provider could work. Bear in mind that a this is only a suggestion, and that the business model can be constructed in a various of ways.

5.2.1 Web-crawler and access points

As mentioned earlier, one of the most cost-demanding investments for a general search engine is to develop a functionally web-crawler that crawls the internet, indexes web-pages, linking them together and providing a search user with a relevant search result based on the query being entered on the search engine. If a new provider of general search entering the general search engine market could lease the services needed to crawl the internet and provide a end user with search results, the provider would be able to skip this investment, being able to focus on other business aspects and services in order to success in the market.

Any VGSE that is interested in leasing infrastructure and services from a established GSE, needs to have a point of access to be able to connect to the GSE. A GSE must offer a easily accessible open API and provide documentation on how to connect to the interface. Two different APIs must be developed: One API for accessing the web-crawler and the services needed to deliver search results, and one separate API for the delivery of advertisements. By dividing these to services into two individual access points, the VGSE-providers more easily can choose which services to access. This allows for VGSE to easily access data, functionality and tools through these points of access. One of the advantages of using an API instead of access to a database, is that is more easy to connect via an API-interface for third party systems and for systems built with different technology. If some services would have to be removed, for example because of regulation, or new services added, an API allows the GSE to easily add or remove services. Whether A VGSE are able to display results from several GSE at the same time, not being limited to just one, has not been further explored in this thesis. It is technically possible, and would increase the flexibility of a VGSE not being limited to one GSE, but how it could affect competition and innovation in the market has not been further explored.

Sufficient documentation on how to access the APIs is also a requirement. This must be easily accessible for developers of a VGSE, as they need to develop a infrastructure on the client-side that can connect to the APIs.

The GSE can not put a limitation on the number of queries per day on the web-crawler that is being accessed through the API. If a VGSE had a limitation on maximum number of queries per day, this could potentially result in a situation where a user doesn't get any results when entering a query on the virtual search

engine, hence making the search engine practically useless. A layer of security must be developed within the APIs, in order to stop cyber-security attacks, e.g. like a brute-force attack. Cyber security and pricing is not discussed in this thesis and is a suggestion for further work.

5.2.2 Advertisement

Advertisement is a crucial part of most general search engines revenue, although it exists ad-free general search engines on the market. Whether a VGSE wants to include ads or not depends on their business model and what customers they want to attract. The framework must offer a way for VGSE to choose if they want to include advertisement in their search engine or not, and to which extent. The framework will provide two options for VGSE, in terms of advertising:

Displaying ads from a single general search engine provider

The VGSE may include ads from the same GSE-provider it gets its search-results from. In this case the GSE-provider pays a percentage of the gross revenue from the ads that are displayed on the VGSE result page. This allows for both providers to increase their profits, and gives a newly started VGSE a way to gain early profits.

Displaying ads from several general search engine providers

A VGSE may decide to display ads from several search engine providers. In this case it must be determined how many percent each GSE will have its ads displayed.

Also, a VGSE may choose to not show ads on their SERP entirely, or develop their own way of displaying ads. In both these cases the VGSE will not be including any ads from a GSE.

5.2.3 Regulation

In order to make a VGSE-business model work, regulation is needed. As each country has different laws and politics, making a international framework that works for all countries would be challenging. The idea of virtual general search engines can be applied to any country, but how it is regulated in the market would have to be handled regionally. For mobile virtual network operators, it exists an EU standard for price regulation. To develop a standard for price regulation, where e.g. the US has its own standard, could be the best way to solve it. Also regulation is needed in order to decide what is required of the access points, develop standards for how VGSEP negotiates with GSEP and constantly doing surveillance on the competition in the general search engine market.

Chapter 6

Discussion

In this chapter I will lead a discussion on Google's monopolistic market domination and whether the organisation's business practices is hurting innovation and competition in the general search engine market. Further, based on the literature review in chapter 2, the analysis in chapter 4 and the introduction of Virtual General Search Engines in chapter 5, I will attempt to answer the research questions stated in chapter 1.

