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Market power, regulatory convergence, and the role of data in digital markets☆

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ABSTRACT

The increased economic importance of digital services has profoundly changed the power structure in telecommunications and media markets. Although these services sometimes directly compete with traditional telecommunications services, the regulatory obligations for both players differ significantly. This article discusses three important areas deemed relevant in order to define a coherent regulatory framework and to account for the specific peculiarities of digital markets: First, challenges associated with assessing market power in digital markets. Second, challenges in harmonizing different regulatory obligations for digital services, and third, the vital role of data and data protection in the context of data-driven business models.

1. Introduction

The increased economic importance of digital services such as instant messaging, video streaming, VoIP, or social networking has profoundly changed the market power in telecommunications and media markets. Traditionally, these markets were characterized by vertically integrated network operators, which controlled the physical infrastructure (e.g., the fixed and/or mobile network) and the deployed services available at these networks (e.g., TV, internet, voice telephony and SMS). Thus, the different services accessed via the same network (e.g., voice telephony and SMS), could be monetized individually. The regulation of services therefore focused on network operators to secure information and media diversity, or interoperability (i.e., interconnection) of the deployed services. However, in Next Generation Access Networks (NGAN) that rely on packet switching rather than line switching, the (physical) network layer is separated from the service layer; in consequence, the monetarization of different types of services by the network operator is no longer feasible. Moreover, network operators lose control over the services deployed on their networks. This also implies that network operators themselves become substitutable because digital services can be consumed independently from a specific network operator or network infrastructure: network access has become a commodity. On the other hand, also content and service providers lose control over the transmission, i.e., they are unable to guarantee a certain quality of service, which is relevant especially for real time applications such as (video) telephony.

Digital services deployed on the already existing physical network infrastructure are most commonly defined as over-the-top services

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(OTTs). BEREC (2016) defines OTTs as "content, a service or an application that is provided to the end user over the public Internet" (BEREC, 2016, p. 3). Thus, this definition excludes services that operate over private IP networks (e.g., intranets), and includes digital services provided by traditional (telecommunications) network operators, i.e., telcos. However, it is useful for the subsequent discussion to differentiate between digital services that are offered by telcos and digital services that are offered by companies without an own network infrastructure on the last mile. According to Krämer and Wohlfarth (2015), OTTs are sensu stricto characterized as services that do not own network infrastructure at the local loop, but offer their services to end users by utilizing the existing infrastructure of traditional telcos. Hence, they do not necessarily have a customer relationship ex-ante and are unable to exercise control over the data transmission on the last mile network. Depending on the provided service, OTTs can thus be differentiated in those having rather high and those having rather low infrastructure requirements. However, this does not imply that OTTs do not own *any* infrastructure or would not be able to exercise control over the transmission at all as the (technical) infrastructure deployed by OTTs comprises inter alia servers, data centers, private routes in the backbone of the internet, and content delivery networks, i.e., servers located close to the end users to cache content. Moreover, and in contrast to traditional telco services, OTTs are not necessarily financed by users only and may even provide their service free of charge to end users. Thus, OTTs can be differentiated according to their pursued business model that can either be one-sided or two-/multi-sided. As it will be outlined later, this differentiation and the resulting diverging economic principles (c.f., Rochet & Tirole, 2006) are crucial in analyzing the competitive effects of OTTs. Finally, the provided (digital) services of OTTs include substitutive as well as complementary applications to the already existing services of (traditional) telcos. To summarize, Fig. 1 provides a framework to differentiate OTTs according to these dimensions.

Moreover, with regard to the type of offered service, Peitz and Valletti (2015) differentiate between "communication services […] Real-time entertainment […] social networking sites […] marketplaces […] filesharing services […] storage services […] gaming services [… and] web browsing" (Peitz & Valletti, 2015, p. 899). Not explicitly mentioned are search engines. Search is considered by Krämer and Wohlfarth (2015) and—in the context of this paper—also deemed relevant as this type of service (i) is potentially dominated by a single provider, Google, and (ii) has far reaching economic impact as nearly half of the total internet advertising revenues on the internet are realized via search (c.f., IAB/PwC, 2017).

Several OTTs gained large popularity, many active users, and remarkable economic success. Consequently, the competitive environment in the telecommunications markets as well as the underlying rationales for regulatory interventions considerably changed (Koske, Bitetti, Wanner, & Sutherland, 2014). In this vein, Peitz and Valletti (2015) assess the competitive concerns of the changing industry and highlight the complexity, inter alia, due to different business models and different regulatory obligations for OTTs vis-à-vis traditional telco services. BEREC (2016) discusses the impact of OTTs on the current regulatory framework of the EU and highlight the challenges for regulatory authorities in the OTT environment (BEREC, 2016). We build on these observations and—by summarizing the relevant literature in the analyzed fields—provide an extensive discussion of the evolving regulatory problems and questions that arise when regulators and competition authorities deal with OTT services and seek to harmonize regulatory obligations in order to ensure a level playing field. Moreover, as most OTT services are data-driven, we discuss how the peculiarities of data and data protection in the context of data-driven business models affects this investigation. In doing so, we are to the best of our knowledge the first that combine the insights of current policy issues in (i) the investigation of OTTs, (ii) the harmonization of different regulatory frameworks, and (iii) the vital role of data in a consolidated way.

The remainder of this paper is organized as follows: First, we focus on the market for digital services in Section 2 and emphasize the challenges in assessing market power in these markets. Moreover, we provide potential solutions to these problems. As the assessment of market power is seen as a prerequisite for regulatory intervention, the provided insights are not only important if the competition between OTTs is analyzed, but especially if OTTs and traditional telecommunications services offer substitutive services and compete

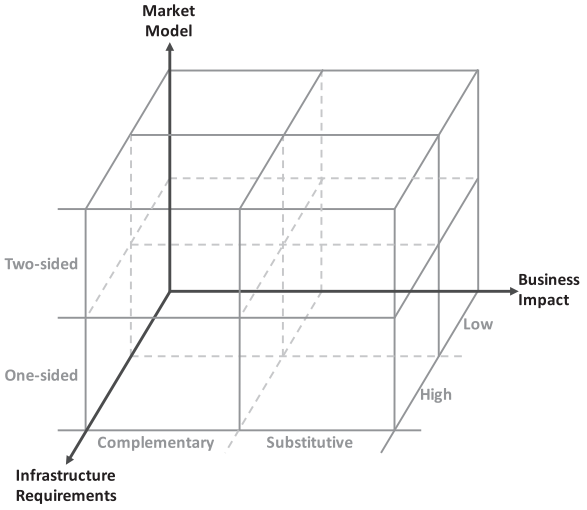

Fig. 1. A framework to differentiate OTTs (Krämer & Wohlfarth, 2015, p. 76).

against each other. The latter aspect motivates the discussions in Section 3, where the challenges in harmonizing different regulatory obligations to create a level playing field for competing services are outlined. Moreover, many dominant OTTs possess extensive user data and data may even be seen as a key asset of these OTTs. Simultaneously, the protection of (personal) data gets increasingly important for users and regulatory authorities, alike. To address this development in the complex environment outlined thus far, Section 4 discusses the vital role and peculiarities of data from a user's, company's, and regulatory authority's perspective.

2. Challenges in assessing market power in digital markets

A competitive or regulatory intervention is oftentimes triggered by an abuse of market power. According to standing legal practice in the US and EU, to assess market power, first the relevant market has to be defined. On this basis market shares, market concentration, or entry barriers are derived as a proxy for a firm's market power (c.f., OECD, 2012, 2014). Consequently, the definition of the relevant market is the first necessary step for possible regulatory intervention.

2.1. Defining the relevant market

The definition of the relevant market generally considers product, geographic and time dimensions. However, in the EU as well as in the US, market definition is predominantly conducted by means of the Hypothetical Monopolist Test (HMT). The idea of the HMT is that (at least) a firm with 100% market share (i.e., a monopolist) has to be able to execute market power in the considered (i.e., relevant) market. If this would not be true, according to the HMT, the relevant market has been defined too broadly and needs to be defined more narrowly. In this context, market power is understood as the ability of a firm to permanently set high(er) prices. For example, this idea is implemented in the Small Significant Non-transitory Increase in Price (SSNIP) test, which operationalizes the idea of the HMT (c.f., Moresi, Salop, & Woodbury, 2017) by considering a small but significant increase in price, usually an increase of 5%–10% over a period of one to two years. The SSNIP test is applied in the EU as well as in the US (with minor adaptations) to define the relevant market (OECD, 2012, p. 19). An alternative but conceptually similar method to implement a HMT is the Critical Loss Analysis, which has been applied in the EU and the US with increasing frequency over the past years (Hüschelrath, 2009). Competition and regulatory authorities have established great expertise in defining the relevant market by means of the HMT in traditional markets. This significantly contributed to greater legal certainty. However, in digital markets, market definition becomes increasingly complex, due to several reasons outlined next.

2.1.1. Determining substitutive effects

Considering the convergence and multi-functionality of different digital services and products, a product-related definition of the relevant market with regard to the substitutability is already very complex. For example, (instant) messages can be sent via SMS/MMS, WhatsApp, Twitter, Skype, Threema, social networks (e.g., LinkedIn or Facebook), games, and even via e-mail (e.g., between two smartphones), with slightly different characteristics, respectively. The definition of the relevant market thus depends on the economic substitutive effects and not necessarily on the comparability of the underlying business models, i.e., whether the service is provided free-of-charge via a two-sided business model, or fee-based via a one-sided business model (c.f., Peitz & Valletti, 2015). According to the logic of the HMT, the consideration of substitutive effects suggests that the relevant market will inherently be broader, making it less likely that a certain firm has market power.

2.1.2. Asymmetric substitutive effects

The aforementioned substitutive effects in digital markets are oftentimes asymmetric. Consequently, the substitutive effect on a service with few features (e.g., SMS) vis-à-vis a service with many features (e.g., WhatsApp) can be more pronounced than vice versa. Therefore, the definition of the relevant market inherently depends on the considered service. However, these issues are no peculiarity that only arise in digital markets. Instead, they have already emerged in the context of traditional telecommunications services, e.g., with regard to the substitutability of mobile and fixed telephone services (c.f., BEREC, 2012). Hence, solutions may already exist and it might be argued that these problems are, in principle, controllable. However, in digital markets many issues related to the definition of the relevant market occur in combination and have high requirements on the amount and quality of data. This additional complexity aggravates the applicability of potential solutions in practice.

2.1.3. High fixed, low marginal costs

Digital services and markets are generally characterized by high fixed and very low marginal costs. The HMT, and especially the Critical Loss Analysis, is implicitly grounded on the assumption that market power allows firms to set prices significantly above marginal costs (c.f., e.g., Hüschelrath, 2009). However, the relationship between prices and marginal costs can be distorted in digital markets because marginal costs are close to zero (Elzinga & Mills, 2011).

2.1.4. Multi-sided markets

Another characteristic of many digital markets is the existence of indirect network effects between different market sides. Markets entailing this feature are commonly classified as two- or multi-sided markets. Examples include ad-financed services (e.g., Google Search), but also ecommerce platforms such as eBay or the Amazon marketplace, as well as digital intermediaries (e.g., Uber or dating portals). Two- or multi-sided markets differ substantially from one-sided markets (such as the market for fixed network access) with regard to their economic characteristics (Armstrong, 2006; Caillaud & Jullien, 2003; Rochet & Tirole, 2003, 2006; Wright, 2004).

Consequently, the logic of the HMT is not immediately applicable. The scientific literature presented numerous suggestions on how to apply the SSNIP test on two- or multi-sided markets (Alexandrov, Deltas, & Spulber, 2011; Argentesi & Filistrucchi, 2007; Filistrucchi, 2008; Filistrucchi, Geradin, Van Damme, & Affeldt, 2014), e.g., by taking the sum of the prices of both market sides instead of the price of only one market side. Although these suggestions are contentious, they imply that both (respectively all) market sides have to be taken into consideration to define the relevant market for services active in a two- or multi-sided market. Hence, it is inappropriate to limit the definition of the relevant market to the substitutive effects on the user side, without simultaneously analyzing the substitutive effects on, e.g., the advertising side. This induces a significantly increased amount of data that is necessary in order to define the relevant market.

Additionally, "prices" have to be made comparable across different market sides. This task can be very complex, either due to the existence of different units (e.g., advertising prices based on clicks and prices per search query), or due to the fact that services are provided free of charge (c.f., Filistrucchi et al., 2014).

Furthermore, according to Filistrucchi et al. (2014), a distinction between transaction based and non-transaction based two-sided markets is necessary to apply the HMT. Whereas transaction based markets are defined by the imposition of fees per transaction (e.g., per ride at Uber), non-transaction based markets (e.g., Google Search) are defined by no fee at all, or, alternatively, by a participation fee that is independent of the (actual number of) transactions. Conceptually, to apply the HMT in transaction based markets, the assumption of a single market seems more reasonable, whereas non-transaction based markets might be classified as two interconnected markets. However, existing business models in digital markets are oftentimes characterized by both transaction-types simultaneously, i.e., by transaction based relationships (e.g., prices per click on shown advertisements) and by non-transaction based relationships (e.g., subscription models). Finally, it has to be noted that one- or multi-sidedness of a business model is not defined by the service type, but is a free corporate decision (Hagiu & Wright, 2013, 2015), possibly also influenced by the regulatory interventions to be expected.

2.1.5. Missing price

Closely related to the properties of multi-sided markets is the fact that digital services are oftentimes provided free of charge. This is not necessarily an expression of predatory pricing, but can be the outcome of an optimal pricing behavior in the logic of multi-sided markets—even for monopolists (c.f., e.g., Evans, 2008; Parker & Van Alstyne, 2005). Whereas this pricing scheme would lead to zero profits in traditional one-sided market (e.g., not billing customers for phone calls), it can be profit maximizing for platforms to set a zero price for end users and to generate revenues only from the other market side (e.g., advertisements). From a regulatory perspective, this pricing complicates the definition of a relevant market in several dimensions: First, in the past, regulatory authorities were inclined to judge that there is no market without the existence of a price and consequently, no potential abuse of market power (c.f., Filistrucchi et al., 2014, e.g., Kinderstar v Google or BSkyB v Kirch PayTV). Second, it is unclear how a markup of 5%–10% can be calculated (e.g., to apply the SSNIP test). It has been proposed to consider quality reductions rather than (price) markups, e.g., by displaying more advertisements (Dewenter, Rösch, & Terschüren, 2014; Peitz & Valletti, 2015), by expanding a service's data usage (Haucap & Stühmeier, 2015), or by changing technical parameters of the service. However, this also induces a variety of methodical questions, because either a relationship between the number of displayed advertisements and demand-related behavior (click behavior, respectively), or between data usage and demand (which can potentially be affected by the quality of experience), has to be estimated in lieu of using the price-demand function. In most cases, this does not seem to be feasible; in any case, there is no (scientific) consensus for an objective measure. Third, a service provided free of charge (potentially even below marginal costs) for one market side, generally implies that the price for the other market side is above marginal costs. This asymmetric pricing is typical for multi-sided markets (Rochet & Tirole, 2006). With respect to the HMT (or the SSNIP test), this implies that current market prices (at one market side) are an inappropriate reference value. This may result in the so called "cellophane fallacy" which leads to markets being defined too broadly, which induces that the identification of market power is less likely (Dewenter et al., 2014). Finally, services provided free of charge are difficult to grasp from an economic perspective, because the zero-price has (also) psychological effects on consumers: even slight deviations from a price of zero can have major implications on the resulting demand (Shampanier, Mazar, & Ariely, 2007). This strong non-linearity has to be considered in assessing market power. However, as these effects are empirically hard to determine, the complexity of concepts relying on the effects of changing prices (e.g., the SSNIP test) additionally increases, making their application burdensome.

2.1.6. Bundled offers

In digital markets, services are frequently offered in bundles. For example, Google offers a variety of different services (e.g., search, e-mail, maps, word processing), which are all accessible directly via the Google homepage by using the same login credentials. Bundled offers are also typical for telcos. Furthermore, they are not limited to the bundling of different services at the network level (e.g., broadband access, TV, voice telephony), but also exist in combination with (unrelated) OTT services (e.g., free premium subscriptions for music streaming services during the contractual period). Usually, bundles can have pro-competitive as well as anti-competitive effects (c.f., e.g., Nalebuff, 2003). Therefore, the existence of bundled offers does not immediately indicate market power. However, the existence of bundled offers makes the application of the SSNIP test more difficult (Pereira & Vareda, 2013; Pereira, Ribeiro, & Vareda, 2013). Additionally, bundled offers are scrutinized critically, if they are perceived as a device of a dominant firm trying to leverage its market power from one market to another market (c.f., Nalebuff & Majerus, 2003; for a compilation of relevant cases). In this context, increased attention is currently directed to Google: The European Commission (2016) sent a statement of objections to Google alleging that manufacturers are contractually obliged to define "Google Search" as default search engine in order to (be also allowed to) offer the Google Play store on produced devices (Google Android Case 40099; additionally, c. f., Edelman, 2014).

2.1.7. Exclusive offers and restrictions

Competing digital services may try to differentiate themselves inter alia by acquiring exclusive content (e.g., exclusive series on video streaming platforms). In other cases, market players may be impeded to be active on several platforms simultaneously through exclusive contracts, e.g., by contractually prohibiting advertisers to transfer advertising campaigns to other platforms (c.f., e.g., Monopolkommission, 2015a). Ultimately, these practices try to increase the switching costs for market participants in order to establish lock-ins, which weaken competition. Although strong competition for exclusive content can occur ex-ante ("competition for the market"), weaker competition in the market may evolve ("competition in the market"). Thus, exclusive contracts have ambiguous effects on total welfare (Farrell & Klemperer, 2007). The assessment of market power via the static HMT can hardly capture this dynamic dimension of competition.

2.1.8. Customization and business services

The characteristics of digital goods allow to fully personalize the offered services ("mass customization"). This may not only result in lock-in effects, but also in difficulties in defining the relevant market with respect to the product and time dimension. For example, specialized as well as business services have traditionally been considered as separate markets because they are relevant to different types of customers (private end customers and business customers, c. f., e.g., OECD, 2014). However, in the context of digital services, this clear-cut separation between the two types of customers is not always feasible, because (i) services are used in both contexts simultaneously (e.g., Skype or Dropbox) and (ii) there is a fluent transition between privately and commercially used services due to a multitude of configuration possibilities (e.g., with regard to the capacity of a cloud storage or the performance of on-demand (cloud) computing).

2.1.9. Multidimensional market definition

Another issue arises from the fact that a solely product-based definition of the relevant market is not sufficient (Peitz & Valletti, 2015). For example, although services are offered world-wide, the geographic location of a customer can have immediate impact. For example, some services are not available in every geographic region or only in English (e.g., mobile payment systems like ApplePay, video streaming services like Hulu, or personal assistants like Amazon Alexa, Google Home or Apple HomePod), or services are offered with a reduced amount of features (e.g., Google Maps where information on public transportation are only integrated for some cities). Moreover, the access technology (i.e., terminal devices or the network access, respectively) can have an impact on the service availability or service quality. Both examples illustrate the necessity to (additionally) consider the geographic dimension in defining the relevant market. Furthermore, digital services are highly dynamic with regard to the features offered, market shares and relevant competitors. In combination with quickly changing user preferences, this might induce to (also) consider the time dimension in defining the relevant market (Peitz & Valletti, 2015).

2.1.10. Dynamic markets

As outlined above, digital markets are in many cases highly dynamic which leads to quickly shifting market boundaries. For example, Google (now Alphabet) acquired more than 229 firms since 2001 (CB Insights, 2017) and now offers more than 100 different services (Google, 2017). The established ecosystem and the possibility to promote or integrate own services vis-à-vis competing services (c.f., Google Search (Shopping) Case 39740 and European Commission, 2017a) highlights the complex interrelations in these dynamic markets. Moreover, as data might be seen as a central input for innovation, and as digital firms have the possibility to increase their amount of data by offering new services (c.f., Section 4 as well as Manyika et al., 2011), the dynamics of digital markets may arguably increase even further. However, this does not necessarily imply that the market power relations actually change, because the relationship between market share and market power is unclear (especially) in digital markets (c.f., Section 2.2). However, the HMT is inherently relying on the assumption of static (i.e., temporally invariant) market conditions as well as on the concept of demand-side substitution (OECD, 2012, p. 19). As just argued, assuming static market conditions is inappropriate in a dynamic framework. Moreover, the established ecosystems of digital service providers (e.g., Google, Apple, Amazon) may also lead to lock-ins and switching costs (related, c. f., Klemperer, 1987; Wohlfarth, 2017). Consequently, one may also argue that the preconditions for the existence of demand-side substitution are questionable. Finally, from a conceptual perspective, it has to be stated that an integration of supply-side substitution into the HMT (i.e., the short-term emergence of substitutes that occurred after the hypothetical price increase, e.g., through the reallocation of resources from existing companies) is possible (c.f., e.g., Briglauer, 2008). However, this concept is based on speculations and is thus, empirically, not objectively applicable. Therefore, it is hardly applied in practice. To summarize, the HMT may be inappropriate to capture the dynamics of digital markets.

Insight 1 *In accordance with established legal practice, the first step to assess market power is the definition of the relevant market. This is conducted by the Hypothetical Monopolist Test or closely related concepts. The complex economic relationships of digital markets and services require numerous extensions to the standard practice in order to define the relevant market. These extensions have high data requirements, which are often impossible to meet in practice. Consequently, a robust and reliable definition of the relevant market for digital services is in many cases infeasible.*

2.2. Market shares as an indication of market power

After the relevant market has been defined, market shares are of particular importance as an initial trigger for the assessment of market power. In the EU, dominance is further analyzed if a single firm has a market share of over 40% (c.f., Article 102 of the Treaty on the Functioning of the European Union (TFEU) and additionally, European Commission, 2013). In Germany, for example, the national

Act Against Restraints of Competition (GWB) defines a threshold of 40% for a single firm (GWB §18(4)), a threshold of 50% for up to three firms (GWB §18(6)), and a threshold of 66.6% for up to five firms (GWB §18(6) no. 2). In the US, dominance is de facto only considered if market shares exceed 70% (U.S. Department of Justice, 2008, p.21). Although market shares are even in traditional markets no *sufficient* evidence for market power (c.f., Kaplow, 2013, 2015), we argue next that the role of market shares is even less clear in digital markets.

First, market shares exceeding 40% are no special feature in digital markets as digital business models inherently require high market shares due to scaling and network effects (Peitz & Valletti, 2015). Moreover, these market shares highly depend on the underlying (assumed) relevant market, whose definition bears several problems as outlined in Section 2.1.

Second, one could argue that certain digital markets are sufficiently contestable because potential competitors could quickly adapt a successful business model (Argenton & Prüfer, 2012; Krämer & Wohlfarth, 2015). The theory of (perfectly) contestable markets states that even a monopolist is (under certain assumptions) not able to exploit its market power, because it would be replaced by a rival firm, which is not yet active in the market. Although the underlying assumptions of the theory of (perfectly) contestable markets are unlikely to be matched in existing, traditional markets (Schwartz & Reynolds, 1983), it nevertheless can be argued that many digital markets comply with the main assumptions. For example, sunk costs for market entry are—especially for firms already offering other digital services—comparably low as these are mainly determined by human capital. Additionally, the necessary technical infrastructure can be scaled dynamically or leased, e.g., by outsourcing computing infrastructure to the cloud. These features may enable established firms to enter adjacent markets fairly fast and on a large scale, if the expected earnings are high enough and the costs of exiting the market are relatively low.[1] Thus, market entry is likely, especially if the established firm tries to exploit its market power, e.g., by (i) raising the price of a previously free service, (ii) degrading the quality of the service, or (iii) displaying more advertisements. Hence, it is often argued that in the highly dynamic environment of digital markets, the necessity to maintain a continuously high innovative performance is a precondition to remain successful in terms of the "creative destruction" according to Schumpeter (Haucap & Heimeshoff, 2014; Haucap & Stühmeier, 2015; Monopolkommission, 2015a). Two examples highlight that contestability is feasible: First, Google successfully entered the search engine market, which at that time had been dominated by Altavista. Second, as Facebook's acquisition of the messaging service Whatsapp became official in February 2014, privacy concerns resulted in many users installing the alternative service Threema, which provided a strong end-to-end encryption. As a result, Threema was ranked as the number one application in the iTunes App store in February 2014 (c.f., Beuth, 2014), and WhatsApp was forced to introduce end-to-end encryption itself. However, although leading firms like Google or Facebook apparently manage to maintain their dominant position in certain service segments over several years, it is neither theoretically, nor empirically deducible whether this is a result of market power, a result of continuously winning the innovation contest (possibly, due to better data; c. f., Section 4), or a result of not exploiting market power in the sense of the contestable markets theory. With this said, a direct relationship of market power and market shares cannot be derived.

Third, it has to be stated that market power in digital markets is not necessarily determined by a high market share in a certain (sub-) market, but by the presence in many different markets (c.f., Prüfer & Schottmüller, 2017). As many digital business models are essentially based on the collection of data, the presence in different markets and the connection of the data derived in these markets, which concerns the very same user, might be seen as valuable (Monopolkommission, 2015a). Consequently, market power might rather be defined by the quality of the gathered data concerning a specific user (c.f., Section 4) than by the market share in the underlying market.

Fourth, the interaction of players at different layers of the value chain is crucial in assessing market power. Although it is technically relatively easy to differentiate the transmission of data (carried out by the network operator) from the applications that rely on that transmission (i.e., the digital service), economically, the consumption of the digital service is nevertheless seen as an inseparable bundle (Peitz & Valletti, 2015). Whereas the transmission itself is worthless without the existence of complementary services, the very same holds for digital services which are useless without the necessary accessibility. Consequently, without regulatory limitations, the market power of an OTT—if present at all—is conditional on the transmission of the network operator; at least with regard to the users reachable by the considered network operator. On the other hand, the market power of the network operator—if present at all—is conditional on the existence and attractiveness of the services reachable over its network. This intertwined structure of relative market power is also at the core of the net neutrality debate (c.f., Krämer, Wiewiorra, & Weinhardt, 2013; for an overview). In this context, market power can possibly be strengthened by vertical integration of service providers and network operators (Lee, 2013; Peitz & Valletti, 2015). For example, this can be achieved by acquiring exclusive broadcasting rights for sporting events, which are afterwards only available in a specific network, or by upgrading the own network infrastructure, respectively developing own operating systems which provide the content of the offered service exclusively or at least preferentially. Thus, to assess market power, the dependencies along the value chain of the internet have to be taken into account. However, these dependencies are only insufficiently represented by the isolated consideration of market shares.

Finally, (high) market shares as a proxy for (high) market power, as suggested by competition law, can already be criticized in traditional markets for inhomogeneous goods. For example, Kaplow (2013, 2015) argues that there is no valid method to extrapolate market power from market shares (in markets with inhomogeneous goods). Moreover, Kaplow states that it is necessary to estimate the market power of a considered firm to properly define the relevant market, which arguably leads to a vicious circle.

[1] In this context, contestability and supply-side substitution are closely related because both concepts assume that exploiting market power (e.g., by a price increase) might result in the emergence of new, substitutive products or services. The concept of contestability emphasizes the disciplining effect due to the threat of replacement—although an actual market entry does not have to occur. In contrast, the concept of supply-side substitution refers to the potentially (compared to the static consideration of the elasticity of demand) increased competitive pressure exerted by close rivals.

Insight 2 *In digital markets a high market share in only one (i.e., the considered) market is not a sufficient indication for market power. High market shares are commonly resulting from concentration tendencies, which, however, do not necessarily imply market power, because many digital markets might be considered as contestable. However, market power may arise from data about specific users, often stemming from access to several heterogeneous data sources across different markets. Consequently, high market shares in many different markets could indeed constitute market power.*

2.3. Alternative approaches to defining the relevant market and to assessing market power

Due to the outlined challenges in assessing market power with traditional concepts, alternatives to assessing market power in digital markets are discussed next.

2.3.1. Pricing pressure

Instead of using the HMT, alternative concepts summarized by "pricing pressure evaluations", e.g., the concept of Upward Pricing Pressure (UPP), which initially does not require a definition of the relevant market (Farrell & Shapiro, 2010), are highlighted next. The concept of UPP has been suggested to initially and quickly evaluate corporate mergers. Especially in the US, the concept of UPP is controversially discussed. The underlying idea is to determine whether a firm has an incentive to increase the price of its own products, the products of the merged firm, or both prices post-merger. In its application, price effects are calculated based on the previous demand, assumptions with respect to the substitutive effects (i.e., diversion ratios[2]), and assumptions regarding efficiency advantages gained through the merger. Assuming a two-firm, two-product merger, the merged firm will set a higher price for product i, if $UPP_i > 0 \Leftrightarrow D_{ij} \cdot (P_j - C_j) > E_i \cdot C_i$, with D_{ij} representing the diversion ratio, P_i the prices, C_i the marginal costs, and E_i the efficiency gain due to the merger for products $i, j = 1, 2, i \neq j$ (c.f., Farrell & Shapiro, 2010, p. 11). As it can be seen in this inequality, the larger the diversion ratio, i.e., the fraction of lost sales from product i that is recaptured by product j, or the higher the margin of product j, the more attractive is a price increase of product i (c.f., OECD, 2012, p. 19). Although the UPP was introduced with regard to merger analysis, the concept is closely related to HMT methods. It may be a suitable device to quantify the lost sales due to increasing the price that are recaptured by other products owned by the hypothetical monopolist. The higher this "recapture percentage", the higher the incentive to increase the prices (c.f., Shapiro, 2010, p. 90f). This logic shows the tight connection to traditional approaches to define the market. However, similar to the HMT, applying the UPP or related concepts basing on pricing pressure evaluations in practice is seen as critical in dynamic markets because they (i) are grounded solely on supply-side substitution, which is difficult to measure (c.f., Section 2.2), (ii) assume efficiency gains with respect to marginal costs, which are anyhow close to zero in digital markets, and (iii) assume markets to be in equilibrium, which is questionable in the highly dynamic environment of digital markets.

2.3.2. Simulation

Especially in the context of mergers, simulation models are occasionally employed. Most commonly, oligopoly models are considered, which are calibrated according to the conditions of the considered market. Although simulation models have several benefits like the possibility to analyze the effects of market entry, market exit, or imposed remedies, the data requirements for such an approach are very high (e.g., with regard to econometric estimations of the demand function) and many degrees of freedom exist (OECD, 2012, p. 19). Moreover, complexity and data needs make it difficult to carry out robust, short-term estimations of market power. However, simulation models are generally suitable to describe complex dynamic market models.

2.3.3. Direct effects approach

Due to the aforementioned problems arising in complex, dynamic markets, the assessment of market power without a prior definition of the relevant market has been suggested: the so called "Direct Effects Approach" (OECD, 2012, p. 19; Zingales, 2013). Instead of considering margins or elasticities, this approach directly focuses on "potential anticompetitive effects, such as the reduction of output" (U.S. Department of Justice, 2008, p.30). At the EU level, the approach can be seen as the continuation of the "Effects Based Approach" relating to Article 102 TFEU; however, this interpretation is de lege lata controversial. The Direct Effects Approach assumes that it is sufficient to show that a firm *abuses* its market power, i.e., demonstrating that a firm *has* market power in the relevant market in the first place is not necessary anymore, because this is seen as necessary precondition for an abuse (Gual et al., 2005). Consequently, if there is an evidence of competitive harm, then there inherently is also evidence of market power. The U.S. Department of Justice (2008) has formulated similar suggestions and thus, stimulated an intense debate concerning the Direct Effects Approach. Currently, the insufficient legal certainty of the procedure arising from (i) the unavailability of a standardized approach to assess market power using the Direct Effects Approach, and (ii) lacking precedents, are criticized (OECD, 2012, p. 19). However, it might still be useful to intensify the debate to establish the Direct Effects Approach de lege ferenda also in the EU. Prospectively, this could introduce an alternative device to enforce regulatory goals. For example, access regulations (e.g., granting access to a dominant firm's data to intensify competition), interconnection regulations (e.g., requiring communications OTTs to forward calls or messages to other OTT networks), or transparency obligations (e.g., requiring Google to publish the influencing factors of the search ranking algorithm) might be introduced for dominant firms in digital markets independent of the definition of the relevant market where market shares are an insufficient signal of market power.

[2] The diversion ratio represents the increase in additional sales (or increase in revenue share) by a firm relatively to the lost sales (or decrease in revenue share) by the other firm. Consequently, if the diversion ratio is high, the products of the firms are close substitutes.

Insight 3. *Alternatives to the commonly used definition of the relevant market exist. However, the applicability of these approaches in digital markets requires further examination. Especially the Direct Effects Approach is a promising alternative, because it does not rely on the definition of the relevant market which is associated with several problems in digital markets.*

3. Challenges in harmonizing different regulatory obligations for digital services

Individual players in the ecosystem of the internet are often characterized by different regulatory guidelines or obligations. Interestingly, such asymmetric regulation can even be observed for services that obviously offer substitutive products. This is particularly immanent in the field of telecommunications services, in the context of which a vivid scientific (Allouet, Le Franc, Marques, & Rossi, 2014; Brown, 2014; Krämer & Wohlfarth, 2015) as well as political (BEREC, 2016; Rossi, 2015) debate evolved. In principle, it can be argued that end customers might benefit if certain regulatory obligations, which have been established for traditional telecommunications services, would also be binding for OTT services. For example, if messaging services would be obliged to forward messages to other messaging networks (e.g., a WhatsApp message is forwarded to Apple's iMessage network), the increased positive direct network effects might lead to users being better off just like in fixed or mobile telecommunications networks. However, it can also be argued that this impedes innovation as service providers might be unable to differentiate themselves, e.g., if messages cannot be encrypted, because the receiving network uses another encryption method or no encryption at all. In the following, we will elaborate on these issues with respect to the field of traditional telecommunications services vis-à-vis communications OTTs; however the discussion concerning the necessity of regulatory harmonization is under no circumstances limited to this area. Instead, existing regulations for brokerage of transportation services (taxi licences vs. Uber), for banking services (vis-à-vis payment services such as Paypal) and for many areas of media regulation (e.g., must carry regulations, protection of pluralism, book price fixing) have to be scrutinized in the age of digitization (c.f., e.g., Monopolkommission, 2015a; Haucap, 2015).

Considering the competitive effects of OTTs and traditional telecommunications services, the necessity to harmonize the regulatory framework is motivated by the fear of competitive distortions as OTTs, providing substitutive services to the existing regulated telecommunications services (e.g., messaging, voice telephony, c. f., Section 1), are subject to much less restrictive regulatory obligations (Krämer & Wohlfarth, 2015; Monopolkommission, 2015a). Such substitutive effects are present in fixed and mobile networks alike. For example, it is observable that traditional telcos lose traditional revenue streams from SMS and MMS particularly due the success of WhatsApp, Apple iMessage or the Facebook messenger. Similar, substitutive effects arise for voice telephony, e.g., via services such as Skype, WhatsApp or Viber.

Although these de facto substitutive effects are present (irrespective of the problems outlined above with respect to the definition of the relevant market) and the principle of technological neutrality (c.f., e.g., Körber, 2015) grounded in the EU Directive 2002/21/EC exists,[3] communications services offered by OTTs are generally not affected by sector specific regulatory obligations (BEREC, 2016; Monopolkommission, 2015b). Existing regulatory requirements for communications services can roughly be differentiated in three categories: (i) requirements protecting competition (inter alia, access regulation, interconnection and interoperability agreements), (ii) requirements protecting consumers (inter alia, integrity of networks, minimum quality standards, forwarding of emergency calls, data retention, existence of an end user contract with specified requirements on the data protection, transparency obligations, central number assignment and a central, consistent number directory), and (iii) measures safeguarding regulatory monitoring (inter alia, the duty to collaborate with respect to data provision). Different regulatory obligations are used because OTTs are not classified as Electronic Communications Service (ECS) in the EU or Common Carrier in the US, respectively. Instead, OTTs are legally defined as an Information Society Service (ISS), or Information Service. Sector specific regulation is not applied to the latter (BEREC, 2016). However, due to the technological convergence of networks and services, there exists uncertainty with respect to the "correct" classification of OTT communications services under the existing regulatory framework—in the EU and the US. For example, in the US, internet access providers who have been classified as Information Service in 2004 have been re-classified as Common Carrier in order to allow the jurisdiction under applicability of the sector specific regulation (Frieden, 2014). In the EU, the definition of an ECS is currently based on three characteristics (c.f., Article 2(c) of Directive 2002/21/EC): First, the service is usually provided for remuneration. Second, the service consists wholly or mainly in the conveyance of signals, and third, services that provide or exercise editorial control over content transmitted are excluded. Here, the first point is understood broad in current jurisdiction and also comprises services free of charge, if they are ultimately profit-oriented (BEREC, 2016). Vital for the unequal treatment of traditional telco services and OTT communications services is the second point, because it differentiates ECS from ISS according to Article 1 of Directive 98/34/EC. However, it has to be noted that this aspect is considered by the proposal for establishing the European Electronic Communications Code (c.f., COM (2016) 590 final), which will be discussed below.

A request of information by BEREC at the national regulatory authorities revealed ambiguous interpretations with respect to the meaning of "transmission of signals" in the EU member states. However, BEREC (2016) suggests the following taxonomy and classification of OTT services based on the current regulatory framework[4]

[3] The principle of technological neutrality refers to the "desirability of making regulation technologically neutral, […] it neither imposes nor discriminates in favor of the use of a particular type of technology" (Directive 2002/21/EC recital 18). In this context, this *might* imply that communications services offered by OTTs and traditional telcos might be treated equally because they both offer substitutive products; either by lifting regulatory obligations (for traditional telcos) or adding new obligations (for OTTs).

[4] It has to be noted that the following classification of OTTs differs substantially from the ones introduced by Krämer and Wohlfarth (2015) and Peitz and Valletti (2015). In the definition provided by BEREC, OTT-0 services also comprise communication services offered by traditional telcos.

- *OTT-0:* Communications services that can be classified as ECS. According to BEREC, this especially comprises services that have a connection to the public telephone network (e.g., Skype-Out).
- *OTT-1:* Communications services that cannot be classified as ECS but compete with an ECS (e.g., Skype (without Skype-Out) or instant messaging).
- *OTT-2:* All other OTT services, i.e., those who do not offer communications services, e.g., ecommerce or streaming services.

In this taxonomy, the question whether the differentiation between OTT-0 and OTT-1 is meaningful arises. Additionally, it is questionable whether regulatory obligations for ECS should be relaxed, or whether the regulatory framework should be adjusted in order to allow the classification of OTT-1 services as ECS to ensure equal competition, i.e., a level playing field. On the one hand, several regulatory obligations (e.g., the guaranteed availability of emergency calls) seem to be dispensable in the age of digitization and ubiquitous connectivity. Therefore, they should be reviewed with regard to their commensurability (Brown, 2014). On the other hand, some regulatory obligations (e.g., interconnection and transparency obligations) might also be seen as useful remedies for OTT communications services (which are currently not classified as ECS), because they provide a substitutive service and users could benefit from these obligations just like they should with regard to traditional telecommunications services (e.g., fixed or mobile network access).

Particularly, taking into account the aforementioned difficulties in defining the relevant market, and considering the length of ongoing competition cases in this context (e.g., seven years for the Google shopping (search) case[5]), the effectiveness of ex-post competition law in such highly dynamic markets can be questioned (Monopolkommission, 2015a). Therefore, ex-ante regulations for dominant OTT services may be seen as more favorable in some cases. In this context, the German monopoly commission (c.f., Monopolkommission, 2015b) initiated a discussion concerning data portability (comparable to the number portability of traditional telcos), interconnection obligations (in the sense of interoperability), and with respect to emergency calls.

However, it has to be traded off whether such obligations are justified after all. For example, with regard to interconnection obligations, it has to be noted that the possibility to multi home several service providers allows users to switch between providers quite easily and typically does not induce high (additional) costs. Notwithstanding, even if a harmonized regulatory framework would exist, there will nevertheless be technical peculiarities that differentiate an OTT service from an integrated service of the network provider. Particularly, OTTs are unable to influence the transmission of data packages (e.g., prioritization), which, in turn, might lead to competitive distortions, even in the presence of the current net neutrality regulations (c.f., net neutrality debate as outlined by, e.g., Krämer et al., 2013).

Hence, more nuanced approaches have been suggested. For example, it has been discussed to assign obligations with regard to data protection and data retention on OTT communications services only and to implement further regulatory obligations later on demand (Brown, 2014). Of course, in the EU the General Data Protection Regulation (GDPR; becoming effective in May 2018) will also apply to OTT services. Therefore, a harmonization may also be achieved by lifting additional regulations concerning data protection and secrecy of telecommunications for telco services (Allouet et al., 2014; Brown, 2014; and Section 4). Specifically, Monopolkommission (2015b) and Larouche, Purtova, and Peitz (2016) suggest to include the sector-specific regulations of the ePrivacy Directive into the GDPR (c.f., Regulation (EU) 2016/679) to omit sector-specific data protection rules as far as possible.

Alternatively, it has been suggested to drop the defining characteristic of the "conveyance of signals" in order to classify a service as ECS (Allouet et al., 2014; Brown, 2014; Monopolkommission, 2015b). In this context, the proposed European Electronic Communications Code (c.f., COM (2016) 590 final) makes the suggestion for a new legal distinction. Specifically, it distinguishes between "interpersonal communications services" that are "number-based" (i.e., connecting to the public switched telephone network) and "number-independent interpersonal communications services" (i.e., not connecting to the public switched telephone network, c. f., Article 2, number 5 and 6, respectively of the Code). Consequently, referring to the classification of BEREC (2016) outlined above, OTT-0 as well as OTT-1 services would be treated as ECS. It is questionable whether this distinction is very useful, because, in essence, it does not solve the aforementioned problems. Instead, a distinction that is based on substitutability, or at least functional similarity would be preferable.

Additionally, BEREC (2016) proposes to issue transparency as well as reporting obligations on OTT communications services to enable regulatory authorities to collect relevant data in the first place (e.g., data required to decide whether a regulation might be necessary). This could also alleviate the data collection problems related to defining the relevant market (see Section 2.1). BEREC (2016) adds that national regulatory authorities should be granted with additional authorities under the existing net neutrality regulation (in the course of the "Connected Continent" regulation package) as well as under the changes of the framework directive by Directive 2009/140/EC (e.g., with respect to the surveillance of traffic flows and with respect to access and interconnection questions) for OTTs which are not classified as ECS. