// NO.20-035 | 07/2020

DISCUSSION PAPER

// MARTIN PEITZ

Economic Policy for Digital Attention Intermediaries

Leibniz Association

ZEW

Economic Policy for Digital Attention Intermediaries[1]

Martin Peitz
University of Mannheim, MaCCI, and ZEW

June 2020

Abstract: This report provides an overview on the economics of attention intermediaries. It addresses the following questions: What are the economics of attention intermediaries? For competition policy, how should markets be defined and market power of attention intermediaries be assessed? What theories of harm in merger control and abuse of dominance possibly apply to attention intermediaries? The report also touches on consumer protection policies and other regulatory issues.

Keywords: Attention intermediaries, platforms, market power, regulation, digital markets.

[1] This report has benefitted from the author's discussions with Serafino Abate, Alexandre de Streel, and Giorgio Monti. It has been commissioned by the GSMA but prepared in complete independence. The views expressed in this report are attributable only to the author; they do not necessarily reflect those of the GSMA or any of its members.

Table of content

Executive Summary

Digital attention intermediaries engage consumers to spend time on their platform. Consumers are valuable because they make payments to the platform or because their attention and the data that come with them are valuable to the platform for other reasons. In particular, content providers and advertisers are keen to attract consumers and may therefore be willing to pay the intermediary to get access to consumer attention.

Attention intermediaries compete for the time consumers spend on their platforms. If intermediaries monetize through advertising that consumers regard a nuisance, competition between attention intermediaries benefit consumers as the result of attention intermediaries reducing advertising volumes and improve content offers. They may also make advertising less intrusive. However, when a consumer's attention span is limited and attention becomes a scarce resource, society may be better off if fewer attention intermediaries control this resource. To assess the effect of competition between attention intermediaries effects on other markets may need to be considered. In particular, with multiple attention intermediaries it may be excessively costly for a seller to deprive competitors of the consumer's attention. Then more concentration among attention intermediaries tends to be bad for consumers as lack of seller competition drives up retail prices. Similarly, for a given number of attention intermediaries, if more and more consumers dedicate their time to only one of them for some type of activity (e.g., maps when navigating through town or a personal digital assistant when shopping from home), it becomes less costly for established sellers to deny competitors access to consumers.

Of particular concern to competition authorities are attention intermediaries with market power. Market power may be due to merit, luck, or through anti-competitive practices.

An attention intermediary may deliver superior or differentiated services to its users and therefore be in a stronger position than its competitors. It may neutralize a weaker position in some dimensions by imitating features developed by others; that is, it learns from others and adjusts its offerings. Users on one side may also see the service as superior to competing offers simply because there are more (of the right set of) users on the same or the other side. This may be due to investments in services offered to users on the same or the other side. All these sources are based on merit. Market power may also be due to users coordinating on one platform and not on another platform. If an attention intermediary achieved coordination for example through costly advertising, then this constitutes a sunk cost. This may include an element of luck due to being first on the market or due to name recognition that leads to user coordination. A competing intermediary with a superior offer then incurs an extra cost to achieve coordination on the new or less-known offer.

When attention intermediaries have successfully locked-in some users, the associated consumer switching costs constitute a source of market power. Consumer lock-in is of particular concern, if consumers are myopic. Behavioral biases including myopia can contribute to the market power enjoyed by an attention intermediary.

Economies of scale, within-group and mutual cross-group network effects are often automatically associated with market power. This however shows a misunderstanding of their role in market competition. While it is correct that economies of scale and positive network effects tend to lead to more concentrated markets—in the sense that only one or few attention intermediaries serve most of the market—competition may still be very intense and margins low or even negligible. An important concern and a reason for markets to be less competitive is that users do not easily coordinate, possibly because users do not frequently revise their usage decisions; because they sign long-term contracts; or because they have switching costs.

Barriers to entry are at the core of establishing persistent market power since they protect incumbent firms from future competition. In their assessment of market power of an attention intermediary, competition authorities should therefore focus their efforts on identifying current and future barriers to entry.

Barriers to entry arise from user miscoordination and may give rise to an incumbency advantage. A strong market position is often the result of positive within-group network effects or, on multi-sided platforms, positive cross-group network effects or economies of scale. In markets with such characteristics, competition then leads to a "winner-takes-all" structure. Once an intermediary has obtained such a position, strong customer loyalty can develop in such markets. This may be complemented by the ability to easily collect and process large volumes of data generating demand-side or supply-side economies of scale. This applies in particular if the quality of the service offered to consumers or the cost of its provision depends not only on present but also previous consumer behaviour. The corresponding data are available to the incumbent intermediary. This constitutes an incumbency advantage in case they cannot easily be replicated by an entrant. Thus, consumer loyalty and data-related economies of scale lead to barriers to entry. However, attention intermediaries entering the market with strong established positions in adjacent markets (e.g. related services or other geographic markets) may not face such an entry barrier.

In merger control, following the effects-based approach, the competition authority has to assess the future anticompetitive concerns and efficiency gains of a merger and to use some probabilistic assessment to make a case-by-case decision whether to block a merger. Here, the authority (and eventually courts) face the challenge that probabilistic assessment that are hard to verify not only ex ante but often also ex post. Adjusting practice to account for severe long-term harm to society which however may be a rather low-probability event, would require that authorities and courts do not need to show that harm is a likely event, but that the expected harm in consumer welfare exceeds expected benefits. In its merger evaluation the authority should try to rationalize the acquisition price. If it can only be explained by higher rents arising from a lessening of competition this is a strong indication that blocking the merger is the right thing to do.

A merger investigation may focus on the removal of a potential competitor. The general point is that entrants may limit the market power of incumbent dominant platforms if the latter cannot simply acquire the latter. This provides an argument to adjust merger control to prohibit some mergers even though, in the short term, the involved firms offer independent or complementary services. When these firms are likely to become actual competitors if they stayed independent, the merger may well be anticompetitive in the long term.

A few attention intermediaries dominate large ecosystems. If a horizontal merger involves such a "systemic" firm, the presumption could be made that the merger is anti-competitive. The authority then needs to be receive evidence of sufficient efficiency gains from the interested parties in order not to block the merger. The natural competition law response to a presumption of harm is a reversal of the burden of proof. Since the merging parties propose to change the market structure in an environment with competition concern, it is then up to the merging parties to document likely efficiency gains from the start. If these are not credible or deemed insignificant, the merger can be prohibited without detailing the anti-competitive effects. Otherwise, efficiency gains have to be balanced with expected anti-competitive effects.

Attention intermediaries that possess market power may abuse this power for exclusionary or exploitative purposes. To make the case against certain behavior, both a convincing theory of harm has to be put forward and has to be weighed against any efficiency defense. Established theories of

harm may apply also to attention intermediaries. However, due to their particularities novel theories of harm may need to be put forward, which capture the way attention is allocated and how it is monetized by attention intermediaries. This applies to novel contractual practices, but also holds for practices known in other sectors if they play out differently.

A pressing concern are conglomerate issues: An attention intermediary which controls an ecosystem may allow innovative offers by newcomers to be tested in its ecosystem, but may block access to attention if the newcomer does not accept the terms imposed by the intermediary or may effectively block the newcomer and provide a substitute itself.

Consumer protection regulation can address market failures related to asymmetric information and behavioural biases. Sometimes consumer harm only occurs in markets in which firms have market power (or is aggravated through market power) and, thus, can also possibly be remedied by competition policy instruments. Some other times, consumer harm is the outcome even absent market power and, thus, competition policy instruments do not have any bite.

Consumer protection aims at protecting consumers from being exploited for their lack of information or limited cognition. However, attention intermediaries may expose attention providers to important externalities, for example in the case of big data and personalization. In this case, certain business practices may make society worse off even with fully informed and fully rational individual consumer giving their consent. Regulation may impose ex ante restrictions regarding certain business practices.

Society may be concerned with how individuals process some types of content and therefore impose restrictions, e.g. for violent or sexually explicit content. This also applies to content considered to be hate speech. Another issue has been the protection of minors, which, in an on-demand world, has become more difficult to address than in the traditional linear programming world. Attention intermediaries may bear certain obligations in this context.

1. Introduction

Welcome to the world of attention intermediaries. As Jonah Weiner in the New York Times Magazine puts it, "the dominant force driving TV in the Netflix age is the same one driving social networks, video-sharing platforms and online publishers: the relentless pursuit and monetization of our attention."[2] Viewers spend time on content in return for paying a subscription price, a price per view, or for being exposed to advertising.[3]

The first two decades of the 21st century has seen the emergence of a few large international players on the internet that have affected the life of billions of users. These include Alphabet (owning Google Search, Android, and Youtube among others), Facebook (also owning Whatsapp and Instagram), and Amazon. While their business models are different, they all have in common that that they use large volumes of data to channel the attention of consumers to services or products provided by others and sometimes provided in-house.

The original model of Amazon was that of a digital retailer. It consisted in recommending products stored in Amazon warehouses to a consumer based on her search queries and the data collected by Amazon on this consumers and others.[4] With the launch of its market place, Amazon was able to increase the set of offerings (in particular, expanding the set of products) and thus also to recommend products that it did not keep in stock itself (or stocked on behalf of others). Again it uses consumer data to help consumers find products they might be interested in buying. When selling through Marketplace, instead of earning the retail margin Amazon obtains revenues from charging listing and transaction fees. Amazon is an attention intermediary delivering attention to sellers (and its own vertically integrated offerings) that consumers use typically actively (i.e., users go to Amazon with a purchase intent). With its Amazon Prime offer, Amazon is reaching out to consumers offering them to stream music and films.

Alphabet provides in particular the Google Search engine. This search engine provides two types of listings, the so-called organic search links and the so-called sponsored search list.[5] Organic search links are a service that is provided for free to the provider of the link and also free to the user entering the search query. By contrast, sponsored search links are auctioned off to interested parties at a high level of granularity, allowing for a highly targeted audience being reached by the provider of the link. The business model of the Google search engine can thus be described as a multisided platform that makes revenues from parties advertising on the sponsored search list. Google is an attention intermediary that consumers use actively (i.e. users enter search requests to collect information, to obtain entertainment, or to purchase a product or service).

Before developing a monetization model, Youtube (now owned by Alphabet) was a two-sided platform with providers of user-generated content on one side and viewers of this content on the

[2] Quoted from Jonah Weiner, "The great race to ruling streaming TV", New York Times Magazine, July 20, 2019.
[3] For an empirical analysis of online viewing behaviour using U.S. clickstream data in the period of 2008-2013, see Boik, Greenstein, and Prince (2016). In this period of changing offers, they find that viewing behaviour is remarkably stable with respect to how much attention viewers dedicate to online offers and how they allocate their attention.
[4] Much of the focus in understanding the success of Amazon is the focus of its interaction with consumers. This is also key in our focus on attention markets. Another success factor is its investment in logistic capabilities (which partly also rely on data and their analysis, e.g. to predict how many unit of a particular product to keep in stock).
[5] Recently, Google added information to certain search queries that it provides without the need to click on a particular link.

other.[6] Later Youtube added a third side for monetization purposes; that is, Youtube charged advertisers for embedding ads in a video and thus consuming some of the attention of consumers.[7]

Facebook is a social network that allows users to interact with other users, in particular, to share experiences and opinions. Users do not make monetary payments for this service. However, together with user-generated content, Facebook allows advertisers to reach consumers through multiple channels. In particular, Facebook allows for highly targeted advertising that appears together with user-generated content. This targeting is possible thanks to the data Facebook collects about its users. In this case Facebook is an attention provider that consumers use passively (i.e. they have a demand for user-generated content and their attention is partly diverted to advertisers). Advertisers may also attract the users' attention if users become followers of a particular brand or seller. In this case, users take a more active role in soliciting advertising and offering advertisers the opportunity that users interact with the brand. Instagram follows a similar business model, and it is still too early to judge how big advertising will figure on Whatsapp.[8]

The success of Amazon, Facebook, Google, and other attention intermediaries is directly linked to the users' limited attention. Attention is limited in two ways. First, by nature, the amount of available time of a consumer is limited. An attention intermediary who monetizes a consumer's attention then benefits from a user spending more time on its platform.[9] Second, not all the stimuli a consumer receives are valuable to the sender. In particular, if an attention intermediary obtains revenues by selling advertising to sellers, these sellers compare the cost of posting an ad to its expected benefit which goes down if some consumers do not pay attention to its ad or after the seeing the ad do not react because they do not process all ads.

Limited attention is not specific to the 21st century. As Herb Simon famously put it,

> *"[i]n an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it." (Simon, 1971, pp. 40-41).*

The rise of mass media can be seen as the rise of large attention intermediaries. To the extent that these mass media rely largely on advertising revenues, their revenue model resembles the one of Facebook, as they provide content together with advertising. They attract users mainly through

[6] Arguably, there was some overlap between the two sides, as people could upload self-produced videos and watch other videos as well.

[7] This is a very simplified version of the Youtube's business model as it is. In particular, Youtube pays content providers depending on the popularity of their content. Also, Youtube allows for sponsored videos. More recently, Youtube introduced an advertising-free subscription model (for videos and music).

[8] Facebook announced that ads will appear on Whatsapp starting 2020. See, e.g., Anthony Cuthbertson, "Whatsapp: Adverts coming to messaging app next year, Facebook reveals," The Independent, May 28, 2019, https://www.independent.co.uk/life-style/gadgets-and-tech/news/whatsapp-adverts-update-new-advertising-when-a8933131.html

[9] Our definition of attention intermediary is one of focus rather than as being part of a classification of different intermediaries. For this reason, we also refer sometimes to shopping portals that bring together buyers and sellers as attention intermediaries. These intermediaries also compete for the attention of buyers and often do not charge buyers directly. However, these shopping portals often provide little value to buyers other than enabling buyers to find products they like at prices they are willing to pay. Shopping portals can however be embedded in an environment that provides additional value to consumers. In this case, the shopping portal becomes an attention intermediary which also provides a content or service beyond its matchmaker function.

content and divert part of the attention to advertisers.[10] Even shopping malls can be seen as attention intermediaries, as they lure potential shoppers into the mall partly as a safe, well-tempered place to stroll around and partly because of the offers made by sellers, which constitute the other side of the platform. The sellers pay to the shopping mall because it delivers the attention of potential shoppers.[11]

The success of Amazon, Google and Facebook (among others) can be attributed to their ability to scale up their operations to satisfy many needs of many consumers. This scale allows them to spread investment cost over a large number of consumers, to deliver attention at a very granular level that is appealing to sellers or advertisers,[12] and to create less nuisance or even benefits to consumers. They can thus be seen as master attention intermediaries. Other attention intermediaries make more specific offerings, which, however, absorb a large fraction of time of a group of attention providers. This includes travel intermediaries such as Booking and Expedia; entertainment intermediaries such as Netflix (audio-visual content), Spotify (audio content), and League of Legends (a particular gaming site); and dating sites such as Tinder and Meetic.

Attention intermediaries have to make decisions regarding the degree of vertical integration of content and their monetization model. There are many digital intermediaries big and small operating as attention providers for some parties which want to sell a product or service and users who are interested in products or services provided by the digital intermediary itself or by other parties. Apple provides its own ecosystem in which it offers music and video. Apple and Amazon have started to be partially vertically integrated by producing their own content. Similarly, Netflix started as an intermediary between content providers and viewers. Regarding their entertainment offers, these three do not follow an ad-financed business model and instead rely on subscription fees (they also possibly monetize data they collect from consumers). Others do not take a clear stance on their preferred monetization model or favor the ad-financed monetization model.[13] For example, Spotify has a subscription service (i.e., consumers pay a monthly subscription fee) and a "free" ad-financed service among which consumers can choose. Youtube used to offer only a "free" ad-financed service, but recently it has introduced a subscription service. Traditional media players who used to offer linear program are entering the streaming world. Disney has launched its fully vertically integrated and ad-free streaming service Disney+. Since it has neither advertisers nor independent advertisers on board,

[10] Whether consumers like or dislike advertising is context-specific. For instance, there is empirical evidence that readers of fashion magazines seem to enjoy the ads and people are looking forward to seeing the ads during the Super Bowl, while on average consumers dislike advertising on television, radio, as well as audio and video streaming platforms. With advertising becoming more targeted, on the one hand users may see advertising less of a nuisance because it is targeted towards their interests. On the other hand, at least some users may see advertising more intrusive disrespecting their private sphere and for this reason dislike it more. In the end, it is an empirical question to be raised in each context whether consumers tend to like or dislike the exposure to advertising or sellers. Clearly, a platform has multiple ways to affect this channel and thus the assessment may well be platform-specific and not just depend on the format in which content and advertising are presented. If consumers like advertising, there is a positive feedback channel between consumers and advertisers. If they dislike advertising, there is a negative feedback channel and thus a negative indirect network effect.

[11] This view is in contrast to Wu (2019) who claims that there is an important difference between attention merchants and two-sided platforms such as shopping malls. One may argue that the former provide bundles of content and advertising, whereas consumers go to a shopping mall simply to be exposed to the offers by different shops. However, shopping malls have also created "content": people come to see the end of season decoration, listen to some life music, etc. In any case, all these intermediaries sell some of the consumers' time or attention to advertisers or sellers.

[12] This allows advertisers to address consumers with specific characteristics selectively and arguably reduces entry costs for new products with a narrow target group. Also, it opens up the possibility for advertisers to experiment so that they better learn about the effectiveness of advertising.

[13] Ad-financed versus subscription-based (or possibly a combination of the two) monetization models by digital players correspond to the different monetization models used in traditional media.

it does not run a multi-sided platform. However, the functioning of its recommendation algorithm relies on being fed with lots of user data. Thus, Disney+ strongly relies on a sufficiently large network of users, which sets it apart from the traditional linear programming on television. Other traditional media giants have their own offers (in the U.S., HBO Now, Showtime, CBS All Access). All these players, old and new, vie for the attention of consumers.

The fight for consumers' limited attention has a long history. Newspapers appeared in Europe in the 16th century. They noticed that by including advertising they could revenues and keep the price per copy charged to readers low. Complaints about advertising appeared early.

> *"Advertisements are now so numerous that they are very negligently perused, and it is therefore become necessary to gain attention by magnificence of promises, and by eloquence sometimes sublime and sometimes pathetic." (Samuel Johnson, in The Idler, issue 40, January 20, 1759)*

A market place that allows sellers to temporarily set up shop or a trade fair that allows exhibitors to showcase their products can be seen as attention intermediaries. Being hidden in a dark corner instead of close to the entrance may make a seller struggle to reach the attention of consumers. Thus, what may be perceived to be an unfavorable listing on a portal corresponds to the dark corner in a trade fare. Branded manufacturers' products occupy shelve space and some parts of the shelf attract more attention than others. Marketing practitioners have assessed the value of products being placed in a particular part of the shelf relative to another. Particular locations in a shop receive a lot of attention (e.g. shelves close to the checkout). Shop managers experiment with how to allocate shelf space and ask brand manufacturers to pay for preferential treatment. This resembles for instance sponsored listings by hotels on Expedia who appear at the top of a search.

What is new in the digital world is that few attention intermediaries are prominent for a large range of activities. In particular, some of them are the natural starting point of many online activities (e.g. Apple, Google, or Amazon) and others provide platforms on which consumers spend a lot of time (e.g. Facebook/Instagram or Youtube). This prominent role can be measured by the amount of time consumers stay, by the number of daily visits, and, in a way, by the market valuation of the companies behind these offers.

An important part of revenues obtained by Facebook and Google is through advertising and both leave a large footprint in digital advertising markets.[14] The overall market for internet advertising has been growing steadily over recent years reaching 55 billion Euro in 2018.[15] This is testimony of the growing importance of digital attention intermediaries for sellers to reach out to consumers. Amazon obtains revenues by taking a cut from the sellers who sell via its Marketplace. While these numbers do not appear in the advertising numbers, they also give evidence of the central role of Amazon as an attention intermediary: It sells consumer attention to the sellers of its Marketplace.

This report provides a framework to think about attention markets. It points to potential market failures that are partly remedied by attention intermediaries. It contains a discussion how to apply competition law to attention markets and points to its limits. In particular, other areas of law (consumer protection law, business law) are better suited to address failures not associated with

[14] See, e.g., ACCC (2019). For a discussion of the functioning of digital advertising markets and guide to the marketing literature about inefficiencies due to problems of measuring ad effectiveness and ad fraud on the advertiser side, ad blocking on the consumer side, conflicting interests among players in the value chain of advertising markets, see Gordon et al. (2019).

[15] See IAB Europe AdEx Benchmark 2018 Study.

market power. For this purpose, sector-specific regulations need to be developed or broadened in scope.

2. Markets for attention and their masters

2.1. Value creation and value capture around attention

Attention intermediaries provide "content" to users. This content is produced in-house, by third parties, or a mix of the two. These third parties may be for-profit content providers or they may be individuals who do so for non-monetary incentives.[16] The attention intermediary who bundles content with advertising has to decide whether and how to compensate third-party content providers. It also decides whether and how much to ask for from viewers (pay-per-view and subscription prices are possible); furthermore, it decides about the advertising rate charged to advertisers or it decides about the advertising level and auctions off ad slots.[17] While consumers often do not make any monetary payment to these intermediaries, consumer attention is essential for the intermediary to obtain revenues (possibly not shortly after the launch of the platform but at least after a while). Thus there is a market in which services provided by the intermediary (by the intermediary itself or third parties on the intermediary's platform) are exchanged for consumer attention. Intermediaries monetize this attention in a different market, in particular, by providing listing services to sellers of content for which they charge in form of listing or transaction fees (e.g., by charging a listing fee or extracting a revenue share) or by charging advertisers (e.g. by charging a pay-per-impression or a pay-per-click fee). Monetization may be delayed if an intermediary strives for increasing its user base. Initially, intermediaries may not even know which revenue model to follow. Intermediaries may also collect and use data to provide other services to consumers, sellers, or other parties.[18] Different revenue models may coexist in an industry. In some cases, intermediaries allow users to pick the channel through which revenues are generated. As mentioned above, Amazon offers premium and additional services to subscribers through Amazon Prime, thus directly charging Amazon Prime customers; Youtube offers subscription for advertising-free video streaming as an alternative to the "free" advertising-financed offer. Such contract offers can be used by the attention intermediary to discriminate between those consumers who are very averse to advertising and others who are less so.[19]

No matter what the revenue model, these businesses feature network effects, which may be direct on the consumer side because, for example, users care about the fraction of friends subscribed to a social network or indirect arising from mutual positive cross-group network effects between

[16] There is no sharp dividing line. Take content provision on Youtube. Some Youtubers started by uploading videos for fun and only later became professionals. Others do not intend to make a living from it, but provide niche content to earn some pocket money.

[17] Wu (2019) claims that an additional pricing decision by the attention intermediary is to determine the "attentional price", that is, how much advertising to combine with content. However, this is not a separate decision but the "attentional price" is pinned down by the attention intermediary's decision on the type and volume of advertising.

[18] Data may also be used to reduce costs and then become source of economies of scope. For example, Amazon's stocking decisions for its warehouses depend on user data. Consumers may also benefit from this because in addition to reducing excessive stocks, shortages become less frequent leading to shorter delivery times. At a more granular level, Amazon can even put some fast-moving items into its delivery vans *before* these items are actually ordered and, thus, allow for even faster delivery.

[19] For a formal theoretical investigation, see Zennyo (2020).

consumers and sellers.[20] An example of the latter is the success of Amazon Marketplace, which is partly due to the fact that Amazon designed its platform with the key feature that sellers are attracted by a larger number of consumers and consumers attracted by a larger number of sellers. In particular, the latter is not obvious and relies on Amazon being able to guide consumers to sellers that are likely to lead to a successful match. Positive cross-group external effects here arise through the platform design decisions about how informative are recommendations and ratings.[21]

Attention intermediaries are part of a longer value chain. Value creation here often features multiple complements comprising of services, products, and infrastructure. For example, using Google Maps to find your way in the city requires a mobile device (e.g. smart phone) and a functioning internet connection (e.g., via 4G or Wifi). The value that is created is thus jointly created by the availability of infrastructure, products, and software solutions. Such complementarities imply that value creation cannot be meaningfully allocated to a particular layer in the value chain.[22] When we talk of the value created by a particular attention intermediary we then often fail to acknowledge its dependence on products and infrastructure. Value capture, i.e. the ability of a firm to extract part of the value it helped to create, then also depends on the ability of actors in other layers of the value chain to extract value. In particular, if one layer is heavily regulated and prohibited from using certain price instruments, this may benefit firms in another layer. One particular example is net neutrality regulation that limits the ability of internet service providers to price traffic. Net neutrality regulation then has an impact on the revenues generated by attention intermediaries such as Youtube.[23] Having said this, the remainder of this report abstracts from these complementarities by taking products and infrastructure as given.

2.2 Some simple economics of attention markets

Attention markets have particular properties that deserve attention by policy makers. Here we point to three features of attention markets that relate to how competition on these markets plays out. First, attention intermediaries compete for the time consumers spend on their platforms. If intermediaries monetize through advertising that consumers regard a nuisance, a larger number of attention intermediaries benefits consumers, as attention intermediaries tend to reduce advertising volumes and improve content offers. Second, when a consumer's attention span is limited, attention becomes a scarce resource. Then society may be better served if not multiple, but a single attention intermediary takes care of this resource, contradicting the first property that holds with an unlimited attention span. Third, in a very different spirit, with multiple attention intermediaries it may be excessively costly for a seller to deprive competitors of the consumer's attention. Then a higher concentration among attention intermediaries tend to be bad for consumers as they obtain a more restricted set of products and have to pay higher prices. The underlying economics of these features are explained next. Furthermore, we point to attention intermediaries playing the role of recommenders.

Competing for attention

Attention intermediaries deliver material to consumers. This may include in-house content or content that is purchased by the intermediary (e.g. articles or videos posted on ad-financed media portals); it may include "free" content that is selected by the intermediary (e.g. organic search results); it may

[20] For an overview of how intermediaries manage network effects on their platform, see Belleflamme and Peitz (2018b). Relatedly, if sellers compete with each other, intermediaries may also manage the degree of competition on their platform, see Belleflamme and Peitz (2019).

[21] For an overview on the functioning and design of recommender and rating systems, see Edelman (2017) and Belleflamme and Peitz (2018a).

[22] For a detailed exposition in the context of OTT, see Peitz and Valletti (2015).

[23] An economists' introduction to the net neutrality debate is provided by Greenstein, Peitz, and Valletti (2016).

include user generated material (e.g., user generated videos on Youtube or uploaded photos on Instagram or Facebook); and it may include material by advertisers who pay to the attention intermediary for dissemination. Ad-financed attention intermediaries provide bundles of content and advertising; they sell consumer attention to advertisers. Attention intermediaries can make a better value proposition to consumers along several dimensions: (i) reducing the amount of advertising if consumers prefer content, (ii) making the time dedicated to advertising more pleasant, (iii) increasing the expected benefit from the interaction between advertiser and consumer, and (iv) increasing the quality of the content or services that are bundled with advertising.

Whether or not consumers like advertising, depends on the platform design decisions by the attention intermediary. To illustrate that more advertising affects the match quality between offers and consumers consider hotel booking site as an example of a specific attention intermediary. The original business model of hotel booking sites was to match hotel offers to consumer preferences based on some algorithms. However, if different hotels generate different expected profits for the booking site, it has an incentive to distort the order in the recommended list.[24] As recently happened, a hotel booking site may also partly move to an advertising model according to which hotels which pay the extra charge are placed prominently. In such a setting, consumers dislike advertising and less advertising (everything else given) is better for them if more advertising leads to a worse match between their tastes and hotel characteristics.[25]

As an example for dimension (ii), if the attention intermediary makes advertising less intrusive, users' attitude towards advertising changes. As an example of dimension (iii), if attention intermediaries increase the transparency of seller offers and, as a result, allow consumers to obtain lower prices and a better fit, consumers are better off accessing the attention intermediary instead of choosing a direct sales channel. Regarding dimension (iv), consumers appreciate the overall bundle if the content part is of higher quality. Clearly, the attention intermediary's incentives to provide such quality will depend on its monetization possibilities. Thus, limiting the intermediary's ability to raise revenues from advertising through regulatory intervention may backfire, leading to lower quality of the overall bundle and thus to a lower consumer welfare.[26]

Consumers actively searching for a product benefit from more variety on the platform. If the matching service works to the benefit of consumers and is provided free of charge to consumers (while sellers have to pay a listing fee), consumers are actually paying neither directly nor indirectly. In an ideal world, they have to pay very little attention to the different offers because the attention intermediary finds the best match from the consumer's point of view. By contrast, if consumers are interested in paying attention to certain content and this is interrupted by announcing offers from some sellers, consumers actually pay with their attention. A simple measure of this cost to consumers is the time advertising absorbs. However, this may be a too simple metric; for example, it may depend on the sequencing of ads how disruptive advertising is.

To summarize, platforms charge sellers for hosting them or for initiating or terminating some sales.[27] While consumers do not make a monetary payment to the attention intermediary, they may pay indirectly because of their opportunity cost of time; they may also pay in the product market if sellers pass some or all of the fees paid to the attention intermediary on to consumers.

[24] For empirical evidence, see Hunold, Kesler, and Laitenberger (2020).

[25] Since hotels with a bad match should be less inclined to advertise, it is an empirical question whether and to which extent advertising actually delivers a worse match.

[26] Evans (2019) stresses the link between advertising and content provision. However, if a change in the market structure leads to a drop in ad revenues this does not imply that content quality must suffer.

[27] Intermediaries have multiple price instruments at their disposal. They can charge sellers for listing, charge a per-click or per-transaction fee, or ask for a revenue share for transactions terminated on their platform.

In general, the typical revenue model of attention intermediaries is to charge those users who want to attract the attention of another group of users and have their own way of monetizing this attention. If an attention intermediary is ad financed its revenues increase in the number of consumers and the amount of time consumers spend on its platform. If consumers make a discrete choice among different attention intermediaries (e.g., consumers watch one news show and decide which one to watch), attention is exclusive. In this case, all the attention is channeled through one attention intermediary and intermediaries compete for the available number of consumers who are present. With non-exclusive attention, consumers spend some amount of time with an attention intermediary. If consumers are rather similar, attention intermediaries compete for the amount of time each consumer spends on their platforms.

Advertisers can and often do advertise on multiple attention intermediaries. Clearly, if consumers on the different intermediaries generate the same value to advertisers then advertisers who want to advertise on one platform also tend to be interested in advertising on another platform. In other words, advertisers tend to multihome. Consumers by contrast may well singlehome in some environments and, at least some of them, multihome in other environments.[28]

The economic literature on advertising-financed attention intermediaries started with a look at the former environments with advertising as a nuisance.[29] Here consumers consume a bundle of content and advertising (as on Facebook or Youtube). To increase the number of consumers on a platform, the attention intermediary has to offer a more attractive bundle. It can do so by increasing the quality of the different parts in the bundle or by reducing the amount of advertising relative to other more attractive content. Focusing on the latter, this means that if an attention intermediary competes harder to attract more consumers it has to decrease the advertising volume. More intense competition among attention intermediaries then results in lower ad volumes and higher ad prices, which is desirable from the consumers' perspective but undesirable from the advertisers' perspective.[30]

Attention intermediaries are in a particularly strong position if they exclusively give access to attention providers. In this case, the attention intermediary becomes a gatekeeper from the viewpoint of the attention seeker. Many market environments feature heterogeneous consumers. Some consumer tend to consume the services of a single attention intermediary, while other use services from multiple such intermediaries. For example, some people are primarily active on either Facebook or Twitter, while others are active on both. Then matters become more complicated. An attention seeker can reach the multihoming consumers through multiple channel. An ad placed with one attention intermediary becomes a substitute to the ad placed with another. An advertiser is then willing to pay only the incremental value from posting another ad. The more consumers multihome, the less attention seekers are willing to pay for advertising.[31]

An attention seeker (i.e., an advertiser) who purchases impressions on both platforms tends to focus on the singlehoming attention providers. Since these singlehoming attention providers are the main source of revenues for the intermediary, the intermediary has a stronger incentive to cater to the

[28] A large part of the economics literature on two-sided platforms has looked at market environments in which one side singlehomes and the other multihomes. Here, platforms compete for users on singlehoming side and operate as monopolists on the multihoming side; this has been termed a "competitive bottleneck" (see Armstrong, 2006).

[29] The seminal paper is Anderson and Coate (2005).

[30] For a formal investigation, see Anderson and Peitz (2020).

[31] For formal investigations along these lines, see Ambrus, Calvano, and Reisinger (2016) and Anderson, Foros, and Kind (2018). For an overview, see Peitz and Reisinger (2016).

tastes of these singlehomers. Then its decisions which content to provide may be biased in favour of these consumers.[32]

Attention as a scarce resource

Advertisers demand access to consumers' attention. Attention is limited by the amount of time spent with attention intermediaries and by the inclination to actually pay attention to the messages that are sent. If there are multiple attention intermediaries, the intermediary's decision about what to show to consumers depends on the consumer attention span, which is often limited. In some market environments, to reach a particular consumer the advertisers has to contract with one specific attention intermediary, that is, this intermediary is the only intermediary offering the possibility to reach the particular consumer.

To fix ideas, suppose that there is a single attention intermediary and that advertisers do not have other means to reach the consumer. Such a monopoly attention intermediary then has a clear incentive not to overexploit the stock of a consumer's limited attention.[33]

> To illustrate this point, consider the following simple numerical examples in which consumers have an attention span of two units and there can be up to four content offers. If a consumer is exposed to more than two content offers then it is assumed that the two units of attention are allocated randomly. Suppose that content providers generate some gains from trade and that the platform charges these providers for directing consumer attention towards them. The gains from trade of the four offers are 10, 8, 6, and 4 if the respective offers reaches a consumer's attention. In our first example, we suppose that half of that surplus goes to the provider and the other half to the consumer. Thus, the content providers are willing to pay 5, 4, 3, and 2, respectively to attract the consumer's attention. If the platform lists one content offer and sets a price, it can charge 5 and thus makes a profit of 5. If it lists two content offers, it can charge 4 and makes a profit of 8. If it lists three, the consumer is attracted to each content offer with probability 2/3. It can thus charge 3 times this probability, which gives a price of 2; it makes profit 6. Listing four offers performs even worse. This illustrates that the platform does not overexploit the stock of a consumer's limited attention. In this example, also the consumer does best with a listing of two offers because consumer attention is misallocated also from the consumer perspective when more offers are listed.
>
> In the second example, we suppose that the first offer gives a surplus of 1 to the owner of the first content offer and of 9 to the consumer. The other offers give 2 and 6; 3 and 3; and 4 and 0, respectively. This means that while the first content provider is great at generating value, it is bad at extracting it; the opposite holds for the fourth content provider. Listing one unit allows the platform to set a price of 4 and make a profit of 4. Listing two units allows the platform to set a price of 3 and make a profit of 6, which is clearly higher. If the platform lists three offers, each one is seen with probability 2/3. It can then list three offers at a price of up to 2 times 2/3. At this price 4/3 it makes profit 4. Again, it is not in the interest of the platform to overexploit the stock of the consumer's limited attention. However, in this example seller and consumer interests are not aligned. This gives rise to different consumer surplus and total surplus result compared to the first example. If the platform lists two content offers consumer

[32] See Anderson, Foros and Kind (2018).

[33] This presupposes that if too much content reaches the consumer, some valuable content gets lost, whereas some less valuable content reaches the consumer's attention. This is clearly unattractive from the platform's perspective. For a formal investigation, see Anderson and de Palma (2012) and for a textbook treatment, Belleflamme and Peitz (2015). A particular specification how to think about the attention intermediary's rationale is provided in the subsequent two examples.

surplus is 3, while with three offers, it would be 3 times 2/3 plus 6 times 2/3, which is equal to 6. Also total surplus would be higher if three content offers were listed.[34] Consumer and total surplus would be even higher if all four offers were listed. The reason for this very different result is that interests of sellers of content and consumers are misaligned (as well as the interests of sellers and society).

If multiple attention intermediaries have access to a consumer's attention, there tends to be overexploitation in the sense that the amount of content offers exceeds a consumer's attention span. If seller and consumer interests are aligned (as in the first example above), competition among attention intermediaries leads to lower platform profits, lower consumer surplus and lower total surplus.

The view that consumers have a limited attention span then challenges the view that increasing the number of intermediaries is beneficial for society. Advertising volumes may actually increase, which clearly harms consumers and this effect may dominate the benefits from an increase variety of intermediation offers.[35]

By contrast, if seller and consumer interests are misaligned, competition may increase consumer surplus and total surplus. Under competition, the intermediaries overexploit the consumer's limited attention, which is a common property resource from the intermediaries' perspective. However, as demonstrated in the second example above, such overexploitation is not necessarily bad for consumers and society.

Attention intermediaries with competing sellers

Market power of attention intermediaries is also of concern under consumer multihoming if there is competition between sellers. Since consumers multihome, sellers receive the attention if they appear on one of the platforms. Then a firm that posts on all platforms and keeps competitors out can raise its profits. This is in the intermediaries' interest if they monetize on the seller side. Taking consumer decisions and the number of platforms as given, it is then easily understood that markets with all platforms under a single owner perform very different from markets in which each platform is operated by an independent intermediary: With a single owner the strongest seller pays for the attention of consumers on all platforms and weaker sellers are foreclosed. With independent intermediaries all sellers become visible to consumers and prices set by sellers to consumers are lower.

A simple numerical examples may clarify this point.[36] Suppose that there are two sellers offering products A and B, respectively, two platforms, and the consumer side. Advertising slots on the platforms are auctioned off sequentially or as bundles in second-price auctions. If intermediaries are independent the former format applies. After a merger, the common owner can decide which format to choose. Each platforms carries only one ad (with two or more ad slots sellers would bid zero under either format). The monopoly profit with intermediated trade is assumed to be 5 and the duopoly profit is assumed to be 2. Sellers are asymmetric in the sense that seller A does not need access to platform through a platform, e.g., because it is a well-established brand that does not need to advertise to consumers. Thus,

[34] With two offers, total surplus is 10; with three offers, it is 12 (because this is equal to the sum of 8+6+4 times 2/3).
[35] For a formal investigation, see Anderson and Peitz (2019).
[36] The argument is due to Prat and Valletti (2019). The example is inspired by their formal analysis and taken almost literally from Motta and Peitz (2020).

if seller A does not advertise so that seller B obtains advertising slots on the two platforms seller A obtains duopoly profits.

With sequential auctions, we start with the second auction. If seller A won the first auction, the analysis from above applies. Then seller A wins the second auction at price 2. If seller B won the first auction, both sellers will bid zero as it does not matter who wins the auction. In the first auction, seller A obtains 3 if she wins and 2 if she loses. Thus she is willing to bid 1. Seller B obtains 2 if she wins the first auction and 0 if she loses. Thus she is willing to bid 2. Hence, seller B will win the first auction and pay 1; both sellers then bid zero in the second auction. If it is equally likely that platforms 1 and 2 run the first auction the expected profit of each independent intermediary is 1/2.

If the two platforms have one owner, the owner may decide to auction off the bundle of one slot on each platform. Winning the auction gives seller A the profit 5 while losing gives 2. Thus seller A bids 3. Since seller B is only willing to bid 2, seller A wins the auction. She has to pay 2 and obtains a net profit of 3. This implies that the owner of the two platforms will make a profit of 2. With sequential auctions the joint profit of the two platforms is 1 which is less than in the case in which the bundle is auctioned off.

This finding can be interpreted as follows. A merger between platforms (which coordinate their selling of attention) is profitable because it reduces product market competition. The ensuing higher seller profits are partly extracted by the intermediary who runs the platforms. The merger is consumer surplus and total surplus decreasing as it preserves the monopoly position of one of the sellers.

A different reading is that, for a given number of attention intermediaries, if more and more consumers dedicate their time to only one of them for some type of activity (e.g., maps when navigating through town or a personal digital assistant when shopping from home), it becomes less costly for established sellers to deny competitors access to consumers' attention.

Attention intermediaries as recommenders

Attention intermediaries channel the attention of consumers. In a competitive setting, attention intermediaries compete with different bundles of content offers. They also compete in the way they present their content offers to consumers. Traditionally newspapers had to make decisions about the top story on the front page. Editors tried to find the most important story, where importance is often defined by how much attention the story attracts at the newsstand so as to make consumers buy the whole paper.

While traditional media use a one-size-fits-all recommendation system (it makes prominent certain stories, less prominent others, and disregards yet others) that is often based on decisions by humans of what is more relevant, many digital players have delegated recommendations to algorithms that provide personalized recommendations. To provide useful personalized recommendations, a platform needs to make predictions on what a particular consumer is likely to enjoy. To do so, it relies on data collected from the particular consumer and data from other consumers. This suggests that digital players need sufficiently rich data to make successful recommendations and may imply that to be viable in the long run they need to reach some critical mass of consumer engagement.[37] The recommender system gives rise to network effects. The better the recommendations, the more

[37] If some blockbuster productions are critical for the success with consumers or if consumers obtain useful recommendations from elsewhere, the quality of the recommendation system by a digital player is less of an issue.

attention consumers dedicate to the offers available from the digital player. Or, as Jonah Weiner in the New York Times Magazine puts it

> *"[…] it's imperative for platforms that when we dig through their digital heaps we find something great, or at least great-ish, often enough that we don't go digging elsewhere. This is where recommendation algorithms come in. Unlike an old-school broadcaster, a digital platform generates oceans of second-to-second data about viewing habits, sign-ups and subscription loss. Platforms use this data to group customers into different segments, organized around viewing preferences — and if all is working as it should to recommend shows that match those preferences."*[38]

As digital players compete for consumers' attention, they have an incentive to provide good recommendations. However, other concerns may also enter the digital player's consideration when providing recommendations. For example, an attention intermediary with partially vertically integrated content may want to bias its recommendation towards its own offers since it does not have to pay for streaming its own contract (whereas it has to pay for third-party content). Furthermore, if some third-party providers receive more than others, the attention intermediary is tempted to recommend the less costly content. Hence, attention intermediaries may to some extent bias their recommendations.[39]

2.3 Attention intermediaries and the multi-markets approach

Many attention intermediaries operate as two-sided platforms with app developers, sellers or advertisers on one side and consumers on the other side operate in multiple markets. They provide intermediation services to consumers (they may also provide proprietary content) and they provide intermediation services to the seller side (which includes the possibility that sellers are app developers or advertisers).

Some attention intermediaries provide matching services. For example, Ebay can be considered an attention intermediary that gives sellers the opportunity to impress consumers; it channels the consumer's attention to particular buyers (e.g., based on the buyer's search). Also Google Search provides a matching service between content and users. The sponsored search part is the base of the monetization model of Google Search.[40] In this part, Google Search offers users sponsored links and advertisers the opportunity to gain the attention of users. The question of market definition for market platforms has given rise to different views whether there is a single market for a matching service or there are multiple markets on each side that are linked through network effects. In line with Katz and Sallet (2017) and Franck and Peitz (2019), we argue for the latter.[41]

Attention intermediaries may compete with vertically integrated firms. For example, an e-commerce retailer (such as Amazon prior to the launch of Amazon Marketplace) may compete with an intermediary running a market place (such as Ebay). Consumers have the option to go for the integrated offer by Amazon to go for offers listed on Ebay's market place. More generally, a platform may tightly control the access to platform on one side (through the use of long-term contracts

[38] Quoted from Jonah Weiner, "The great race to ruling streaming TV", New York Times Magazine, July 20, 2019.
[39] We return to biased recommender systems further below. See also Belleflamme and Peitz (2018a).
[40] The matching occurs through a price mechanism, as advertisers bid for certain keywords conditional on certain user characteristics. For a formal analysis of the auction mechanism, see Edelman, Ostrovsky, and Schwarz (2007).
[41] For an opposing view, see Filistrucchi (2018). The following two paragraphs closely follow Franck and Peitz (2019, pp. 25-26).

resembling vertical integration); alternatively, it follows a market place approach in which non-discriminatory fees determine the offerings. Clearly, the multi-markets approach is well suited to analyzing such setting; the single-market approach is not.[42]

Consider ride-hailing platforms, such as Uber and Lyft.[43] In contrast to the standard examples of intermediaries connecting sellers to consumers (such as Ebay), the ride-haling apps fully control prices on the driver and the passenger side. Following the single-market approach, one could then define a single market consisting of ride-hailing services available in a geographic market. Here, drivers are attracted to the platform to serve passengers as the former earn a payment from transporting the latter – the more passengers are active, the more attractive the platform. Passengers are attracted by the availability of drivers. With more participation on the other side, each side enjoys a shorter waiting time.[44] Passengers tend to have a number of substitution possibilities such as relying on a classic taxi service, using their own car, using public transport, or walking.[45] Many drivers are unlikely to have good substitution possibilities. Thus, market conditions on both sides may be drastically different and the relevant market on the driver side may be different from the one on the rider side. Even if the same substitution possibilities exist for both sides, the single market for a single transaction or matching service remains an abstract concept, as it relies on some derived demand, which is the result of a complex interplay of the characteristics of both sides of the market.[46] In light of these considerations, the multi-markets approach is the preferred approach to delineate markets for multi-sided platforms.

2.4 Defining markets for platform services provided by attention intermediaries

Consumers have a demand for platform content and services (as mentioned before, often without any monetary payment). Thus, there is a consumer market for platform content and services. Is there *one* market for consumer attention? As always the case when defining markets, substitution possibilities have to be considered.

The intermediary's services may be pure intermediation services. For instance, Ebay allows consumers to find products they are interested in. In the case of Ebay, Amazon, and Google Shopping, consumers typically are active in their search for products or services. Products listed by these intermediaries belong to different product categories and there may be little substitutability across these categories.

[42] This generalizes to cases in which one of the platforms is partially vertically integrated, as in the case of Amazon after the launch of its marketplace.

[43] Classifying Uber and Lyft as attention intermediaries may be seen as using a too broad definition of what constitutes an attention intermediary. In a sense, all digital apps and platforms constitute attention intermediaries since using them absorbs some of the consumer's attention. Different from e.g. Facebook, ride hailing apps offer specific uses, which consumers turn to with a particular activity in mind. However, also such more specific apps gain from more attention or time spent using them. Arguably, the Uber app is becoming more similar to Google Maps. It integrates different transport possibilities provided by itself or as an intermediary (car rides, bikes, and e-scooters). In addition, it selectively lists tourist activities, restaurants and hotels. Consumers of the Uber app use it to locate themselves and find out about the best available transport possibilities. At the same time, they also pay attention to the other offers shown on the Uber map.

[44] There may also be negative within-side network effects, as expected waiting time goes up if there is more participation on the own side.

[45] As O'Connor (2016, p. 12) puts it, "[f]or example, a person needing transportation from Washington, DC to New York can drive, fly, take a train or bus, or use an online carpooling app. Consumers decide by evaluating the price, quality and speed of those offerings and will substitute between these options accordingly. A ridesharing app's closest competitor in this context may be a bus, train, or airplane—none of which looks or operates anything like a ridesharing app."

[46] In contrast to markets with perfect complements, not individual consumers have a demand for this single service, but it takes the joint decision by users on both sides of the platform to realize such a demand.

There also tends to be little substitution across the associated intermediation services. Examples of specific intermediation services provided to consumers are intermediation services to find and book a hotel (e.g. on Booking or Expedia) and intermediation services to find and purchase handicraft items (e.g. on Etsy). The lack of substitutability across categories helps to explain why specialized intermediaries exist for these types of services. Similarly, general search engines coexist with so-called vertical search engines (e.g., Kayak and Tripadvisor). The latter can only exist because at least some consumers have specific search requests that they feed into vertical search engines rather than only relying on general search.

We conclude that specialized attention intermediaries have developed that help consumers find sellers and give sellers the opportunity to reach consumers. When consumers actively look for certain products or services, substitutability between products or services then determines whether the associated intermediation services on the consumer side belong to the same market. For example, consumers may look for a particular hotel accommodation. Then they may use the services provided by Booking or Expedia and book via those portals (or collect the information, but bypass the portal and book directly on the hotel website); they may alternatively use Google Maps to locate interesting hotels and then either book via a portal or the hotel website. We may consider then a market for hotel search and a market for hotel booking. Google, Booking and Expedia (and Tripadvisor and others) are active on the market for hotel search. Booking, Expedia and hotels with their own online booking system are active on the market for hotel search. However, consumers may not just look for hotel accommodation but for short-term accommodation more generally, including serviced apartments or rooms. Thus, portals such as Homeaway (which runs portals under different names in some European countries), Airbnb, and others provide intermediation services that consume attention and are substitutes to each other from a consumer perspective.

Sticking with the example, Booking, Expedia, and others provide listing services to hotels. Whether they provide exclusive access to the attention of consumers depends on consumer behavior. If consumers tend to use only one intermediary (i.e. they tend to singlehome), hotels can access any given consumer only through the consumer's intermediary of choice. If hotels rely critically on a particular intermediary (because it provides exclusive access to a large number of consumers), one may define a separate market for the access to the attention of a large set of consumers. Listing on this intermediary may then be essential for the hotel to be able to operate profitably. By contrast, if consumers tend to visit multiple portals (i.e. they tend to multihome), hotels have multiple access points to a consumer's attention. For example, if consumers tend to search on Booking and Expedia before making a reservation, a hotel may feel less need to list on both portals.

In the broader setting in which consumers look for short-term accommodation including serviced apartments and rooms in private flats, consumers have multiple substitution possibilities and thus also a wider choice of associated intermediation services. However, hotels then have fewer listing possibilities, as they are not (or only a subset of them) eligible for listing on Airbnb or Homeaway. This shows that markets for intermediation services should be defined for each user group and include substitutable services for this group. The degree of substitutability of course depends on the offers available on a platform. If intermediaries offer almost perfect substitutes to each other from a consumer perspective, consumers are likely to singlehome. Thus the homing behavior of sellers is likely to drive the homing behavior of consumers and vice versa. For example, if all hotels list on multiple platforms and their visibility is also the same on the different platforms then consumers tend to singlehome. By contrast, if hotels listed on a single platform and hotels offers were considered to be quite heterogeneous from the consumer perspective, then consumers would have strong incentives to multihome. This interdependence of homing decision has to be kept in mind when defining markets (as e.g. the prohibition of exclusivity clause on one side of a platform may affect the homing decision of participants on the other side of the platform).

In some cases, singlehoming occurs due to technological restrictions. For instance, consumers have to decide on a particular operating system when buying their smartphone (Android or IOS). App developers by contrast do not face such a technological constraint and can develop their app for both operating systems (and the different versions of each operating system). App developers are therefore multihomers. Each operating system provides exclusive access to the attention of "their" consumers. Each operating system acts as a monopolist vis-à-vis app developers and competes for consumer adoptions. Consequently, there are three markets: A consumer market in which operating system compete for consumer adoption, a market in which Android provides app developers exclusive access to its consumers, and a market in which IOS does so. This illustrates that it is important to understand which user groups are best described as singlehomers or multihomers to define markets properly.[47]

If advertisers and sellers are offered the opportunity to make targeted offers, there may be a fragmentation of markets for products and services offered to consumers and the associated intermediation services. This applies, in particular, to attention intermediaries catering to individual users on both sides, such as dating apps. Here dating portals that do not make participation conditional on certain characteristics or tastes compete with highly specialized portals that restrict participation to people from a particular ethnicity or with a particular educational background or are promoted to cater only to people with particular tastes. In such an environment, it then depends on the particular user characteristics or tastes to determine which intermediaries offer substitute services.

The above discussion points to the possibility that there may be many separate attention markets. However, the ability to define very granular consumer groups to provide targeted ads may depend on the ability of an attention intermediary to have consumers spend a large fraction of their time on its platform (or affiliated sites). This applies in particular to contextual advertising that reaches a specific set of consumers at the "right" moment. Large attention intermediaries such as Facebook and Google have access to detailed consumer data in real time and offer many opportunities to advertisers to impress consumers. In a way, these attention intermediaries can "read" a consumer's wishes; they may enjoy here an advantage over other more specialized attention intermediaries because they observe a broad range of activities of consumers. This speaks in favor of defining broad attention markets.

Regarding the spatial dimension, take as an example digital maps that help users find their way, but at the same time can guide them to particular attention seekers such as restaurants or shops. While a particular shop may want to raise the attention of a consumer in the vicinity (and there may thus be a local market), consumers are likely to use digital maps if they work well at a less granular level. This suggest that there may be not so many attention markets, but many advertising markets.

Competition authorities regularly use the SSNIP test to define the relevant market.[48] According to this test, the relevant market is defined as the smallest product group such that a hypothetical monopolist in control of this product group could profitably sustain *a small but significant non-transitory increase in price*.[49] The issue is whether selling a smaller quantity at a higher price would be more profitable than selling the initial quantity at the initial price. In a standard market, the key property is how sensitive demand reacts to a price change, which is measured by the price elasticity of demand. The

[47] For a more elaborate discussion, see Franck and Peitz (2019).

[48] The exposition of the SSNIP test and its application to attention intermediaries is a condensed version of Franck and Peitz (2019, section 3.6).

[49] European Commission, Notice on the definition of relevant market for the purposes of Community competition law, OJ 1997 C 372/5, paras 15–19 and 40. In its merger decisions, the Commission does regularly refer to the SSNIP test.

critical elasticity of demand is then defined as the value of elasticity of demand that would leave profits unchanged following a price increase. If the firm's price elasticity of demand is less than this critical elasticity, the price increase would be profitable and the market is defined.[50] If the opposite holds, this is seen as indication that the firm does not have sufficient market power to raise price.[51] The next closest substitutes are then added to the relevant market and the test is repeated for the larger set of products with a price increase on all these products.

How can the SSNIP test be applied to attention intermediaries operating multi-sided platforms? Two issues are of particular importance: First, the intermediary operates in multiple, interrelated markets. The question then is how to define the relevant markets on the multiple sides the platform caters two. In particular, if the intermediary charges prices to all these sides, which price changes should be considered and how does the interrelation between markets matter? Second, in case there is a zero monetary price on some side the intermediary serves, how can the SSNIP test be modified to be applicable to such environments?

The straightforward application of the SSNIP test to each market in which the attention intermediary operates is to take behavior in the other interrelated markets as given and continue to be only concerned with the elasticity of demand in this market and its effect on profits that stems from this market. The attraction of this approach is that it is rather simple. However, this simplicity comes at the cost of a potentially large bias because the interrelation of the markets is ignored. In particular, with mutual positive cross-group network effects, reduced user participation on one side due to a price increase on this side generates a feedback loop that further reduces participation on both sides. Thus, taking the interrelation of markets into account, demand on the side under consideration reacts more sensitive to the price increase. In this case, ignoring the feedback loop tends to lead to a too narrow market definition.[52]

If an attention intermediary sets prices on both sides – the side of the attention seekers and the side of the attention providers – there are various options as to which prices are increased. According to Belleflamme and Peitz (2015, p. 676),

> *"[d]ifferent scenarios can then be envisioned to perform a SSNIP test. The hypothetical monopoly intermediary could be thought of as raising (i) the sum of prices while optimally adjusting the price structure, (ii) all prices together while keeping the price structure fixed, (iii) each of the prices separately allowing the other prices to be adjusted optimally, or (iv) each of the various prices while keeping the other prices fixed."*

[50] Alternatively, a critical loss analysis can be carried out.

[51] Already in standard markets, the SSNIP test has its conceptual problems. A monopolist sets its price in the elastic part of the demand curve. Starting at the monopoly price level, applying the SSNIP test leads to a too broad market definition; this is the so-called cellophane fallacy. To avoid this fallacy, a counterfactual "competitive" rather than the prevailing price has to be used as the starting point.

[52] To assess the profitability of a price increase on one side of a two-sided platform, the competition authority needs information on the price elasticity of demand on each side as well as information on the strength of cross-group network effects.

In line with Katz and Sallet (2018) and Franck and Peitz (2019), option (iv) is the preferred approach.[53] Option (iv) can be complemented by option (iii).[54]

Attention intermediaries often set prices for access (i.e., the listing) and transactions on the side of attention seekers. If an attention seeker is rational, the expected overall payment will then determine whether she signs up. The price increase can apply to the access price or the transaction price. If a listing decision is a more long-term decision by attention seekers, then considering a change of the access price, demand sensitivity necessarily refers to the long-term substitutability across different access possibilities. If attention seekers have gained access only to some of the platforms, their substitution possibilities are more limited in the short term. Then, taking access decision as given demand reacts less sensitive to an increase of the transaction price compared to the case in which also changes in access decision is taken into account. Whether the short-term or the more long-term view is the more-appropriate one, depends on the specific case investigated by a competition authority.

The second issue concerns the SSNIP test in case of zero prices. While attention intermediaries often choose a zero price on the side of attention providers, this does not necessarily mean that a positive price is infeasible. If such a price is feasible, one can modify the SSNIP test such that one considers an increase of the price in absolute terms since a percentage increase clearly will not do. However, most attention providers may simply refuse to pay a positive price and desert such an intermediary. The zero price often reflects a situation in which the attention intermediary would like to pay attention providers for spending their attention on the platform, but such monetary payments cannot be tied to the attention providers actually paying attention. In such a case, increasing the price from zero to some positive amount is not profitable. Does this imply that a broader market has to be defined?

A modified SSNIP test that is not based on price changes but on changes of user valuation is a way to address market definition in zero-price markets. Such a test has been called SSNDQ (small but significant decreases in quality). Here characteristics of the intermediation service such as quality are varied to understand substitution patterns. Attention providers may refuse to pay a positive price, but many of them may be willing to cope with a quality deterioration of the intermediation service.

A zero-price strategy on the attention provider side may be highly profitable if an attention intermediary is able to convert attention into revenues made from other market participants. An ad-financed social network such as Facebook is a case in point. To understand substitution patterns the question is: how much traffic would Facebook lose if it decreased the quality of service (e.g. to other social networks or different offerings such as video streaming or online games)? A quantification is often challenging, as it is often unclear how to operationalize a certain quality reduction.

[53] Katz and Sallet (2018, p. 2159) write "consider[ing] price changes on one side of the platform while holding prices on the other side constant and examining whether there are significant, plausible feedback effects. If there are no such effects, then focusing on a single side manifestly will give a clear overall picture. But if there are feedback effects, then they must be taken into account to avoid reaching misleading conclusions." This stands in contrast to the view expressed by Crémer, de Montjoye and Schweitzer (2019, p. 45).

[54] Option (iii) is more difficult to implement. It takes into account that the attention intermediary controls several prices. An increase of one price by a hypothetical monopolist may be more profitable if it can adjust its other prices. Following option (iii), the price adjustment on the other side may neutralize the effect on demand stemming from the price increase on the side under consideration. In particular, if the intermediary sets per-transaction prices on each side and there is full pass-through then only the total price charged for the transaction affects demand on both sides. Consequently, if a hypothetical monopolist is assumed to increase one price by 5 or 10 percent, if it can adjust the price on the other side optimally the price increase can never reduce profits.

In case of ad-financed attention intermediaries such as Youtube it is possible to ask how much time spent on the social network is lost if the advertising level is increased by 5 or 10 percent.[55] Such a question is meaningful for video and music content where consumption is in real time.[56] It is more difficult in case of Facebook because here the newsfeed includes sponsored entries. In this case there is no direct time equivalent and, as an imperfect measure, one may want to use the fraction of sponsored entries relative to the total.[57] Even more difficult to deal with are display ads that occupy a fraction of the screen.

The idea of the SSNIP test extended to quality can be applied to characteristics other than advertising. For instance, collecting more personal data may be seen by consumers as intrusive. However, it is more difficult to determine what should constitute a small decrease corresponding to 5 to 10 percent; in addition, the implication for profits are hard to assess. One further complication regarding data consumers may have heterogeneous views about data collection: Some consumers may actually benefit from more data collection. Collecting more data then cannot be seen as a quality degradation, but rather the opposite.

If attention intermediaries use different monetization strategies applying the logic of the SSNIP test becomes particularly challenging. For concreteness, Franck and Peitz (2019, p. 66) consider a hypothetical example to explain how to tackle this issue:

> *"Consider dating apps and restrict attention to heterosexual users. These apps possibly offer substitute services ... Some platforms charge subscription prices for male and female users. Others offer matching services at zero prices and run an ad-financed business model with advertisers as the third side.*
>
> *… [C]onsider … four apps, two subscriber-financed and two ad-financed. To assess whether the offer(s) of, first, one and, second, both subscriber-financed apps to male users define the relevant product market one may ask whether a 5% or 10% increase of subscription fees charged by the respective app to male users is profitable.[58] Suppose that the answer is negative.*
>
> *The question is then whether the two subscriber-based and one ad-financed app belong to the relevant market. To assess whether some apps using such a different business model belong to the same market among male users, it is necessary to consider a 5% or 10% increase of price or a 5% to 10% reduction in quality. The following approach can then in principle be considered: a price increase of 5% (or 10%) in subscription price for male users on subscription-based dating apps and a 5% (or 10%) increase in ad levels experienced by male users on the ad-financed dating app under consideration. The corresponding issue arises when asking whether ad-financed apps (together with a subscriber-financed app) constitutes the relevant market for male users or when asking these questions for female users."*

[55] Instead of proportional increases one can use absolute increases in advertising time. Wu (2019) proposes what he calls an attentional version of the SSNIP test, the A-SSNIP. This test "tries to determine how consumers might react to a small but significant and non-transitory increase in undesired messages or advertising load for a given product." Wu (2019, p. 29)

[56] It is not perfect though because some intermediaries offer the option to skip an ad after some time and others do not. In the former case, it has to be addressed what is the relevant length of the ad. Also, ads may differ in their intrusiveness. For example, the sound volume may be higher for ads compared to content.

[57] This measure is clearly imperfect because the ordering matters very much.

[58] Here, we presume that the other subscriber-financed app is the closest substitute to the subscriber-financed app under investigation.

Despite these complications and limitations, the SSNIP test and its modifications serve "conceptual clarity in the application of demand-side substitutability. Therefore, although it is difficult to empirically implement the test in the context of two-sided platforms, it is a useful instrument for competition practice even if only applied as a thought experiment." (Franck and Peitz, 2019, p. 67)

2.5 Consumer attention and personal digital assistants (PDA)

Consumer attention is particularly limited when consumers are exposed not to written but to oral offers. While a consumer may pay attention to several offers when going through a written list of recommendation, the same consumer is likely to pay attention to fewer offers of a product or service when listening to recommendations. This suggests that in the world of personal digital assistants such as Amazon's Alexa, Apple's Siri, or Microsoft's Cortana, the set of sellers who can come to the attention of consumers is more limited than in the case of reading search results on the internet.[59]

Another feature of PDAs similar to smart phones (and possibly connected to them) is that they are always on. Thus, PDAs collect a lot of data which possibly allows them to anticipate our hidden desires and wishes. This may make life more comfortable, as we may not have to choose a playlist to play music from, but where we simply agree to have music played according to our mood.

PDAs may become the central interface for sellers to reach buyers. Given people's impatience regarding oral communications, they may make less-informed choices and be more open to accept biased recommendations. They may even fully delegate certain types of choices and trust their PDA to do the right thing for them, as some rich people did in the past when they entrusted personal butlers to make choices for them.[60]

While the smart phone may be our key device outside the home, the PDA partly in interaction with the smart phone may become the key device in the home. When walking in the streets of Manhattan people are likely to rely on a single mapping service; similarly, at home they are unlikely to simultaneously use multiple PDAs. While they may change the mapping service from one day to another, they are unlikely to do so in the case of a PDA. Thus, PDAs feature singlehoming and consumer lock-in. Even if competition in the market for installing PDAs in people's homes is intense, if PDAs cannot credibly commit to act in people's best interest, recommendation biases and inflated prices for services available on PDAs may become common – due to the PDA's market power that materializes after people have adopted a particular PDA. People may get accustomed to using the PDA and use less alternative channels to obtain relevant information.[61] In a world, in which an important fraction of consumption decision is made via PDAs prices may be inflated and even those consumers who try to bypass the PDAs may not find much better offers because sellers have little thought and resources to spend on those consumers. A more favorable few is that PDAs provide a comfortable and curated environment in which consumers can choose among competing apps the one that provides the best services.[62]

3. Market power of attention intermediaries and competition policy

[59] The move from laptops to smart phone arguably led to more-limited consumer attention, as fewer offers can be seen on the screen of a smart phone compared to a laptop.

[60] See e.g. Ezrachi and Stucke (2016, p. 193).

[61] As Ezrachi and Stucke (2016, p. 194) write, "… the more we communicate only with our personal assistant, the less likely we will independently search the web, use price-comparison websites, seek independent customer reviews, and rely on other tools. The ease of voice activation and verbal communication with our butler may limit our view of the available outside options."

[62] Similar issues may arise outside the home; for instance if consumers obtain recommendations while driving.

Together with the previous section, this section is at the core of the report. We ask about market power of attention intermediaries, merger policy and abuse cases. The concerns of competition authorities are manifold. Among the questions competition authorities have to address are the following: In quickly growing markets with new product and services, how should authorities act to prevent markets from tipping and monopolies from developing into unassailable dominance? If market have tipped towards one/few dominant players, how do authorities ensure that markets remain contestable and competitive entry feasible?

3.1 Market power

The assessment of market power is an essential element in merger control and in many types of abuse cases. In case of attention intermediaries operating two-sided platforms, particular care is needed. If the markets are strongly linked through cross-group network effects, an assessment of market power on one side that does not take such links into account risks reaching wrong conclusions: market power may be underestimated or overestimated. An assessment of market power of an attention intermediary then involves not just the analysis of one market, but of the other markets that are strongly linked through cross-group network effects.

Attention intermediaries may possess market power for a number of reasons. First, they may deliver superior or differentiated services to its users and therefore be in a stronger position than their competitors. Superior services may stem from investments by the intermediary, e.g. in a better-functioning or more-user-friendly web portal. Product improvements and differentiation is typically an ongoing process. To give a few examples, Alphabet constantly invests in improving the Google Search algorithm; Amazon constantly makes costly adjustments to its portfolio of products it sells as a retailer; Netflix frequently spends on the production of new content.

Attention intermediaries also sometimes pick up ideas and features developed by others;[63] they learn from competitors what works better or is popular with users and adjust. Again, this is not different from how other firms operate. For example, Facebook imitated some features from Snapchat. This can be seen as a strategy to reduce product differentiation. As long as there exists product differentiation in some other dimensions, this can emerge as the equilibrium strategy absent any dynamic considerations.[64] Attention intermediaries can try to compensate a disadvantage, create an advantage, or achieve product differentiation through their own investment, exclusive contracts or vertical mergers. For example, Netflix invests in own content, but also buys exclusive distribution rights and occasionally buys media firms (e.g., in 2019 it bought Storybots, a children's media company).

Users on one side may also see the service as superior to competing offers simply because there are more (of the right set of) users on the other side. This may be due to investments in services offered to users on the *other* side. It may also be due to users coordinating on one platform and not on another platform. If an attention intermediary achieved coordination for example through costly advertising, then these advertising costs constitute a sunk cost. A competing intermediary with a somewhat superior offer may have to engage in these expenses to achieve coordination on the new offer.

Second, attention intermediaries may have successfully locked-in some users; this happens if consumers are subject to consumer switching costs (see Klemperer, 1995). Consumer lock-in is of particular relevance if consumers are myopic. In this case, consumers may not foresee that an established platform may use attention and data not only to provide superior content proposals but

[63] They may do so either by imitating a feature introduced by another firm, or simply by taking over that firm.
[64] It may even hold if product differentiation is horizontal; see Irmen and Thisse (1998).

also to generate revenues in particular on the advertiser side, which may negatively affect the experience consumers make on the platform or the interaction with advertisers. These consumers may be locked-in because a competing platform may take time to collect data on the consumer to be able to provide the right services. Lock-in also arises if consumers only infrequently revisit the decision to spend some time with the attention intermediary. Then a consumer who considers switching to a newcomer knows that this newcomer will remain small for some time. This then leads to excess inertia because it is better to wait until other consumer spend sufficient time with the new attention intermediary. Lock-in is also possible on the advertiser side. This is likely to be the case if an advertiser benefits more from the advertising service of one platform compared to another if she has been more active on the former.

In emerging industries, competing attention intermediaries may have an interest to ensure low switching costs, e.g. by agreeing to joint standards. Since consumer switching from one intermediary to another is facilitated, consumers may become more interested in accepting one of the competing offers (there is less fear to become locked-in). This may explain the recent initiative by Alphabet, Amazon, and Apple among others to develop a joint standard for the smart home.[65] Since Alexa, Amazon home, and Siri allow users to control physical devices, not only consumers but also appliance makers are affected; in particular, with one common and open standard in place, appliance makers more easily benefit from scale economies. Consumers then may benefit not only from the ability to continue to use their appliances also after switching e.g. from Alexa to Siri; they may also benefit from lower prices for appliances. Attention intermediaries' incentives may however be different in more mature markets since it may become more attractive to "exploit" consumers who are already hooked up.

Third, in attention markets, consumers tend to make decisions quickly relying on heuristics and being possibly manipulated by the way offers are presented; that is consumers are often subject to behavioral biases. One example is that consumers agree to releasing their personal data without much thought to move quickly on to the content they are asking for; they look for instant gratification, but ignore long-term costs. Another example is that consumers may follow the recommendation by a website about which offering to check out first because they are not prepared to look at other offers.[66] Behavioral biases may affect consumer choice no matter whether the attention intermediary is big or small. However, large incumbent attention intermediaries may be at an advantage. For example, if the relative strength of an attention intermediary depends on combining data from many different users and thus assembling large data sets, then the "blind" agreement by consumers to give their data, strengthens the market power of large attention intermediaries, whereas smaller ones may be at a disadvantage. In this sense behavioral biases can contribute to the market power enjoyed by a firm.

Fourth, the collection of data give rise to economies of scale. For example, a firm may use consumer data to manage the logistics of shipping physical goods. A smaller firm has fewer observations and is therefore less able to predict future demand. This gives rise to economies of scale in the delivery of products. Scale economies do not only stem from the use of data; they also arise if fixed costs are spread across more units. For example, it matters for Netflix whether its films can reach a large or a small audience. By having a large subscriber base, Netflix can produce content targeted to specific niche audiences because it still has a sufficiently large number of users with specific taste to make the investment worthwhile. Large firms can negotiate deals with content producers that provide better terms per consumer to the large firms compared to a smaller rival. If costs are spread across different

[65] See e.g. Financial Times, “Apple, Amazon and Google form alliance for smart home devices”, December 18, 2019, https://www.ft.com/content/2d6add54-21b0-11ea-b8a1-584213ee7b2b

[66] This is not to claim that such behavior is necessarily due to a behavioral bias; if the opportunity cost of time is sufficiently high, rational consumers also behave this way.

markets or if the benefit from data accrue across markets firms also enjoy economies of scope. Smaller competitors may be able to overcome their disadvantage in size if they capture a specific audience.

Fifth, network effects may contribute to the market power of an attention intermediary. If a user's benefit depends positively on participation and usage levels of its fellow users, one speaks of positive within-group network effects. The success of a number of prominent attention intermediaries can be (directly or indirectly) attributed to positive within-group network effects. An important reason for Facebook to be attractive as a social network is that many people use it. An important reason for Google Search to be attractive is that many people use it as their primary choice of search engine, as this allows Google Search to collect a lot of user data enabling it to provide more relevant search results than small competitors. Rating systems that aggregate consumer ratings may generate data-driven network effects; for example, Amazon may benefit from this.[67]

Other digital players such as Ebay, Booking, or Uber generate value by matching users from two different groups. In a buyer-seller context a seller prefers a platform with more buyers, everything else given, and a buyer prefers a platform with more sellers, everything else given. This is a situation of mutual positive cross-group network effects, which can also be a source of market power.

Economies of scale, positive within-group and mutual positive cross-group network effects are often automatically associated with market power. This however shows a misunderstanding of their role in market competition. If participation decisions can easily be coordinated among users, then an entrant with a more attractive offer (at the same level of usage and participation than an incumbent) may be able to quickly invade a market. While it is correct that economies of scale and network effect of either type tend to lead to more concentrated markets competition may still be very intense and margins low or even negligible. An important concern and a reason for markets to be less competitive is that users do not easily coordinate, possibly because users do not frequently revise their usage decisions; because they sign overlapping long-term contracts; or because they have switching costs (see above). In this case, a temporary lead may lead to a long-term lead and an entrenched position in the market.

3.2 Indicators of market power

Market power is the ability to obtain higher profits than in a competitive environment. In markets without network effects, one takes price equal marginal cost as the relevant competitive benchmark. In the presence of network effects price equal marginal cost does not deliver a welfare-maximizing outcome. Thus, it is far from obvious how to measure market power even if all relevant information is available.[68]

Price and market share information

A competition authorities can use a number of indicators to assess the market power of an attention intermediary operating a two-sided platform.[69] This includes prices and price cost margins on the two sides it serves. This information in one market should always be seen in combination with information in the other market linked through cross-group network effects.

A competition authority may also see high revenues as an indicator of market power somewhere in the ecosystem an attention intermediary serves. As Franck and Peitz (2019, p. 70) explain

[67] For an elaborate discussion, see Belleflamme and Peitz (2018b).
[68] Franck and Peitz (2019) and de Streel (2020) refer to relevant cases and guidance papers.
[69] See Franck and Peitz (2019) for a list of potential indicators.

> *"the only reasonable option is to use revenues on all sides. Thus, such shares should not be interpreted as market shares as they are aggregated over two interdependent markets. Large revenue shares based on revenues appear to be meaningful if all undertakings under consideration serve the same sides. If, by contrast, some undertakings make integrated offers, whereas others do not or some undertakings offer certain bundles and yet others only a subset or products, such revenue shares are difficult to interpret."*

Particular care is needed if attention intermediaries are partially vertically integrated. To assess market power in providing intermediation services and use revenue shares as an indicator, it would be necessary to subtract revenues due to offering vertically integrated content from total revenues. This may be difficult, in particular, if these vertically integrated offers are contained in a bundle with intermediation services. For example, Amazon Prime offers consumers not only fast delivery without an extra charge but also access to video content, some of which is produced in-house. Hence, revenue shares for intermediation services may not be easily calculated.

Other indicators of market power can be market shares calculated on the side of attention providers. One possible metric is to calculate the share of active consumers in a given period, e.g. a month.[70] Another possible metric is to calculate the accumulated time spent on a platform relative to numbers summed over all undertakings offering substitute services. If an attention intermediary has a consumers with an average time spent on the platform that differs from the one that applies to competing intermediaries, these two metrics differ. Otherwise, the two coincide. It is useful to take a closer look at these metrics and link them back to revenue shares.

A large market share of attention can be seen as an indicator of market power on the side of attention providers. However, this metric hides heterogeneity across consumers. Take a hypothetical example with two attention intermediaries in which attention providers singlehome and attention seekers can only reach attention providers through their attention intermediary. There are two types of attention providers: those who spend a lot of time with an attention intermediary and others who tend to spend little. If one attention intermediary is particularly attractive for the former and the other for the latter, the one attention intermediary may have a market share of attention time far above 50 percent even though it may cater content to a smaller number of attention providers than the competing intermediary.

> To illustrate this point, consider a numerical example with two types of consumers. The ones of the first type are assumed to spend six hours per day with the intermediary, whereas those of the second type only one hour per day. Suppose that one third of consumers are of the first type and two third of the second. If consumer of the first type go to the first intermediary and consumers of the second type go to the second intermediary, the first intermediary has a market share of one third in terms of consumer base, but a market share of three quarter in term of accumulated time spent on the platform.
>
> How do these different market shares relate to revenues of the attention intermediary? Staying with the numerical example, suppose that both intermediaries are ad-financed and that advertisers are interested in obtaining the attention of consumers independent of their type. If there is a limited number of high value advertisers the share of the number of consumers better reflects the revenues of the attention intermediary. For example if there are only 30 such advertisers, each requiring an ad slot of 30 seconds, then each intermediary

[70] As an indicator for the intensity of platform usage, competition authorities often refer to the number of unique visitors. This is the number of contacts by different devices (identified by an IP address) in a period of time. See Franck and Peitz (2019, p. 71) for details.

will provide 30 ad slots and extract the willingness to pay from these advertisers.[71] Thus, the revenues of the second intermediary will be twice as large as the ones of the first intermediary (leading to a revenue share of two third). In this case, the consumer share reflects revenue shares.

By contrast, if the number of high value advertisers exceeds the number of ad slot the second intermediary can reasonable place in one hour, the first intermediary tends to do relatively better. For simplicity, assume that there is an unlimited number of advertisers with the same willingness-to-pay and that consumers are only willing to stay with an intermediary if the intermediary does not include more than 15 minutes of advertising. In this case, the second intermediary can only accommodate 30 advertisers, whereas the first intermediary can accommodate 180 advertisers. Taking into account the number of consumers, the first intermediary will make three quarters of revenues while the second intermediary only one quarter. In this case, the accumulated time spent on a platform relative to the total time spent on both platforms corresponds to revenue shares.

The numerical example shows that properties of consumer demand and advertiser demand matter. Often neither of the two market shares corresponds to revenue shares. However, if both are high, this appears to be a more reliable indication of market power than the case in which only one of the two is high.

One may also look at market share on the side(s) of attention seekers. This is useful if attention seekers singlehome.[72] Other than market shares regarding users and attention time, the depth and breadth of relevant data may contain information about market power. An attention intermediary with access to a lot of consumer data may be able to lower its cost or provide higher match quality between attention seekers and attention providers. The intermediary with the relatively "better" data set is in a stronger position and has market power. However, it appears to be difficult in practice for the competition authority to construct a meaningful market share with respect to data.

We acknowledge that high current market shares only describe the status quo. If the market environment is very volatile and there is little persistence in market share, competition authorities may rightly be not very concerned about a finding of high market shares.[73] However, a volatile market environment in the past is not necessarily a good guide about future developments. This is of particular relevance, if the market is undergoing a drastic change; for example, a vertical or conglomerate merger, while not directly affecting the market share of the attention intermediaries, may be such a change.[74]

[71] They are spread differently since consumers on the first intermediary spend much more time on the platform.
[72] Otherwise, given that attention providers are multihomers, each attention intermediary acts as a monopolist for attention seekers, as explained above. For a formal analysis of asymmetric attention intermediaries, see Anderson and Peitz (2020).
[73] This is in line with the view taken by competition authorities. For example, when investigating the Facebook/Whatsapp merger, "the Commission notes that the consumer communications sector is a recent and fast-growing sector which is characterised by frequent market entry and short innovation cycles in which large market shares may turn out to be ephemeral. In such a dynamic context, the Commission takes the view that in this market high market shares are not necessarily indicative of market power and, therefore, of lasting damage to competition." (European Commission 2 October 2014, Case M.7217, Facebook/Whatsapp, paragraph 99)
[74] See the discussion of mergers among attention intermediaries below. The case in which some users are locked-in (e.g., because of long-term contracts) implies that it is impossible that all users coordinate on the entrant. Hence, an installed base with some locked-in users gives rise to barriers to entry even if all users who can make a choice manage to coordinate their actions.

Barriers to entry

Barriers to entry are at the core of establishing persistent market power since they protect incumbent firms from future competition. In their assessment of market power of an attention intermediary, competition authorities should therefore focus their efforts on identifying current and future barriers to entry.

An important question is whether and to what extent network effects constitute barriers to entry.[75] In the presence of network effects, an entrant faces a disadvantage if users do not easily "coordinate" their decision to migrate to the new platform.[76] This may lead to an incumbency advantage meaning that the incumbent platform would remain dominant after entry even if it offered lower quality for equally-sized networks than the entrant. From the viewpoint of the incumbent platform, "[p]recisely because various users find it so difficult to coordinate to switch to an incompatible technology, control over a large installed base of users can be the greatest asset you can have." (Shapiro and Varian (1999, p. 185)

The entrant intermediary's problem depends on the nature of network effects. If there are positive within-group network effects, the entrant intermediary must convince most users that sufficiently many fellow users from this group will join. If there are mutual positive cross-group network effects it must convince sufficiently many users from each group that users from the other group will join. The latter can be achieved by courting one group and monetizing on the other side. In either case barriers to entry arise from user miscoordination.[77] To convince users to join the entrant platform, the new attention intermediary may have to subsidize early users (in the case of mutual positive cross-group effects, users on at least one side), e.g. by offering free trial periods or providing stand-alone benefits. The associated expenses or foregone revenues constitute an entry barrier.

However, attention intermediaries entering the market with strong established positions in adjacent markets (e.g. related services or other geographic markets) may not face such difficulties; in this case, incumbent attention intermediaries may have a hard time convincing users that there is a future for the incumbent platform facing competition from players who are strong in adjacent markets and users may be prone to join the platform that enters and has a successful track-record elsewhere.[78] As Franck and Peitz (2019, p. 76) put it:

> *"This is likely if economies of scale and scope can also be exploited on markets demarcated by region or product category (for example, in the form of more advanced algorithms or a particularly user-friendly interface) or if network effects exist across these different markets, in particular, if some users on one side are active in several markets (e.g. travellers using Uber in different cities). This also applies if switching costs do not apply to a specific product but to a specific platform. For example, a user who registered on Amazon in the early days to buy books may use her profile to buy products in other product categories (and may have provided information that allows Amazon to make useful recommendations).*

[75] Our exposition on barriers to entry follows Franck and Peitz (2019, pp. 75-79).

[76] This issue is of particular relevance if consumers singlehome, as this implies that they have to forego network benefits enjoyed with the incumbent platform if they migrate.

[77] Biglaiser, Calvano and Crémer (2019) review the economic mechanisms that lead to network effects-induced barriers to entry.

[78] This assessment is more nuanced than what is stated in some policy reports or decisions by competition authorities: Network effects have been associated with barriers to entry, e.g. by German Monopolkommission (2015, para. 220) and Autorité de la concurrence, Décision n° 15-D-06, *Booking.com*, paras 122, 21 April 2015. For details, see Franck and Peitz (2019).

> *Thus, users who in the past have chosen other vendors when purchasing, for example, clothing do not incur switching costs when they purchase this from Amazon (when Amazon enters this other product category)."*

It is widely recognized in policy reports that (positive) network effects tend to lead to high market shares for one or a small number of platforms. However, this does not imply that contestability of a market is necessarily compromised. Some of today's dominant platforms were entrants at an earlier point competing against other incumbent platforms. For example, Myspace, which Microsoft acquired with high hopes, started earlier than Facebook but lost against Facebook. Google's Android unseated the incumbent Symbian to become the preferred mobile operating system.

The two examples have noteworthy features. Regarding Myspace, Facebook entered the market at a time at which there were many new users arriving and thus were not yet aligned to any social network.[79] Regarding Symbian, the arrival of new technologies made it harder for the incumbent system to continue to dominate.[80] We conclude from these examples that (i) barriers to entry are lower in quickly growing markets (in which many unattached users arrive); (ii) barriers to entry are also lower in markets with fast technological change. Absent fast technological change, as markets mature, it becomes harder for intermediaries to make large quality improvements. As a result, barriers to entry become a growing concern in more mature markets.

Another relevant feature to check is whether the platform's quality improvement are primarily due to improved matching or to an increased stand-alone value that the platform provides to at least one user group active on the platform. While in the latter case users benefit from it regardless of the decisions of other users, in the former, users still have to coordinate on the platform offering improvements to enjoy its benefits. Thus, if improvements are of the former kind, barriers to entry are a more pressing concern.

As markets mature and platforms make only incremental updates of their offerings, barriers to entry become a growing concern. In such situations, a large installed user base can make all the difference and provide a critical advantage to the incumbent platform. This applies in particular if the installed user base can be eroded only slowly, as is the case when consumer switching costs are large.[81] Franck and Peitz (2019, p. 78) provide two examples of consumer switching costs, one regarding attention seekers and the other attention providers:

> *"An instance of consumer switching costs in the context of digital two-sided platforms is a seller's "investment" in his reputation. For example, it may be impossible for a reputed seller on Amazon to use his rating and the consumer feedback he received on another platform. Another instance is the personal history on a social network in the presence of privacy protection. Even under mandated data portability, a user on a social network such as Facebook is unlikely to be able to port all material since some of that material contains personal data by other*

[79] In the United States the "market" for social network services was dominated initially by Friendster (from around 2002 until 2004), then by Myspace (2004 until 2008), before becoming dominated by Facebook. According to Evans and Schmalensee (2016), the success and failure of Friendster, Myspace and Facebook is due to different decisions regarding their governance structure and business model.

[80] A similar observation applies to video games played via consoles. Incumbency was difficult to sustain since gamers and developers had to start fresh when moving from one game console generation to the next. Arguably, for demographic reasons there is also a large number of new gamers entering the market each year.

[81] The failure of Google+ to succeed against Facebook may be seen as evidence that even firms with deep pockets and a strong position in adjacent markets may not be able to overcome the combination of network effects and consumer lock-in; see CMA (2019, p. 100).

Facebook users who did not grant permission to use the material outside Facebook."

Even in mature markets, switching costs are not always unsurmountable. In particular, entrant intermediaries catering to the needs of a specific niche audience may be able to make major improvement on the incumbent's offer and, thus, overcome the lack of an installed user base. A case in point is the platform Etsy for handicraft goods, which displaced Ebay for the associated intermediation service (for more details, see Franck and Peitz, 2019, p. 77).

Another concern is that start-ups may face particular difficulties in obtaining adequate funding if their offering constitutes a close substitute to the offering of a large digital firm.[82] We acknowledge that this appears to apply also outside the digital world and can be seen as a fact of life. However, if network effects constitute a barrier to entry, this may imply inadequate funding even for superior offers. Thus, barriers to entry due to network effects (and switching costs) may be aggravated through the capital market.

Data and attention as barriers to entry

An important question is whether data and attention can constitute barriers to entry. This is the case if this gives an incumbent intermediary an advantage over an entrant. As recognized by the CMA (2019, p. 188), "[t]he need of suppliers of display advertising to first grow their user base in order to gain access to consumer attention and data mean that the most important barriers to entry are faced on the consumer side of the market." Of course, any entering attention intermediary can collect data as well and make a service proposal to consumers. The newcomer may face a disadvantage in attracting consumers and may at the same time be at a disadvantage in monetizing consumer attention. These disadvantages may stem from an installed base of consumer goodwill and data that takes time to build up.

What can be the sources of disadvantage of small newcomers in data? Newcomers may lack the depth and breadth of data. If these data are proprietary and unique, the newcomer faces the problem that due to an initially small consumer base it cannot deliver the same value to advertisers for any unit of advertising. Furthermore, it is in a worse position than the incumbent to offer the kind of service or content consumers are particularly interested in. Then it is both harder for the newcomer to attract consumers (i.e. attention providers) and to deliver this attention effectively to advertisers.

The European General Data Protection Regulation (GDPR)[83] limits the possibility for newcomers to obtain the relevant data to manage advertising. The GDPR requires individual consent for data to be shared with third parties (also in the form of newcomers). While anonymized data can be shared, anonymization may require a reduction of granularity and thus limit the usefulness of these data to manage advertising. Hence, the established platform which obtained the consent of consumers is at an advantage. Furthermore, with the treasure of data at hand, it may take little to obtain the consent of newly arriving consumers to obtain their consent because the extra information provided by an individual user has little impact on the experience of the consumer but contributes to the overall quality of data. Furthermore, joining consumers on the incumbent platform may not need to provide a lot of information.[84]

[82] Furman et al. (2019, p. 37) write: "The Panel has also heard views from independent digital companies that investors may be less enthusiastic about backing a new product or service in a similar space to an existing large incumbent due to the perceived risk that the incumbent might seek to replicate it or kill it off."
[83] Regulation (EU) 2016/679.
[84] For example, Schweitzer and Peitz (2017, p. 43) write: "With a sufficiently large data pool, modern data analysis techniques allow conclusions to be drawn about the behavior of people about whom little detailed

The data accumulated by the attention intermediary can be called social data. As Bergemann and Bonatti (2019, p. 8) observe, "[s]ince the social data is more valuable for the platform than the individual, in the absence of regulation, the platform may create excessive incentives to the individual to spend time on the platform than is individually optimal." Keeping a consumer on the platform may make it difficult to new attention intermediaries to attract consumers. The information externality then gives rise to endogenous barriers to entry for attention intermediaries.

To sum up, in some markets, one or very few platforms have high and stable market shares on the different groups it serves and overall high profits over a long period of time. A strong market Position is often the result of positive within-group network effects or, on multi-sided platforms, positive cross-group network effects or economies of scale. In markets with such characteristics, competition then leads to a "winner-takes-all" structure. Once an intermediary has obtained such a position, strong customer loyalty can develop in such markets. This may be complemented by the ability to easily collect and process large volumes of data generating demand-side or supply-side economies of scale. This applies in particular if the quality of the service offered to consumers or the cost of its provision depends not only on present but also previous consumer behavior. The corresponding data are available to the incumbent intermediary but in case they cannot easily be replicated by an entrant. Thus, consumer loyalty and data-related economies of scale lead to barriers to entry.[85]

Consumer loyalty (e.g. from learning by doing) and personalization (achieved with the help of past personal data) are likely to become important in the context of personal digital assistants (PDAs): Once a consumer has been engaged for some time with a digital assistant it will be costly for her to use a PDA from a different attention intermediary. Data portability may be considered to reduce these switching costs, but it is to be seen to what extent data portability obligations will be effective. Even with data portability, consumer switching costs are likely to be significant and protect a PDA from its competitors.

3.3 Exerting market power

An attention intermediary can monetize market power on the advertiser side, on the consumer side or, thanks to the collection of data in adjacent markets. Direct monetization instruments on the consumer side are subscription or per-view fees. For instance, Netflix or Spotify charge subscription fees. Being advertising-free, they do not run a two-sided business model. By contrast, as discussed in the introduction, Facebook runs a multi-sided business model including advertisers as one side and consumers on the other. Positive direct network effects stemming from the attention of other consumers are the source of market power, which is exerted by diverting part of the consumers' attention to advertisers.[86] Some apps may collect consumer data and allow other services by the same company to access those data and thereby for instance increase ad effectiveness on the linked attention platform. Other attention intermediary directly use consumer data to improve ad effectiveness on the platform. An improved ad effectiveness may be to the benefit of consumers (if more relevant advertising is shown) or to the detriment (if advertisers are better able to extract

information is available." (in the German original: "Bei einem hinreichend großen Datenpool erlauben moderne Techniken der Datenanalyse Rückschlüsse auf das Verhalten auch solcher Personen, über die nur sehr wenige detaillierte Informationen bereitstehen.")

[85] Schweitzer, Fetzer, and Peitz (2016, p. 40) also make this point. Hagiu and Wright (2020) argue that in many instances data do not give rise to a competitive advantage and, thus, do not lead to barriers to entry.

[86] There are further interesting links between advertisers and consumers through the possibility that consumers can share entries by advertisers and like them, which is seen by Facebook friends.

surplus in the seller-consumer interaction). Of course, the effect may be heterogeneous across consumers with some benefitting and others being hurt.

Personal digital assistant may have more sway over consumers than for example search engines. While consumers may not just take a look at the item at the top of the list when using a search engine, they are likely to be less patient when being presented with a recommendation via voice and more likely to pick the first option. A PDA with a captive audience can then monetize among sellers of product or services and what is best for the PDA is not necessarily best for consumers.

Attention intermediaries obtain two things from consumers: their attention (which can partly be sold to advertisers) and their data. Well-informed and rational consumers would take into account any negative effect of their release of data on their own surplus. For instance, if they experience that personal data are used to fully extract the surplus from a transaction, they are less inclined to continue to use such an attention intermediary than if the attention intermediary makes sure that such "exploitation" does not occur. On a per consumer basis, the attention intermediary has an incentive to facilitate such surplus extraction if it only charges advertisers. Thus, the intermediary trades off per-consumer revenue with consumer base. Also, the attention intermediary may compensate the consumer for this surplus extraction by providing higher-quality content.

Of particular interest is a situation in which accumulated data on other users are a substitute to detailed personal data and that such information is used by the intermediary to the detriment of consumers (using the information may allow for targeted advertising that hurts consumers, everything else given). In this case, the depth and breadth of data can give rise to negative direct network effects. Platforms as data intermediaries may have to compensate consumers to offer their data. They may do so by a monetary payment. Alternatively, as is more common, they may provide content free of charge if the consumers accepts the privacy policy of the platform. A consumer then has to decide whether private benefits from this content exceeds the opportunity cost of providing those data. The downside of providing those data may consist in higher prices or more-intrusive advertising. Thanks to economies of scale in data collection, the data provided by many other consumers allows a platform to predict individual consumer tastes and characteristics even when having only limited information about this consumer.[87] For instance, even if the consumer in a social network decides not to provide detailed personal data, its position in the social network may be highly informative about characteristics that a platform is not allowed to collect. For example, as shown in a study by MIT students, men's sexual orientation can be predicted by an analysis of a social network site such as Facebook. Since homosexual men tend to have a higher share of gay friends than straight men, a man's predicted sexual orientation can based on the sexual orientation of the nodes in the social network they are linked to.[88] This exemplifies the presence of information externalities. If more consumers agree to give their data, the better the attention intermediary can predict certain characteristics of a consumer who did not do so. In this case, a rational consumer is willing to provide data for a rather small compensation.[89] The larger the platform, the smaller is the compensation the consumer receives. Even the total compensation by the platform may be decreasing (including in cases in which the platform makes monetary payments to agreeing consumers).

[87] Bergemann, Bonatti, and Gan (2019) provide a formal analysis to explain the generation of information through individual data that correlate across consumers. For an accessible discussion, see Bergemann and Bonatti (2019).

[88] See C. Y. Johnson, Project `Gaydar', Boston Globe, September 20, 2009, available at http://archive.boston.com/bostonglobe/ideas/articles/2009/09/20/project_gaydar_an_mit_experiment_raises_new_questions_about_online_privacy/

[89] Choi, Jeon, and Kim (2019) show that negative information externalities can explain the privacy paradox in the presence of rational consumers. It reconciles the observations that consumers express serious concerns about a loss of privacy, but are willing to provide their personal data for a small compensation.

A large attention intermediary can then provide only a small (possibly non-monetary) compensation to consumers to be allowed to collect and process their personal information, while a small attention intermediary would need to provide a substantially larger compensation. Hence, when many other consumers provide data, users consciously decide to provide detailed personal data because the private cost of providing them is small. By contrast, when few do (as arguably in the case of a newcomer), users would decide against giving consent, unless they receive a larger compensation. While a large intermediary has to pay only a small compensation to consumers, this does not imply that such an attention intermediary has strong market power. The reason is that such an attention intermediary may more easily be challenged by a newcomer. This newcomer will not acquire detailed information (since it requires a large compensation). However, this implies that consumers are not subject to the negative network effect, which makes the small newcomer an attractive place to be for a consumer.[90]

The opposite situation that the accumulated information is used by the intermediary to the benefit of consumers is also of interest. Here, if the attention intermediary has many consumers the social benefit from participation exceeds the private benefit (or the private loss, if there is one). Here, the information externality generates a positive direct network effect. The attention intermediary has to compensate the consumer for the opportunity cost of providing the data. Such a situation is likely to lead to a dominating platform for a particular type of service. The platform exerts its market power on the advertiser side. It is difficult to challenge when consumers do not regularly revise their participation decision.

3.4 Merger policy

One of the tasks of antitrust authorities is to prohibit anticompetitive mergers.[91] To avoid spending resources on mergers that are unlikely to raise competition concerns, it is common practice to have a notification regime whereby only sufficiently "large" mergers are brought to the attention of the authority.

Notification thresholds

In dynamic industries with long lead times, a firm may become an attractive target quite a while before it makes large revenues. Notification thresholds based on revenues of acquirer and target lead to a potential underenforcement as such mergers would not be notified even though they may raise important competition concerns. Some jurisdictions have therefore added alternative notification thresholds based on the value of the acquisition.

We note that firms with negligible revenues can place an important competitive constraint on other firms. This even holds in very basic oligopoly models where the less efficient obtains zero or negligible market shares but prevents the more efficient firm to charge the monopoly price.

Firms may serve a large number of users and still generate zero or negligible revenues. In particular, a two-sided platform may be successful on one side of the market and attract a lot of users, but less successful with another group (or even not yet deliver services to this group). The platform may not charge its consumers hoping for a future revenue stream from a different group of potential users.

[90] As a warning, consumers may be worse off with competing attention intermediaries. See Bergemann, Bonatti, and Gan (2019, Section 8).
[91] For some complementary discussion, see de Streel (2020, Section 4.2).

For example, an app can be downloaded for free by consumers and the app developer may hope to develop a model by which it can charge other parties for delivering consumer attention (and thus act as an attention intermediary) or providing consumer data (which may be used elsewhere to obtain higher revenues from consumer attention or for other purposes). Perhaps the app developer even has a developed business plan that relies on attracting a sufficiently large number of consumers and collecting consumer data before being able to provide an attractive service to attention seekers. In any of these cases, such an app may put a competitive constraint on other established substitute apps generating incentives for the developer of the established app to increase the quality of the app to consumers and, in particular, to make the interaction between the two groups of users it serves more pleasant for consumers. A merger may simple remove this competitive constraint and thus be anti-competitive. The acquiring firm is willing to pay a high acquisition price if those competitive constraints are severe. Thus, a notification threshold based on the acquisition price will lead to the notification of those merger that raise important competition concerns.[92]

In EU merger regulation there are currently no thresholds based on the acquisition price. It has been argued that the current referral process by which national competition authorities can refer the case to the European Commission is sufficient and therefore underenforcement due to lack of notification of harmful mergers is not an issue.[93] Even if this were the case, introducing corresponding notification thresholds (taking into account that multiple countries must be affected) is unlikely to do any harm. For a consistent merger policy at the European level, we would therefore advocate to introduce notification thresholds based on the transaction value. The investigation of a merger such as the Facebook-Whatsapp merger would then naturally be dealt with at the European level, without relying on referrals.

Social costs and benefits of mergers in the attention economy

An attention intermediary may benefit from positive feedback loops. A larger variety of offers makes users more likely to join the intermediary and spend more time on its platform. The more consumer attention it attracts the more important the platform becomes for content providers as attention seekers. A merger between a large established attention intermediary and a smaller target is likely to increase the time spent with the intermediary (presuming it continues to offer both platforms). This may simply reflect the improved offering, but may be self-reinforcing.

> To illustrate the latter, take a hypothetical numerical example with four attention intermediaries: consider a market in which 40 percent of consumers are with intermediary A, 30 percent with intermediary B, 15 percent with intermediary C, and 10 percent with intermediary D. To recover their investments and make a profit, app developers are assumed to need access to strictly more than 50% of consumers. Suppose now that intermediary A plans to acquire intermediary C. Using pre-merger market shares on the consumer side, the

[92] See, e.g., Motta and Peitz (2019) who argue in favour of introducing such a notification threshold at the European level. Of course, also mergers in which the acquired firm is valuable in any case or generates high synergies will be picked up. It is then the task of the merger assessment to look at the case more closely. Bourreau and de Streel (2019, pp. 29-30) advocate the introduction of notification thresholds in the context of "killer acquisitions". However, mergers involving start-ups that do not meet turnover thresholds but that are picked up by a notification threshold based on the acquisition price may be anti-competitive even if they do not constitute killer acquisitions (see, e.g., Motta and Peitz, 2020).

[93] See Schallbruch, Schweitzer, and Wambach (2019, pp. 63-64). In particular, regarding the European Merger Control Regulation, they write: "The Commission 'Competition Law 4.0' does not currently find it necessary to revise the Merger Control Regulation thresholds, but advocates the systematic monitoring and evaluation of the handling of relevant cases by the European Commission and the submission of a two-yearly report to the Council and Parliament." (p. 64)

combined attention intermediary would hold a market share of 55% percent of all consumers. If the merged firm can convince consumers that it does not reduce the attractiveness of its service, it can sell consumer attention to app developers as a bundle. The merged attention intermediary has become essential to app developers, as they cannot make a profit without being present on its platforms.[94]

The merger raises competition concerns on the app developer side because app developers will have to be present on the merged entity's platforms. More consumers then join those platforms as they feature more variety. As a result, the market share of the non-merging intermediaries may be diminished. Endogenizing prices, the merged platform can use its stronger position, to charge higher fees to app developers. If fee increases are partially passed through to consumers, also consumers may suffer.

A potential social benefit of mergers is that the merged firms benefit from complementarities. In the context of innovative industries such as biotech and digital services, an important means of benefitting from complementarities is the acquisition of start-ups with innovative products or services at an early stage of developments by established firms. This allows established firms to pick promising ideas and to fine-tune and commercialize them. Start-ups may lack these abilities and thus rely on the expertise of established firms. Clearly, if absent an acquisition these complementarities do not materialize, a merger is welfare improving. In particular in the context of digital services, the established firm may acquire a start-up with the intent of integrating its functionalities into its existing offers. As the usefulness of novel services is often uncertain (e.g. it may turn out that a new service has serious security flaws that cannot be fixed easily), the mere fact that the established firm decides some time after an acquisition to discontinue the innovative service is not proof that the merger has occurred for anticompetitive reasons. The reason is that the possibility of a surplus-increasing integration of the service motivated the merger, but that when learning about the true potential after consuming the merger, the project of integration is abandoned with positive probability.

However, the integration of an innovative service into the established firm's offering is not proof either that the merger is welfare improving. It may well be that the merger allows the acquiring firm to increase the quality of its services, but it may be the case that the start-up would have managed to scale up on its own (e.g. with the help of a VC fund) or as part of a different established firm (see Motta and Peitz, 2020). A merger is particularly problematic if the acquired firm would likely impose some competitive constraint on the acquirer if it stayed independent or became part of a different established firm. In the attention economy, digital services offered to consumers may look rather different, but to the extent that consumer attention (and possibly the data which come with it) is the key to monetize from advertisers or content providers, attention intermediaries (and possibly vertically integrated attention seekers) may still compete with each other. If this is the case, the authority does not have to rely on an assessment of potential competition (see below), but can include quite different offerings of attention intermediaries in the same market on the consumer side. In practice, the authority may start an investigation considering the merger as a conglomerate or vertical merger assessing potential competition and, in parallel, consider it as a horizontal merger assessing the effect on actual competition in more broadly defined markets.

An example is the Facebook-Whatsapp merger which took place in 2014. In this case Facebook paid 19 Billion US$ for Whatsapp, a firm with around 50 employees hardly generating any revenues. The one asset Whatsapp already had was a consumer base of more than 400 million users. Arguable, Facebook and Whatsapp were both attention intermediaries. Facebook operated a social network and, at that point in time, had a well-developed revenue model. It obtained revenues of more than 12 Billion US$ mostly through advertising (in particular, by including ads when users accessed Facebook

[94] For the sake of the argument, we ignore price effects at this point.

for social networking activities) and a net income of above 2.9 Billion US$.[95] Whatsapp did not have a revenue model, but many people were spending a lot of time on Whatsapp chatting with each other. This time spent on Whatsapp arguably competed with the time consumers spent on Facebook. Thus the presumption is to place Whatsapp and Facebook in the same market for attention.

A similar assessment applies to Facebook-Instagram merger. At the time of the merger, Facebook operated as a social networking site and Instagram as a photo-sharing website. In their assessment of the case with the OFT in the UK, Argentesi et al. (2019, p. 71) concluded that[96]

> *"the Authorities placed significant attention to the function that the merging parties' apps performed and whether the range of functionalities they offered made them substitutes or complements. However, even though the apps of the merging parties performed different functions, they may still have competed with each other as both were potentially in the business of harvesting consumer attention and selling it to advertisers."*

Evaluating efficiencies and competitive risks of such mergers is difficult, as the potential negative effects of the merger lie in the future. Standard tools to evaluate the merger are thus not really useful. Regarding the Facebook-Whatsapp merger, a key question is whether an independent or otherwise aligned Whatsapp places significant competitive constraints on Facebook. Since Whatsapp did not yet have a revenue model in place, it appears to be very hard to quantify the effects of keeping Whatsapp independent on the benefits that accrue to consumers. And even if an ad financed business model had been in place, since consumers do not make monetary payments, the effects on the net utility offered to consumers would be hard to predict. One would need to evaluate the likely development of service quality in the absence and presence of the merger. One would also have to include indirect effects such as to which extent predicted changes in ad prices are passed through into consumer prices.

On the other side of the market, an assessment of how the merger affects ad prices (ideally in terms of effective price of a conversion or an additional sale) would need to be made. The authority will have to have a consistent approach how to account for consumer and advertiser surplus. This is of particular importance if surplus effects are not aligned.[97]

Currently, it is hard to see how existing quantitative tools in merger analysis can be extended to cover those effects. Hence, such long-term effects that are not reflected in any price paid by consumers to intermediaries have either to be ignored or be assessed based on heuristics. An "optimist" approach is to ignore such long-term effects under uncertainty and prohibit only those mergers in which anticompetitive concerns outweigh potential efficiency gains in the present. This would be based on the optimistic assumption that future risks of the merger to societal welfare are negligible.

The "pessimist" approach consists in prohibiting a merger in all instances in which long-run negative effects cannot be ruled out. This approach can be based on the goal of minimizing maximal damage and the belief that while future dampening of competition occurs only with some probability, the societal damage could be large.

Following the effects-based approach, the authority would need to assess the future anticompetitive concerns and efficiency gains of a merger and to use some probabilistic assessment to make a case-

[95] See https://www.statista.com/statistics/277229/facebooks-annual-revenue-and-net-income/

[96] Wu (2019) makes a similar assessment. In particular, he writes "At a minimum, the fact that the two firms were competing in attention markets might have yielded the conclusion that they were at least potential or nascent competitors in advertising markets." (Wu, 2019, p. 5)

[97] For a formal investigation of this issue, see Anderson and Peitz (2020).

by-case decision whether to block a merger. While the discussion which of these three approaches to take is rather abstract, it appears to be a political decision that is reflected in competition law, which of the three approaches is to be followed. Continuing with an effects-based approach would make it necessary for the authority (and eventually courts) to rely on probabilistic assessment that are hard to verify not only ex ante but often also ex post. Adjusting practice to account for severe long-term harm to society which however may be a rather low-probability event, would require that authorities and courts do not need to show that harm is a likely event, but that the expected harm in consumer welfare exceeds expected benefits. This is in line with the proposal in the Furman report that

> *"[a] more economic approach to assessing mergers would be to weigh up both the likelihood and the magnitude of the impact of the merger. This would mean mergers being blocked when they are expected to do more harm than good." (Furman et al., 2019, p. 99)*

Evidence as to whether a merger should be prohibited based on expected consumer surplus can be gathered in several directions, as proposed by Federico, Scott Morton, and Shapiro (2019). First, phrased for the case of potential competitors, they suggest the authority to follow an error-cost approach:

> *"The cost of under-enforcement will be a function of the degree and durability of the incumbent's market power, which drives the value of a loss of (future) competition from the target. If there are existing competitors to the incumbent, or potential competitors better placed than the target, then the loss of that source of potential competition may be limited. However, if there is limited "competition in the market," and the main or only locus of competition is to be found in "competition for the market," then the loss of a potential challenger can cause substantial consumer harm, increasing the cost of under-enforcement." Federico, Scott Morton, and Shapiro (2019, p. 22).*

Second, the authority should try to rationalize the acquisition price. Can this price (more precisely the overpayment) be explained by sharing the value of anticipated synergies of the merger or can it only be explained by higher rents due to lessening of competition? Evidence of the latter gives a strong indication that blocking the merger is the right thing to do.

Third, the track record of the established firm regarding previous acquisitions may provide information as to its intent.

Potential competition

In the context of digital services (and some other industries, such as biotech), the issue has been raised that some mergers may look at first sight to be vertical or conglomerate mergers since the involved firms are not active in the same market, but that the merger may nevertheless effectively be an anticompetitive horizontal merger because a potential competitor is removed.

Conglomerate concerns can also arise due to supply-side economies of scope or network effects across markets (the latter can be called demand-side economies of scope). Both types of economies of scope can be used for an efficiency defense of the merger. However, the positive short-term effects (lower price, higher quality of service) may lead to long-term harm if the increased competitive pressure induces exit of competitors from the industry and increases barriers to entry.

The Facebook-Whatsapp merger may also apply to this context. Using a narrower market definition according to which Facebook primarily provided social networking services for consumers and

Whatsapp communication services (messaging and calls) they are active on separate attention markets (however, Facebook also offered messaging services).[98] The issue then is whether the merger removes Whatsapp as a potential competitor for social networking services.[99] Similarly, the Facebook-Instagram merger was described as a merger of complements with Facebook offering social networking services and Instagram a photo-sharing site.[100] Also here the counterfactual to the merger is what would have happened with Instagram if it were not acquired by Facebook.[101]

The general point is that entrants may limit the market power of incumbent dominant platforms if the latter cannot simply acquire the latter. This provides an argument to adjust merger control to prohibit some mergers even though, in the short term, the involved firms offer independent or complementary services. When these firms are likely to become actual competitors if they stayed independent, the merger may well be anticompetitive in the long term.

The challenge for authorities then is to balance short-term efficiency gains with the risk of less competitive pressure in the future; see, e.g., Motta and Peitz (2019) and Crémer, de Montjoye and Schweitzer (2019, chapter 6). In particular,

> *"[i]n the Facebook/WhatsApp merger, the Commission found no documentary evidence that WhatsApp was planning to become a fully-fledged social network in the future. Such proof that the start-up is planning to enter the acquirer's core market will generally also be difficult to obtain in other cases. Clear plans for doing so will rarely exist when start-ups are being bought up at an early point of their life." (Crémer, de Montjoye and Schweitzer, 2019, p. 119)*

Bourreau and de Streel (2019) make a proposal how to assess when a merger is likely to remove a potential competitor. Motta and Peitz (2020) provide a simple, formal framework to address the issue.

Blocking a merger because the acquired firm is deemed to be a potential competitor requires the authority to make a probabilistic assessment of the future development of the market. In particular in digital markets, we have seen convergence in the sense that platforms integrate different functionalities. Thus, what may look as different markets in status quo is likely to be one larger market in the future. Taking a forward-looking perspective then leads to the conclusion that the two companies will belong to the same market and the merger amounts to integrating a future competitor. In line with the general approval rule, the authority will have to weigh expected benefits against expected social costs.[102]

---

[98] In its decision, the European Commission concluded that "[f]or the purposes of the present case, the exact boundaries of the market for social networking services, in particular whether consumer communications apps such as Facebook Messenger and WhatsApp fall within the scope of such a potential market can be left open." (European Commission 2 October 2014, Case M.7217, Facebook/Whatsapp, paragraph 62)

[99] The merger was approved partly based on the assessment that barriers to entry for communication services are low irrespective of whether the merger takes place. "… the Commission has found in its market investigation that there are no significant `traditional´ barriers for a new consumer communications app to enter the market, that is, to be offered to users for download." (European Commission 2 October 2014, Case M.7217, Facebook/Whatsapp, paragraph 117)

[100] The OFT in the UK cleared this merger in 2012.

[101] Argentesi et al. (2019, p. 71) came to the conclusion that "the Authorities indicated that available evidence did not show that Instagram was particularly well placed to compete against Facebook in the supply of social network services. However, the evidence available to the Authorities would not seem to unambiguously support this conclusion, most notably because of the level of user engagement already generated by Instagram at the time and of its plans to supply social network functionalities."

[102] For an insightful rebuttal of the claim that prohibiting mergers in which stablished firms acquire start-ups is likely to remove innovation incentives by start-ups, see Federico, Scott Morton, and Shapiro (2019).

Presumption of harm

A standard result in markets with imperfect competition is that the larger the firms involved in the merger the stronger is the anticompetitive effect of the merger. If a particular firm dominates an ecosystem (such as Google the Android ecosystem) and a large group of users tends to be attached to this ecosystem this firm can be called "systemic".[103] A systemic attention intermediary then is a firm that directly or indirectly manages the attention of an important number of consumers in a particular environment. For example, Google Maps is systemic if many consumers only use this and not other mapping services when walking in a city and only (or more likely) pay attention to offers listed on Google Maps. Mergers that involve at least one systemic firm may be seen as particularly problematic as such a merger may cement the market position of a firm. In particular, by bundling additional services into its offers or removing potentially competing offers in the ecosystem or by a substitute ecosystem, a merger raises entry barriers or removes a potential competitor. Of course, the merger may lead to efficiency gains and these gains may trump the competition concerns. However, not only losses due to anti-competitive effects but also efficiency gains are often hard to assess for competition authorities in a merger case, which is run under severe time constraints.

In horizontal merger cases involving a systemic firm, the competitive concerns tend to be typically present. The authority then needs evidence of sufficient efficiency gains in order not to block the merger. While merging parties are supposed to cooperate in a merger investigation, we propose to start with a presumption of harm in such cases and thus propose a reversal of the burden of proof.[104] The argument here is that the merging parties want to change the market structure in an environment with competition concern. Therefore, it is up to the merging parties to document likely efficiency gains from the start. If these are not credible or deemed insignificant, the merger can be prohibited without detailing the anti-competitive effects. Otherwise, efficiency gains have to be balanced with expected anti-competitive effects.

In particular, the authority may require evidence by the merging parties that justify the acquisition price paid by the acquiring firm. For example, in the Facebook-Whatsapp merger, the merging parties would need to substantiate synergies that justify Facebook's premium; this requires an assessment of how much of the 19 billion US$ constitute the premium.

3.5 Abuse of market power

Firms with market power may abuse their market power; this clearly may be the case for attention intermediaries. To make the case against certain behavior, both a convincing theory of harm has to be put forward and has to be weighed against any efficiency defense. Established theories of harm may

[103] This notion is related to other terms coined in some recent reports. Scott Morton et al. (2019, p. 105) define "bottleneck power" as "a situation where consumers primarily single-home and rely upon a single service provider […], which makes obtaining access to those consumers for the relevant activity by other service providers prohibitively costly." Furman et al. (2019, p. 41) speak of platforms with "strategic market status" when they operate as "gatekeepers between businesses and their customers".

[104] See also Motta and Peitz (2019, 2020) on burden and standard of proof. For the U.S., Scott Morton et al. (2019) propose to establish a digital authority (DA). For platforms with bottleneck power they also recommend a specific merger regulation with a reversal of burden of proof: "These specific merger regulations should require merging firms to demonstrate that the combination will affirmatively promote competition. This shifting of the burden of proof from the government (to prove harm) to the parties (to prove benefit) will assist the DA by placing the job of demonstrating efficiencies on the parties, who have a greater ability to know what they are." (Scott Morton et al., 2019, p. 111). Relatedly, for the UK, Furman et al. (2019, p. 59) recommend the creation of a digital markets unit that among other tasks would establish a code of conduct on platforms with strategic market status. However, Furman et al. (2019) advise against a reversal of burden of proof.

apply also to attention intermediaries. Due to the particularities of attention intermediaries, and digital platforms more generally, novel theories of harm may need to be put forward. This is clearly the case for novel contractual practices, but may also hold for practices known in other sectors, which may however play out differently. Recently, economists have started to work on such issues, often motivated by concrete cases. Below we point to some issues regarding exclusionary and exploitative abuse.[105]

Exclusionary practices and deterrence

Exclusionary abuse by an attention intermediary can take the form of contractual restrictions (e.g., by establishing specific governance rules) that make it more difficult for other attention intermediaries to attract attention providers or seekers. This leads to horizontal concerns. The attention intermediary may also engage in practices that make it more difficult for participants on one side to participate and compete with vertically integrated offers on the merit. This leads to vertical concerns. Also, the attention intermediary may use actions in matching certain types of attention providers and attention seekers to restrict competition for other matching activities; then there is a conglomerate concern.

Certain vertical contracting practices may be exclusionary and raise *horizontal concerns*, as they may deprive an as-efficient competing attention intermediary from successfully entering the market and strengthen the position of a large attention intermediary. This may hold for exclusive dealing clauses signed with content providers. For example, with staggered contracts, competitors will not be able to attract quickly content providers. Since consumers are unlikely to pick an offer with very little content, it will be hard for an entering attention intermediary to convince content providers whose contract with the incumbent expires to change the intermediary. Thus, staggered exclusionary contracts may be anti-competitive.[106] This issue arises if many attention providers singlehome, as this implies that the attention seeker can only obtain access to a given attention provider by contracting with the provider's attention intermediary.

Exclusive contracts on the side of attention seekers may cement the market position of the attention intermediary on the other side and restrict the substitution possibilities of the attention provider. If the attention intermediary controls more than half the market on the attention provider side (i.e., more than half of attention providers singlehome with this attention intermediary) than the ability to contract with other attention intermediaries gives access to fewer attention providers than accepting the exclusive contract. Since the attention seeker is small, a content provider cum attention seeker refusing the attention intermediary will hardly trigger a response by attention providers. Coordinated behavior by attention seekers may not be possible because of staggered contracts mentioned above or simply because they do not find a way to coordinate their actions. With many exclusive contracts in place, other attention intermediaries are deprived of the possibility to offer attractive deals to attention providers if the supply of content providers is limited.

If an attention intermediary is also a platform for device markers that run on its system, attention intermediaries may lock-in attention providers by forcing device makers onto their system. This makes it more costly for attention providers to switch from one system to another and therefore raises horizontal concerns. The market for PDAs may be a case in point. Sonos, a producer of voice-controlled speakers has accused Google of such contractual restrictions. It alleges that "Google said it would cut off Google Assistant integrations with Sonos if Sonos allowed customers to toggle between different

[105] Additional considerations are provided by de Streel (2020, Section 4).
[106] See Cabral (2017).

assistants. And speaker makers increasingly need to support the voice assistant technologies from Amazon and Google to keep up with consumer expectations."[107]

In the attention economy *vertical concerns* can be voiced if an attention intermediary delivers the attention of (some) consumers to content providers or advertisers and this attention is not made available on equal terms to all attention seekers. This may lead to concern about exclusionary abuse. An attention intermediary who fails to deliver the best available content can be expected to lose favor with consumers when they become aware of the fact that other, better content is available elsewhere. Suppose that content providers charge consumers. However, if an attention intermediary enjoys some market power it may want to use this market power to favor own content or favor paid-for content by incumbent content providers.[108] The same applies to advertisers if the attention intermediary has some stakes on the advertiser side.

Vertical integration may give rise to a recommendation bias. An attention intermediary may have superior information about consumer preferences than the sellers it hosts. One concern that has been expressed by practitioners is that the attention intermediary may be partially vertically integrated or have a long-term relationship with one or a subset of sellers. The intermediary may then shift the attention of consumers more towards those in-house or contracted offers, effectively introducing a bias in its recommendation. Such a biased recommendation may then be constructed to be an abuse of market power (where market power may be the result of captive consumers). There is no question that because of integration or long-term contracting, the attention intermediary may have an interest to direct the consumers' attention of its own or contracted offers and thus introduce a bias, but consumers are not necessarily harmed (at least in the short run taking the set of sellers as given). The reason is that a bias affects the use of price and non-price instruments available to the sellers. For example, if there is one integrated offer and one non-integrated competing offer, sellers can adjust price and quality of their product. It is then possible that the quality increase due to the bias overcompensates any price increase suffered by consumers.[109]

Conglomerate concerns can arise if we define multiple markets involving attention seekers (who differ across markets) and attention providers (who may have a large overlap or may be likely to have so in the future). For example, bundling of services may raise anticompetitive concern as it may exclude more-efficient competitors.[110] A particular setting in which such concerns are well-founded is developed in Choi and Jeon (2020). They consider the interplay between two markets, one monopoly product market and another competitive product market with ad financing. As they show, bundling of two offers may be profitable and anti-competitive.

Their argument can be presented as follows. Suppose that a monopoly attention intermediary attracts consumer attention by offering a service in one content category at some price. Suppose also that there is a another content category in which this attention intermediary competes against a competitor who offers its service at some price to consumers and on top monetizes on the advertiser side (for simplicity assume that consumers do not mind advertising in combination of content from

[107] This quote is taken from reporting by Jason del Rey, "6 reasons smaller companies want to break up Big Tech," January 22, 2020, on https://www.vox.com/recode.

[108] An economic mechanism how this can be achieved has been described under the heading "Attention intermediaries with competing sellers".

[109] For a formal analysis establishing this result, see de Cornière and Taylor (2019).

[110] As is recognized in the economics literature, the effect of bundling is in general ambiguous, as it is pro-competitive in some market environment and anti-competitive in others. Regarding the latter, bundling may also be an exploitative abuse. For a quick review of some contributions on bundling by platforms, see Jullien and Sand-Zantman (2019).

this second category).[111] The competitor is more efficient in the sense that it offers higher content quality and incurs the same cost. Furthermore, suppose that intermediaries cannot subsidize consumers. The more-efficient competitor then is limited in its ability to offer a better deal to consumer in response to a better deal offered by the intermediary who is less efficient in the second category. If access to the two types of content is sold separately, this is not an issue: the monopoly intermediary sells the first type of content at the monopoly price, while the more-efficient competitor for the second type of content sells in the other market at a price that reflects the consumers' willingness to pay for higher content quality and, in addition, makes positive ad revenues. Can the former offer a better deal to consumers for the second type of content? When bundling is possible, the answer is `yes' because it can offer the bundle of both types of content at a lower price. Does it have an incentive to do so? Again the answer is `yes' if it is not too much at a disadvantage compared to its more-efficient competitor. Since consumers would like to consume both types of content they choose the bundle if the bundled price is not too high. In return the intermediary offering the bundling attracts all attention and can monopolize the advertising market for the second type of content. The point is that because of advertising opportunities there is a positive surplus on the table in the market for the second type of content. If the more-efficient competitor lacks instruments to offer a higher surplus to consumers it is vulnerable to lose out to the firm with the bundle.

> For concreteness, take a numerical example with content of types A and B and firms 1 and 2. There are 10 consumers who all attach the value of 2 monetary units to content of type A, 1 to B-content offered by firm 1, and 2 by B-content offered by firm 2. In addition, each consumer watching B-content generates advertising revenues of 3 for the intermediary who hosts the content. Attention intermediaries do not incur any costs. Absent bundling, firm 1 sells A-content at price 2 and makes profit of 20; firm 2 sells B-content at price 1 and makes profit of 40 (revenues on the consumer side of 10 plus revenues on the advertiser side of 30). If firm 1 instead sells a content bundle at a price of slightly below 1, it will sell the bundle to all consumers (here we assume that consumers cannot consume the bundle and the stand-alone product of firm 2 together). This is seen as follows. Firm 2 cannot set a price less than 0. At a price of zero consumer would obtain a net benefit of 2 if they bought from firm 2. By contrast, buying from firm 1 gives them a net benefit of slightly above 2. Thus, consumers prefer to buy the bundle. Firm 2 will then make zero profit. Firm 1 sells to all consumers and makes revenues of 10 on the consumer side. In addition, it earns 30 from advertisers. Its total profit of 40 are larger than without bundling. Hence, bundling allows firm 1 to leverage its monopoly position into a competitive market with a more-efficient competitor.

Exploitative practices

In its attempt to monetize consumer attention, an attention intermediary may want to safeguard margins on the seller side by ruling out that the seller bypasses the attention intermediary. Exclusivity clauses imposed on sellers may serve this purpose. Alternatively, the attention intermediary may impose price-parity clauses which remove the otherwise existing possibility that consumer and seller contract directly bypassing the attention intermediary or by transacting with the help of a competing transaction intermediary who charges less to the seller. A seller who passes costs it incurs because of contracting with an intermediary partially through to consumers would have an incentive to offer a better deal to consumers on attention intermediaries who charge less for a comparable service. Price-parity clauses eliminate this possibility and thus have the potential to raise fees paid by sellers who advertise their products on attention intermediaries. Eventually consumers suffer from such contractual restrictions because of higher price levels in the product market.[112]

[111] It is immaterial to the argument whether there are also advertising revenues in the monopoly market.
[112] For a formal investigation, see Edelman and Wright (2015) among others.

In many other cases it is difficult to define what constitutes exploitative abuse. In general, a firm with more market power enjoys higher profit margins. In standard markets, this is reflected by higher prices consumers have to pay. In the case of ad-financed attention intermediaries, the analogue is that consumers may experience higher advertising levels, more intrusive advertising, less attractive content offers, and less attractive terms and conditions (e.g., regarding the data consumers have to provide and their uses). From an economic perspective, in such instances it is conceptually difficult to distinguish between the exertion of market power and its exploitative abuse.

In some instances, a firm with market power may be better able to exploit behavioral biases than other firms. For example, consumers may become addicted to using a platform when the content offers by an attention intermediary match a consumer's tastes and matching relies on rich data which only a firm has that attract a lot of consumer attention. Then such an attention intermediary can exploit a consumer once she has become addicted. This is of particular concern if consumers become irrationally addicted; i.e. if they do not foresee their future exploitation. While the presence of strong behavioural biases suggests the need for ex ante regulation through consumer protection policies, competition policy has the means to address the problem if consumer harm that results from these biases is linked to market power.

The Bundeskartellamt alleged exploitative (and also exclusionary) abuse by Facebook on the ground that Facebook used its dominance to collect and combine data from consumers not only when they visit Facebook but also when they visit websites controlled by Facebook (e.g., Instagram and Whatsapp) and websites controlled by associated third parties.[113] In its decision, the Bundeskartellamt forced Facebook to change its policy, setting strict deadlines. Facebook appealed against this decision at the Higher Regional Court, OLG Düsseldorf. While the case has not yet been decided, in August 2019, the OLG granted Facebook temporary relief and raised serious doubts about the legal basis of the decision by the Bundeskartellamt. The OLG is highly critical of the arguments given by the Bundeskartellamt. In particular, it writes that "the necessary causal link between Facebook's dominant market position confirmed by the Bundeskartellamt and the breach of data protection law assumed by the Office cannot be established."[114]

It would be premature to draw general lessons about the limits of competition policy in the attention economy. However, as the OLG clearly pointed out the mere facts that (i) an attention intermediary is dominant and (ii) that it (as claimed by the competition authority) violates privacy regulation does not make the latter an exploitative abuse. What is needed is a causal link, which may not exist or may be difficult to establish. If it does not exist then competition law is clearly the wrong avenue to go against the illegal behavior. If the link does exist, but the authorities cannot convincingly make the case, then competition law is ineffective in going against the illegal behavior. No matter whether the former or the latter holds, if the issue is a violation of existing regulations, those regulations should lay out the proper avenue for redress. It is then not the task of competition law enforcers to deal with such behavior. Instead, ex ante regulation is needed.

[113] Third-party website become associated if they have embedded Facebook products (e.g., the "like" button or the "Facebook login" option) or if they use Facebook services such as Facebook Analytics.

[114] Own translation of: "… der notwendige Kausalzusammenhang zwischen der vom Amt bejahten marktbeherrschenden Stellung von Facebook und dem kartellbehördlich angenommenen Datenschutzrechtsverstoß lässt sich nicht [feststellen] ..." (OLG Düsseldorf, August 26, 2019, Case VI-Kart 1/19 (V), p. 16) For a discussion of the reasoning of the Bundeskartellamt, see Economides and Lianos (2019). In a surprising turn of events, on June 23, 2020, the German Federal Supreme Court (BGH) overturned the decision by the OLG. Different from the Bundeskartellamt, it constructs the abuse of market power as a restriction of the freedom of choice of Facebook users. However, this decision was about the temporary relief and the main case is still with the OLG.

Exploitation may also happen on the attention seeker side. The business model of ad-financed websites is to offer a bundle of content and advertising, where advertising is often a "bad" from a consumer's perspective. If consumers could opt to see the content without being exposed to advertising or being exposed to it, many would do so. Ad blockers offer such a service to consumers. In particular, ad blockers may filter out advertising which is seen as particularly intrusive (e.g. pop-up ads or automatically playing videos with sound). They may also limit the amount of non-intrusive ads; possibly only for larger websites. In particular, the program "Adblock plus" has the feature that consumers are not exposed to ad or only to selected ads. The program contains a black list as standard pre-installation. Ads from these websites are blocked. The program also features a white list. To become part of the white list, the website has to follow some rules on advertising and the website has to pay 30% of its revenues from advertisers to the ad blocker. As Germany's highest court recently correctly observed in a case against the ad blocker, "[t]he defendant … acts as an intermediary between the website operators and the users, the special nature of its position vis-à-vis other intermediaries resulting from the fact that it offers the site operators the exclusive removal of an obstacle to access which it has created itself with the provision of the advertising blocker and its preset blacklist vis-à-vis the users."[115]

Such behavior of an ad blocker may be considered to be an unfair trade practice, which the higher court (OLG München) negated; the highest court did not challenge this view. However, the highest court refuted the ruling that the defendant did not violate antitrust law considering the assessment as inadequate. It raises the question whether and to what extent a website can bypass the ad blocker and avoid the payment to the ad blocker without losing access to consumers who installed an ad blocker. The ad blocker case is interesting because the claimed abuse is about attention seekers not attention providers being exploited. The highest court also makes the point that the absence of an unfair trade practice is not proof that the underlying action is not an exploitative abuse from a competition perspective.

Burden and standard of proof

In the previous section on merger control, we argued in favor of reversing the burden of proof for `systemic' platforms. The question of whether to change the burden and standard of proof also arises in the context of abuse cases. It is argued that in digital markets intervention may come too late (if at all) and that given the uncertainty and the risk of long-lasting harm from anticompetitive practices a new approach is needed.[116]

The proposal could be to be more open to probabilistic assessments based on expected harm versus expected efficiencies. In a case in which harm may not be seen to be very likely but very severe, it will have to be offset by efficiencies for a practice not to be prohibited. The proposal could also be to oblige platforms to show the lack of alleged harm. Clearly, implementing such a change of burden and standard of proof across the board would constitute a drastic change in competition practice.

[115] Own translation of: "Die Beklagte tritt … als Intermediär zwischen die Seitenbetreiber und die Nutzer, wobei sich die Besonderheit ihrer Stellung gegenüber anderen Intermediären daraus ergibt, dass sie den Seitenbetreibern ausschließlich die Beseitigung eines Zugangshindernisses anbietet, das sie mit der Bereitstellung des Werbeblockers und seiner voreingestellten Schwarzen Liste gegenüber den Nutzern selbst geschaffen hat." BGH KZR 73/17, October 9, 2019, p. 11.

[116] An even more drastic change would be to rely more on ex ante regulation in some areas usually dealt with by antitrust (see Scott Morton et al., 2019). An intermediate proposal by Furman et al. (2019) is to establish "codes of conduct" in cooperation with industry.

However, such a change could be applied selectively to a subset of digital platforms that are deemed `systemic', as defined in the previous section.[117]

4. Consumer sovereignty and consumer protection policy

Attention markets may suffer from market failures other than market power. Often attention intermediaries emerge to address such market failures. However, some market failures may only insufficiently be attenuated and others even be amplified through the activities of attention intermediaries. In case the latter happens, competition authorities may intervene when the failure is caused or made more severe because of intermediaries' market power. Otherwise, consumer protection policies and specific regulations with consumer protection concerns in mind can try to address such problems for consumers.

4.1 Market failures and consumer protection

Attention markets and the underlying products or services that are intermediated by the attention intermediary may be subject to a number of market failures, some of which may be remedied by the attention intermediary itself. This happens if the attention intermediary has the tools and the incentive to address the market failure.

To shed some light on the issue, a few examples may be useful. First, there may be asymmetric information problems between attention seekers and attention providers. For example, some news providers may be reliable and have fact-checking in place; other news providers may be captured by special interests. If users are interested in receiving facts and not fiction, they would like to dedicate their attention to reliable sites. Provided that at least some users become informed ex post whether an attention intermediary such as Facebook or Google News filters between reliable and unreliable sources, a user who experiences exposure to a lot of unreliable sources may stop using the intermediation service.[118] While users do not pay for the service, the attention intermediary experiences a revenue loss on the advertising side. In such a case, user and intermediary incentives are aligned. Users dislike news from unreliable sources and reduce their demand of the attention intermediary's service if such news become more prominent. Since this hurts the intermediary's profit the intermediary itself has an incentive to make news from reliable sources more prominent.

However, in the example, incentives are misaligned if sensational news receives more attention from users. Suppose that sensational news is more valuable for the attention intermediaries because it attracts more easily the consumer's attention or if it is more costly for the intermediary to filter out unreliable news. Then the intermediary does not improve the "quality" of its service when consumers ex post are not able to distinguish between high- and low-quality service provision.[119]

Incentives may be misaligned even if ex post consumers would have liked to be exposed to a more balanced news coverage and discover that the platform did not deliver. This can be the result of consumers suffering from a self-control problem.[120] For example, they want to get a broad news

[117] The Draft Bill for the Reform of the German Competition Act (released in January 2020) contains such a provision for firms labelled to have "paramount significance for competition across markets" (translation of "mit überragender marktübergreifender Bedeutung für den Wettbewerb"). See the new paragraph 19a in "Referentenentwurf, Entwurf eines Zehnten Gesetzes zur Änderung des Gesetzes gegen Wettbewerbsbeschränkungen für ein fokussiertes, proaktives und digitales Wettbewerbsrecht 4.0 (GWB-Digitalisierungsgesetz)", January 24, 2020.

[118] In this case, economists speak of an experience good.

[119] In this case, economists speak of a credence good.

[120] Thus, asymmetric information and a behavioural bias are both present.

coverage, but when presented the choice between sex&crime and other news, they always click on the sex&crime entry. In such a case, it is profit maximizing for the intermediary to make sex&crime more prominent on its platform. Here, a regulator may want to address this problem from a consumer protection angle.

Yet, often there may be a difference between private incentives of a user and society's interest.[121] In this case there can be societal harm even when the interests of attention intermediary and consumers are aligned. Then media regulation may be devised to address this issue, which is distinct from a consumer protection issue; it will be shortly addressed in the following section.

Other asymmetric information problems between attention seekers and attention providers arise in buyer-seller context. Sellers may be privately informed about the quality of their product or may privately decide whether to put effort into the service they provide. An important role of attention intermediaries such as Ebay or Amazon Marketplace is to, at least partially, resolve this asymmetric information problem by establishing and monitoring rating systems. Profit incentives of attention intermediaries are often aligned with consumer incentives; in case sellers are subject to a moral hazard problem also seller incentives are aligned. Then, the rating system makes all parties better off.[122]

Different from asymmetric information problems are behavioral biases by consumers. Such behavioral biases may be systematic and lead to consumer choices that are not in their best interest. In particular, platforms with market power may exploit such biases to their advantage; for example, by suggesting products or services that give high profits to the intermediary but little benefit to consumers. As mentioned above, if the exploitation of behavioral biases is linked to market power, competition policy instruments can be used to counter the associated exploitative practice. However, an intermediary may exploit behavioral biases even in competitive settings. In particular in such cases, consumer protection policies rather than competition policy appear to be the adequate policy response.

4.2 Who is a "consumer"?

Attention intermediaries offer interaction possibilities to attention providers and attention seekers. Thus, there are two groups of users on the platform. Often users on both sides are small. E-commerce and sharing platforms serve as examples. In its early days, Ebay served individuals to buy and sell second-hand products. Platforms in the sharing economy cater to individuals on both sides of the market. Hence, consumer protection may not only refer to consumers as buyers of a product or service, but also to sellers.

For the purpose of this report, we do not need to take a position of whether consumer protection regulation applies only to consumers of a product or service intermediated through the platform or also to sellers who obtain an intermediation service. However, our subsequent discussion focuses on the final consumers who are the attention providers.[123]

4.3 Consumer protection issues in attention markets

[121] Such a difference arises not because of asymmetric information but because of externalities. Users may like sex&crime stories, but they benefit from fellow citizens to be informed about other issues.

[122] Such rating system are the source of positive network effects, as discussed in Belleflamme and Peitz (2018a). However, as they also discuss, private incentives of the intermediary and social benefits are often not fully aligned leading to biased or less informative rating systems.

[123] In Section 5, we shortly return to the protection of attention seekers.

Apart from market power issues, consumers may suffer harm for other reasons that may appear in combination with market power or even in the absence of market power. In the former case, both consumer protection policies and competition policies provide avenues for intervention. Consumer protection regulation may then be applied to firms with market power or dominant firms only, since competition may protect against attempts of exploitation. If exploitation occurs even when competition is intense, competition policy is clearly not up to the task to address the resulting market failure. To avoid consumer harm, consumer protection regulation may be enacted; in particular, ex ante regulation may impose certain obligations on attention intermediaries and affiliated attention seekers.

Asymmetric information

As content offers and offers made by advertisers are often not very transparent for consumers, consumers may not make the consumption choices that turn out to be in their best interest. Attention intermediaries can remedy this problem, possibly through the use of recommender systems. The intermediary is at an advantage compared to the individual content provider because it has more matching possibilities and can often make more-informed inferences about the preferences of consumers. For this reason, the intermediary can remedy the asymmetric information problem faced by the consumers (which may also be in the interest of content providers as it increases the match quality; this also provides incentives to invest in quality provision).

However, as argued above, the intermediary's incentives may well be misaligned with those of consumers. Consumer protection regulation can then include provisions that consumers are allowed to cancel a contract with the attention intermediary or with attention seekers (who contract with the attention intermediary) within a certain time window or that attention intermediaries are forced to disclose certain characteristics of postings by attention seekers (e.g., whether or not a listing is sponsored).

Consumer naïvete, limited attention, and limited cognition

Behavioral "biases" and limited cognition often lead to suboptimal consumer decisions. For example, a consumer who is not aware of some extra charges after paying the subscription fee may regret her subscription decision, as she may end up paying more than what she was willing to pay. However, consumers who suffer from a misperception become highly valuable to firms. In competitive markets, firms then tend to compete fiercely to attract such high-value consumers. This suggests that these consumers will receive attractive deals when deciding to join an attention intermediary because they will become highly valuable.[124] For this logic to work, attention intermediaries must be able to distinguish ex ante which consumers will be of high value to them and which ones not. If they cannot tell them apart, it is still true that they will compete to benefit from the expected value, but there will be a redistribution from consumers who will be exploited to those who find ways to avoid subsequent exploitation. This presumes that both types of consumers will buy. Firms may be able to make sufficiently unattractive offers that are only acceptable to consumers who do not foresee the later exploitation. This implies that in a competitive market, firms may not have an incentive to compete fiercely so as to avoid attracting less valuable consumers.[125]

Suppose that consumers have limited attention and firms' offers contain some basic features and some auxiliary features that are more difficult to identify for consumers. Because of limited attention, consumers face a trade-off between understanding the basic features of a lot of offers (browsing behavior) and fully understanding few offers (inspection behavior). Interventions that regulate auxiliary features (e.g., strict liability regime or an unfair contract terms principle) removes the

[124] This is the same logic as in markets in which consumers have switching costs.

[125] For analyses of such settings, see Ellison (2005) and Heidhues, Kőszegi, and Murooka (2012).

consumers' worries about these auxiliary features and encourages them to browse rather than inspect. This intensifies competition between firms who compete for these consumers. Thus regulating auxiliary features of complex offers can intensify competition and increase consumer welfare; for a formal analysis, see Heidhues, Johnen, and Kőszegi (2018). This argument can be applied to attention intermediaries in two ways: first, at the level of attention intermediaries competing for consumers with rather complex offers; second, at the level of attention seekers who may compete for consumers who are with a specific intermediary if these attention seekers make complex offers.

Consumers may suffer from an attention intermediary's action if they have a behavioral bias and the intermediary has some market power. Johnen and Somogyi (2019) consider an attention intermediary who brings sellers' additional fees to the attention of consumers. In their setting there are many different sellers, with always two sellers offering a service in a specific category. The attention intermediary is assumed to charge participation fees to both groups. Sellers post a transaction fee and can also charge an add-on for additional services. Naïve buyers presume that there is a zero add-on fee, while sophisticate buyers foresee the add-on fee. If they foresee a high add-on fee, the latter can costly avoid paying this add-on fee. The decision whether to force sellers to make this add-on fee transparent is the intermediary's information policy. Under transparency a fraction of naïve consumers becomes sophisticate. As Johnen and Somogyi (2019) show, in their setting, a monopoly attention intermediary has weak incentives to enforce transparency on its platforms. These incentives are weaker than in the case of non-intermediated trade between buyers and sellers. In such a situation, a regulation that forces platforms to ensure transparency could be welfare-improving because shrouding fees induce inefficient avoidance behavior of sophisticate consumers.[126] But on the other hand, shrouding makes sellers' products look cheaper for naïfs, and encourages them to join the platform. In this way, shrouding can lead to more participation on a monopoly platform and possibly increase welfare.

To summarize, consumer protection regulation can address market failures related to asymmetric information and behavioral biases. Sometimes consumer harm only occurs in markets in which firms have market power and, thus, can also possibly be remedied by competition policy instruments. Some other times, consumer harm is the outcome even absent market power and, thus, competition policy instruments do not have any bite.

Consumer sovereignty and PDAs

In a number of market environments, consumers are impatient and quickly follow the recommendation. This applies in particular to PDAs. As argued above, consumers are unlikely to compare several offers and instead pick the first recommendation if is not too far off the mark. Consumers may even delegate some types of decisions and allow for automated decision making (IoT). While there are clear advantages for consumers, there are also risks. Consumer protection authorities may want to impose rules that limit the use of automated decision making. They may also want to impose certain codes of conduct to protect consumers from exploitation.

5. The open society, public policy, and the role of competition law

5.1 Policy goals in the open society

While the avoidance of consumer harm underpins both competition policy and consumer protection regulation, this does not imply that society can exclusively rely on these two pillars. Other public policy

[126] Since incentives are distorted in the presence of market power, competition policy could also be used to go against exploitation of consumers with a behavioural bias.

instruments include media regulation (which can be applied to some attention intermediaries) and sector-specific regulation of digital platforms.[127]

Consumer protection aims at protecting consumers from their lack of information and limited cognition being exploited. However, as illustrated in the context of privacy, there may be important externalities. In this case, society may be worse off because of certain business practices even with fully informed and fully rational individual consumers giving their consent.

For example, some consumers may like trash tv, but society may be better off regulating it because of negative externalities. Regulation can serve the public good (and receive popular support) if individuals reach the conclusion that society benefits from certain content to be limited because of the behaviour this generates among some members of society.

> *"But I tremble for the sanity of a society that talks, on the level of abstract principle, of the precious integrity of the individual mind, and all the while, on the level of concrete fact, forces the individual mind to spend a good part of every day under bombardment with whatever some crowd of promoters want to throw at it …*
>
> *Subjecting a man, willy-nilly and day after day, to intellectual forced-feeding on trivial fare, is not itself a trivial matter; to insist, by the effective gesture of coercion, that a man's right to dispose of his own faculties stops short of the interest of another in forcing him to endure paid-up banality, is not itself banal, but rather a sinister symbol of relative weighting of the independence of the mind of man and the lust to make a buck." (Black, 1953, p. 962)*

Even without individuals being force-fed, society may want to regulate trivial fare. Society may be concerned with how individuals process certain content and therefore impose restrictions e.g. regarding violent or sexually explicit content. This also applies to content considered to be hate speech. Another issue has been the protection of minors which in an on-demand world has become more difficult than in the traditional linear programming world. Attention intermediaries may bear certain obligations in this context.

The concern about how certain content is processed extends to content that is factually wrong and leads to risks how members of society live together (and how they vote in elections). Limits to the freedom of expression then imply the balancing of conflicting fundamental rights. Society or, for that matter, the legislator has to provide guidance about how attention intermediaries have to deal with these issues. The legislator will also have to define liabilities of attention intermediaries if they are misused by third parties trying to manipulate the behavior of attention providers as citizens in an open society. Codes of conducts and regulations can be developed to prevent or reduce certain risks.

5.2 Competition policy in the open society

An important question is which role competition policy can and should play in the context of multiple policy goals and policy instruments. While there is certainly a risk to include unrelated concerns into competition policy, it is also true that the severity of some problems can be related to market power and the scale of an operation. Competition policy instruments may then be appropriate to deal with the issue (exclusively or as one of several types of policy instruments).

A case in point is diversity of opinion. The idea here is that beyond the private benefits of variety, society may be better off in an environment in which different opinions are expressed and multiple

[127] Monti (2020) presents various regulatory options and institutional implementations of how to deal with attention intermediaries.

media outlets attract the attention of consumers. From this perspective, merger control can be an important element to preserve diversity of opinion, and authorities may want to use a stricter standard for attention intermediaries that carry news and other information of societal value.

Media regulation with a stricter merger control regime (and thus the use of competition-policy instruments) is an answer. Traditionally this has been applied to media with editorial policies.[128] It can also be applied to attention intermediaries without an editorial policy, so as to avoid a lack of diversity because of algorithmic design.[129]

In other instances there appears to be a risk of overreach of competition policy. For example, the violation of privacy obligations may be constructed as an exploitative abuse case even if this violation or the harm inflicted by it cannot be causally linked to market power. The ongoing case launched by the Bundeskartellamt against Facebook may be a case in point.[130]

In some cases, attention seekers may think (rightly or wrongly) that they are being treated unfairly by an attention intermediary. Rather than relying on general competition law, laws against unfair trade practices may apply. To the extent, that certain problems are prevalent in certain market environments, a sector-specific regulation may be the preferred instrument to address them.[131]

[128] For a short analysis of the Springer/ProSieben merger, see Monti (2020, Section 2). As he points out, the notion of attention intermediary is useful to better understand the market in which these firms operate.
[129] An important caveat is that many consumers want their view to be confirmed. Thus, with detailed data about consumer tastes, an attention intermediary will serve consumers according to their tastes no matter whether the intermediary is deemed to have market power. If this is so, then competition policy is ineffective; it is not an appropriate instrument to align consumers' incentives with society's interests.
[130] However, it is too early to draw definite conclusions.
[131] To this effect, the EU has adopted Regulation (EU) 2019/1150 on promoting fairness and transparency for business users of online intermediation services.

References:

Ambrus, A., E. Calvano, and M. Reisinger (2016). Either or both competition: A "two-sided" theory of advertising with overlapping viewerships. American Economic Journal: Microeconomics 8, 189-222.

Anderson, S. P. and S. Coate (2005). Market provision of broadcasting: A welfare analysis. Review of Economics Studies 72, 947-972.

Anderson, S. P., O. Foros, and H.-J. Kind (2018). Competition for advertisers and for viewers in media markets. Economic Journal 128, 34-54.

Anderson, S. P. and A. de Palma (2012). Competition for attention in the information (overload) age Rand Journal of Economics 43, 1-25.

Anderson, S. P. and M. Peitz (2019). Ad clutter, time use, and media diversity. CRC TR 224 Discussion Paper 140.

Anderson, S. P. and M. Peitz (2020). Media see-saws: Winners and losers in platform markets. Journal of Economic Theory 186, 104990.

Argentesi, E., P. Buccirossi, E. Calvano, T. Duso, A. Marrazzo, and S. Nava (2019). Ex-post assessment of merger control decisions in digital markets. LEAR report for the CMA. May 9, 2019.

Armstrong, M. (2006). Competition in two-sided markets. Rand Journal of Economics 37, 668–691.

Belleflamme, P. and M. Peitz (2015). Industrial organization: Markets and strategies. 2nd edition. Cambridge University Press.

Belleflamme, P. and M. Peitz (2018a). Inside the engine room of digital platforms: Reviews, ratings and recommendations. In: J. J. Ganuza and G. Llobet (eds.), Economic analysis of the digital revolution, Funcas Social and Economic Studies nº 4, Funcas.

Belleflamme, P. and M. Peitz (2018b). Platforms and network effects. In: L. Corchon and M. Marini (eds.), Handbook of Game Theory and Industrial Organization, vol. II, Edward Elgar, 286-317.

Belleflamme, P. and M. Peitz (2019). Managing competition on a platform. Journal of Economics and Management Strategy 28, 5-22.

Bergemann, D. and A. Bonatti (2019). The economics of social data: An introduction. Cowles Foundation Discussion Paper No. 2171.

Bergemann, D., A. Bonatti, and T. Gan (2019). Markets for information. Discussion paper, Yale University.

Biglaiser, G., E. Calvano and J. Crémer (2019). Incumbency advantage and its value. Journal of Economics and Management Strategy 28, 41–48.

Black, C. L. Jr. (1953). He cannot choose but hear: The plight of the captive auditor. Columbia Law Review 53, 960-972.

Boik, A., S. Greenstein, and J. Prince (2016). The empirical economics of online attention. NBER Working Paper 22427.

Bourreau, M. and A. de Streel (2019). Digital conglomerates and EU competition policy. Unpublished manuscript, March 2019.

Cabral, L. (2017). Staggered contracts, market power, and welfare. Unpublished manuscript.

Chen, Y. and C. He (2011). Paid placement: Advertising and search on the internet. Economic Journal 121, F309–F328.

Choi, J. P. and D.-S. Jeon (2020). A leverage theory of tying in two-sided markets with non-negative price constraints. American Economic Journal: Microeconomics, forthcoming.

Choi, J. P., D.-S. Jeon, and B. Kim (2019). Privacy and personal data collection with information externalities. Journal of Public Economics 173, 113-124.

CMA (2019). Online platforms and digital advertising. Market study interim report.

Crémer, J., Y.-A. de Montjoye, and H. Schweitzer (2019). Competition policy for the digital era. Final report presented to the European Commission.

de Cornière, A. and G. Taylor (2019). A model of biased intermediation. Rand Journal of Economics, forthcoming.

de Streel, A. (2020). Attention online intermediaries: A competition law perspective. Unpublished manuscript.

Economides, N. and I. Lianos (2019). Restrictions on privacy and exploitation in the digital economy: A competition law perspective. CLES Research Paper Series 5/2019.

Edelman, B. (2017). The market design and policy of online review platforms. Oxford Review of Economic Policy 33, 635-649.

Edelman, B., M. Ostrovsky, and M. Schwarz (2007). Internet advertising and the generalized second-price auction: Selling billions of dollars worth of keywords. American Economic Review 97, 242-259.

Edelman, B. and J. Wright (2015). Price coherence and excessive intermediation. Quarterly Journal of Economics 130, 1283-1328.

Eliaz, K. and R. Spiegler (2011). A simple model of search engine pricing. Economic Journal 121, F329-F339.

Ellison, G. (2005). A model of add-on pricing. Quarterly Journal of Economics 120, 585-637.

Evans, D. (2019). Attention platforms, the value of content, and public policy. Review of Industrial Organization 45, 775-792.

Evans, D. and R. Schmalensee (2016). Matchmakers. Harvard Business Review Press.

Ezrachi, A. and M. E. Stucke (2016). Virtual competition: The promise and perils of the algorithm-driven economy. Harvard University Press.

Federico, G., F. Scott Morton, and C. Shapiro (2019). Antitrust and innovation: Welcoming and protecting disruptions. Unpublished manuscript, May 24, 2019.

Filistrucchi, L. (2018). Market definition in multi-sided markets, in: OECD, Rethinking Antitrust Tools for Multi-Sided Platforms, 37-51.

Franck, J.-U. and M. Peitz (2019). Market definition and market power in the platform economy. CERRE report. May 2019. Available at www.cerre.eu

Furman, J., D. Coyle, A. Fletcher, D. McAuley, and P. Marsden (2019). Unlocking digital competition. Report of the Digital Competition Expert Panel, March 2019.

Gordon, B., K. Jerath, Z. Katona, S. Narayanan, J. Shin, and K. Wilbur (2019). Inefficiencies in digital advertising markets. Unpublished manuscript.

Greenstrein, S., M. Peitz, and T. Valletti (2016). Net neutrality: A fast lane to understanding the trade-offs. Journal of Economic Perspectives 30, 127–150.

Hagiu, A. and J. Wright (2020). When data creates competitive advantage. Harvard Business Review. January-February 2020.

Heidhues, P., B. Kőszegi, and T. Murooka (2012). Deception and consumer protection in competitive markets. In D. Sjöblom (ed.): The pros and cons of consumer protection. Stockholm: Swedish Competition Authority, 44-76.

Heidhues, P., J. Johnen, and B. Kőszegi (2018). Browsing versus studying: A pro-market case for regulation. Unpublished manuscript.

Hunold, M., R. Kesler, and U. Laitenberger (2020). Rankings of online travel agents, channel pricing, and consumer protection. Marketing Science 39, 92-116.

Irmen, A. and J. Thisse (1998). Competition in multi-characteristics spaces: Hotelling was almost right. Journal of Economic Theory 78, 76-102.

Johnen, J. and R. Somogyi (2019). Deceptive products on platforms. NET Institute Working Paper #19-13.

Jullien, B. and W. Sand-Zantman (2019). The economics of platforms: A theory guide for competition policy. TSE Digital Center Policy Paper No. 1.

Katz, M. and J. Sallet (2018). Multisided platforms and antitrust enforcement. Yale Law Journal 127, 2142-2175.

Klemperer, P. (1995). Competition when consumers have switching costs: An overview with applications to industrial organization, macroeconomics, and international trade. Review of Economic Studies 62, 515–539.

Monti, G. (2020). Attention intermediaries: Regulatory options and their institutional implications. Unpublished manuscript.

Motta, M. and M. Peitz (2019). Challenges for EU merger control. Concurrences N° 2-2019, 44-49.

Motta, M. and M. Peitz (2020). Big tech mergers. Information Economics and Policy, forthcoming.

O'Connor, D. (2016). Understanding online platform competition: Common misunderstandings, in A. Ortiz (ed.): Internet – Competition and Regulation of Online Platforms, Competition Policy International, 9-29.

Peitz, M. and M. Reisinger (2016). Media economics of the internet. In: S. Anderson, D. Stromberg and J. Waldfogel (eds.), Handbook of media economics, vol. 1A, North Holland (2016), pp. 445-530.

Peitz, M. and T. Valletti (2015). Reassessing competition concerns in electronic communications markets. Telecommunications Policy 39, 896–912.

Prat, A. and T. Valletti (2019). Attention oligopoly. Unpublished manuscript.

Schallbruch, M., H. Schweitzer, and A. Wambach (2019). A new competition framework for the digital economy. Report by the Commission 'Competition Law 4.0'. German Federal Ministry of Economic Affairs and Energy.

Schweitzer, H., T. Fetzer, and M. Peitz (2016). Digitale Plattformen: Bausteine für einen künftigen Ordnungsrahmen. ZEW Discussion Paper 16-042.

Schweitzer, H. and M. Peitz (2017). Datenmärkte in der digitalisierten Wirtschaft: Funktionsdefizite und Regelungsbedarf. ZEW Discussion Paper 17-043. October 2017.

Shapiro, C. and H. Varian (1999). Information rules: A strategic guide to the network economy. Harvard Business School Press.

Simon, H. A. (1971). Designing Organizations for an Information-Rich World. In: M. Greenberger (ed.). Computers, Communication, and the Public Interest. The Johns Hopkins Press.

Scott Morton, F., P. Bouvier, A. Ezrachi, B. Jullien, R. Katz, G. Kimmelman, D. Melamed, and J. Morgenstern (2019). Committee for the Study of Digital Platforms, Market Structure and Antitrust Subcommittee, report. Stigler Center for the Study of of the Economy and the State. Available at https://www.publicknowledge.org/wp-content/uploads/2019/09/Stigler-Committee-on-Digital-Platforms-Final-Report.pdf

Wu, T. (2019). Blind spot: The attention economy and the law. Antitrust Law Journal 82 (3). Citations from the preprint available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2941094

Zennyo, Y. (2020). Freemium competition among ad-sponsored platforms. Information Economics and Policy 50.

Download ZEW Discussion Papers from our ftp server:

http://ftp.zew.de/pub/zew-docs/dp/

or see:

https://www.ssrn.com/link/ZEW-Ctr-Euro-Econ-Research.html
https://ideas.repec.org/s/zbw/zewdip.html

IMPRINT

ZEW – Leibniz-Zentrum für Europäische Wirtschaftsforschung GmbH Mannheim
ZEW – Leibniz Centre for European Economic Research

L 7,1 · 68161 Mannheim · Germany
Phone +49 621 1235-01
info@zew.de · zew.de