6.1 How is Google's business practices impacting innovation and competition in the general search engine market?

As presented in chapter 2, Google has deals with companies like Apple making Google Search the default search engine provider on Apple's devices. This practice has been going on for years, and in the US especially, Apple devices are an important point of access because of Apple's market shares in both the smartphone-market and web-browser market. The fact that the 8-12 billion USD Google pay Apple annually to make Google Search the default general search engine for Safari and in Siri, make up around 15-20 percent of Apples worldwide yearly net income, makes it very clear that this is not only an important deal for Google, but for Apple as well. Not only are Apple compensated with billions of dollars annually, they also provide their customers with the most powerful search engine on the market. Why is this relevant? Let's say that Microsoft with its search engine Bing would attempt to make a similar deal with Apple making Bing the default search engine on Apple's products, Microsoft paying Apple the same amount that Google currently pay Apple annually. Although Apple still would have the same revenue out of the exclusive deals, they would provide their users with a much poorer quality of search, and probably would eventually choose not to have an agreement with Microsoft. In other words, Google's *quality and robustness* as a search provider in itself gives Google a competitive advantage in the market.

As mentioned earlier, Apple is currently working on its own general search engine. As Apple has a history of replacing competitive tech-companies where they are able to, e.g. when they replaced Google Maps with Apple Maps, it is not unlikely that they over time will try to do the same with Google Search. A tech-giant like Apple launching its own general search engine would be good for innovation and competition in the market. If the US DoJ's complaint against Google results in Google having to change their agreements with e.g. Apple, their process of developing the search engine may be even more prioritized. If Apple wasn't compensated billions of dollar annually making this agreement, they might have prioritised the development of the search engine even earlier as well. Also, if users started using Apples search engine, this would mean less scale for Google.

Historically, Google quickly has adapted new areas of entry for Google Search as they appear. Their acquisition of Android in 2005 enabled them to implement Google Search on the mobile OS from the start, as Android became open-source in 2007. As Google owned the mobile OS themselves, they could greatly affect what software to bundle with Android. 14 years after Android was made open-source, Android has a 60 percent market share in the US. Although Google over the years has been forced by regulation to give manufactures more options in what software to bundle with Android, the business practice of having many Google's services as a default still remains. But Google owns Android, so why shouldn't they be allowed to choose what software to bundle with their own mobile OS? The Microsoft v. US case from 1998 is clearly similar to this situation. Microsoft lost the case, and had to change its bundling of Internet Explorer as the judge ruled that Microsoft was breaking antitrust laws because of making Internet Explorer default on Windows, and making bundled apps hard to delete. Because of Google's market shares today in the general search engine market, it is not unreasonable to assume that Google needs to keep on changing their Android-policy making Google applications easier to uninstall, making competitors services more available.

6.2   Which factors are the most important to succeed in the general search engine market?

In chapter 4.1.2 during the analysis with Porters Five Forces, it was made clear to me that there are many barriers of entry to the general search engine market. One may argue that one of the biggest challenges for a general search engine that wants to be a real competitor to Google Search is access to *scale.* As Google Search receives billions of queries on their search engine every minute, the algorithm keeps indexing the web and fine-tuning every search result that is entered in the engine at all times. For a competing general search engine to stand a chance against a search engine of Google Search's size, it must gain adequate scale. As users access

search engines on different devices, for example on a computer or a smartphone, the search engine needs to attract a substantial amount of users in several markets. On a computer the main access point is a web browser. On a mobile device, there are several access points, depending on the device and the operating system. Mutual for both these markets, mobile and desktop, is that Google has exclusive agreements with manufactures and firms, making Google Search the default search engine.

One of the main issues with Google Search being the default general search engine on so many entry points is that many users don't know how to change the default. Some users doesn't even have know that it exists alternatives. To understand how, a more relatable example may be of help; Let's imagine a classic American super market. In this super market they sell a wide range of products, from cereal to fresh foods. This super market has an agreement with one of the biggest corporations in the world, Nestlé. Nestlé is paying the super market billions of dollars every year, to ensure that in the cereal-section, only Nestlé's product are present. Any other brand, like Kellogg's, is not present. As a customer arrives at the cereal-section, he or she picks a cereal from the shelf, not really thinking about the fact that Nestlé was the only brand to choose from. Another customer might raise questions upon arrival, and ask one of the cashiers where the other brands are at. The cashier tells the customer that other brands are available, but in the back room, only accessible if you know where to find it. This example is comparable to the issues with a dominating search engine being installed as a default. A user might want to change the default search engine, e.g. on a smartphone, but with minimal technical skills this might end up being a difficult task. In other words, it is crucial for a search engine to succeed in the market that the users know about its existence, hence another important factor to succeed in the general search engine market is *awareness*. Most people have heard about Bing and Yahoo!. But if you ask any person on the street to name two more search engines than that, I bet most of them would have a hard time coming up with names. Personally, I had never heard of DuckDuckGo before starting working with this thesis, although it is the fourth biggest general search engine in the US (and amongst the top five most popular general search engines in most countries). So why does this lack of awareness exist? To answer that it may helpful to look into the European market.

European antitrust has, just like US antitrust, constantly evaluating big tech companies like Google, Microsoft and Facebook for years. As presented in chapter 2.4.2, the European Commission has been handing out multi billion fees to Google in the past decade. Some say that the EU are biased in fining American tech-giants, but there is no data backing that up. As a consequence of the European Union's antitrust-work, Google have made several changes to their products in Europe. Some of the latest changes, is that Android users in Europe now are faced with a choice upon configuring their Android-phone. Users now get two choice-screens; One for

choosing their default web-browser, and one for choosing their default general search engine. In my opinion, this is a move in the right direction regarding competition in the general search engine market. When a Android-user now is presented with a choice-screen to choose a default search engine, awareness of general search engine competitors to Google Search is raised, hence potentially increasing the competition in the general search engine market.

But increased awareness of Google Search's competing general search engines is not the only consequence of the European Union fining Google on several occasions. It also contributes to search engine users awareness of *trust* and *quality*. A result of Google Search being the monopolist in the general search engine market for several decades is most people's conception of both the quality and trustworthiness of the search engine. In terms of quality, we know for a fact that Google Search is the biggest search engine with the most powerful web-crawler on the market. But can users keep trusting that the search results that are delivered to them through Google Search, are the most relevant and best search results? When Google introduced advertisement on their SERP, they made sure that search results were displayed in a way that users easily could differentiate between paid results and ads, and organic results. In recent years, it has become harder to differentiate ads from organic results. How this further evolves, remains to be seen, but if Google keep moving their SERP in a direction were users feel they don't trust the results as much as they did before, they may be inclined to look for alternative general search engines. In other words, Google may ultimately through their own business practices actually move users over to competitors, hence increasing competition in the general search engine market. Especially if Google keep getting fined for tempering with search results, users conception of Google Search's quality and trustworthiness may change.

6.3   Concepts that can increase competition and innovation in the general search engine market

In chapter 4.1.2 an analysis using the model of Porters Five Forces was conducted. One of the forces in Porters model is the *threat of new entrants.* In the analysis this force was concluded to be low, meaning that it is less likely that new entrants in the general search engine market provides a real threat to the established general search engines on the market. One of the most important factors of a new entrant most probably having difficulty succeeding in the general search engine market, is the huge investment a company must make to build and develop a fully functional search-engine. To build a web-crawler capable of indexing the internet and delivering valid and high quality search results to a user, not only requires capital and labor, but it also requires a high level of expertise as the development of such a service is an incredibly complex task. This also takes into account that making a web crawler

and a general search engine is a lot easier today than 20 years ago. Cloud computing
enables companies to do maintenance on infrastructure that would have been nearly
'impossible' 20 years ago.

6.3.1 Virtual General Search Engines

To lower the barriers of entry for an entrant in the general search engine market,
potentially increasing competition and innovation, the concept of Virtual General
Search Engines was introduced in chapter 5. With this concept, a company that
wants to enter the general search engine market, can lease the necessary infrastructure
and services in order to offer their own general search engine. This enables new
entrants to focus on other areas of business, like *differentiation* and *innovation.*

Lowering the barriers of entry through the concept of Virtual General Search
engines it is reasonable to believe that more competitors would arise on the market.
What the most important factors for a search user when picking a general search
engine is relevant to what areas a business should focus. For example, to a growing
number of users, privacy matters. If more users knew they had an option not to sell
their personal information online to a company like Google, which use this data in
advertisement, a lot of users most probably would be open for a change. DuckDuckGo
has this as their main business model; No collection and reselling of data on their
search users. As the concept of Virtual General Search Engines are presented, a
comparison to the Mobile Virtual Network Operators is drawn. If a user today is
trying to decide on which mobile network operator to choose, him or she has a lot of
choices. In terms of which radio-networks to choose, the options are less limited, as
there are only a few mobile network operators that have their own infrastructure
in each country. This means that user might have landed on two alternatives to
choose as their mobile operator: The first alternative is Big Brother, and the other
alternative is Little Brother. Little Brother is a virtual mobile network operator,
and they get their wireless network infrastructure from Big Brother, who owns and
have built their own infrastructure. This means that the customer gets reception
based on the same infrastructure, but the two mobile network operators may provide
different services and prices. This could also be the case for Virtual General Search
Engines. Most general search engines today does not require payment to use. But
most search users are actually paying for the use of the search engine through selling
their personal data to the search engine company who sells it to advertisers. The
concept of Virtual General Search Engines may motivate companies to provide users
with new ways of payment. The may also add services on top of the search results
that are being provided to them.

6.3.2   Limitations and challenges

One challenge with Virtual General Search Engines using established general search engines web-crawler is scale. For example, if a virtual general search engine is leasing Google Search's web-crawler, Google Search will gain more scale as users query the virtual general search engine. The virtual general search engine provider may develop an algorithm that sorts the search results received from Google Search, and deciding how the data is presented. As more data is queried, both Google Search's and the virtual general search engine's algorithms, can process the data, improving the search engine and increasing scale. In other words, the way I see it, the general search engine that provides the services, will always gain at least as much scale as the virtual general search engine, at a minimum. How these dynamics could develop over time has not been further investigated in this thesis.

As mentioned in chapter 2.4.2, Google Search was fined by the European Commission for manipulating search results on Google Search's SERP giving advantage to its own comparison shopping service. Other general search engines have also been criticised for delivering biased search results, affected by factors like politics and economy. An advantage with a Virtual General Search Engine is the possibility to combine search results from various web-crawlers. How the search results are presented on the SERP is still up to the Virtual General Search Engine, which also obviously can present biased search results. Focusing even more on the trust from general search users, may a point of differentiation for a Virtual General Search Engine.

The presentation of Virtual General Search Engines in chapter 5 is only a touch on the surface of the concept. In order to make the concept a reality, a huge amount of work and resources is needed. The fact that antitrust laws and politics differ in each country, makes the process of realising the concept even more challenging. Cooperation across wide areas of expertise, like politics, economics, law, technology and engineering is needed. This thesis only gives a brief overview of the technical and business-related part of the concept. There is also numerous ways to solve and develop the concept, where only one suggestion is presented in this thesis. Further research and work on the concept needs to be conducted, in order to conclude on whether or not it is a sustainable business model that can create value in the future.

6.3.3   Stricter regulation of antitrust in the US market

With its antitrust-practices, Europe has come a longer way when it comes to regulating the general search engine market for increased competition than the US. The European Union's fines against Google, forces Google to change a lot of its business practices, allowing for an potential increase in competition in the market. The choice-screen that Android users in Europe now are presented with upon initialisation of an Android

smartphone, is something that should be implemented for American Android-users
as well. In fact, a choice-menu to choose the default search engine should have been
standard on most access points, including web-browsers, smartphones, smart-speakers,
voice-assistants, smart TVs and so forth. If users are presented with a choice upon
initialisation of software, their awareness of competitors will rise, potentially leading
to an increase in competition in the general search engine market. This may be
especially important for emerging search access points, where Google can enter new
agreements with distributors. The emerging access points, such as internet-enabled
smart devices, represents the next generation of search platforms.

Chapter 7
Conclusions

This thesis has considered how Google's business practices impact innovation and competition in the general search engine market. Research questions inspired by the US Department of Justice's 2020 complaint against Google have been stated, and following a qualitative research method, these questions have been addressed.

Based on a literature review on relevant topics, a techno-economic analysis of Google Search has been conducted. The results of the analysis made it clear that it exists high entry barriers for a general search engine entering the general search market. For research question 1 I conclude with the following: As Google Search is the dominating general search engine on the market, it is associated with a strong brand delivering high quality search results, and most users will therefore consider Google Search as the best choice no matter the available options. However, Google paying manufactures billions of USD annually to make Google Search the default search engine on important access points is a business practice that results in users being less aware of the existing alternatives, ultimately resulting in reduced competition and innovation in the market. At the same time Google has been force to change some of its business practices after being regulated by the European Union. Although it is early to conclude the effect of the introduction of Android-choice screens, I believe that this change in business practice will increase competition in the market over time. Another outcome of the antitrust allegations against Google, is that more people may be aware of the quality that Google Search delivers. Google making ads look more like organic results, and choosing to manipulate the search results on their SERP, are business practices that, if continued, will weaken search users trustworthiness of the search engine, ultimately making them look for alternatives and increasing competition and innovation in the market.

As for research question 2 I have found that being visible and making search users aware that they can change the default general search engine, and introducing them to alternatives to Google Search, is one of the most important factors for success in the general search engine market. Another important factor for a general

search engine to succeed in the general search engine market is access to scale. A consequence of Google dominating the market, and being the default search engine on a number of access points, is the major scale Google get. Every day Google's search engine uses the queries entered on the search engine, to improve its search results. If a competitor could gain adequate scale, its chances of success in the market would drastically increase.

Conclusively, for research question 3, Visual General Search Engines have been introduced as a concept to potentially increase competition and innovation in the general search engine market. The creation and development of a search engine represents high barriers of entry, so a business model where a virtual general search engine can surpass these barriers of entry, but still offer their own search engine to the public is very promising. This allows for virtual general search engines to more easily focus on innovation in order to differentiate themselves from already established general search engines, thus including more competitors on the market and potentially increasing competition. Although regulation of antitrust in digital markets is no new thing, it can be seen as a concept for American antitrust lawmakers to draw inspiration from the EU and how regulation in Europe may lead to an increase of competition and innovation in the market over time. Regulators in Europe are leading the way in terms of antitrust law, and are not afraid to take action, and fining companies like Google with record-high fines, making companies like Google changing their business practice, ultimately leading to an increase in competition and innovation in the general search engine market.

7.1   Further work

As this master thesis include a wide specter of topics, further work may be conducted in several areas.

Virtual General Search Engines

In this thesis, only the surface on Virtual General Search Engines has been scratched, and a more detailed research and development of the business model are needed. Suggestions for further work is a more detailed suggestion of a potential business model, including how the concept might work in the market and how a business idea like this may affect the economies of leading tech-companies like Google and the market in total.

The effects of antitrust law being practiced

Google having to make changes to their business practices as a result of antitrust law being practiced in the general search engine market is interesting to see the effect of. Are the changes that Google has to make actually increasing competition and

innovation in the general search engine market over time? Or will companies like Google just find new way to dominate its areas of business?

Structural separation of Google Search

Although mentioned in the problem description, a structural separation of Google Search has not been conducted in this thesis, but is highly interesting in terms of investigating whether such a change would increase competition and innovation in the general search engine market. How would the market look before and after a structural separation where for example Google Search and Google Ads are divided into two different companies?

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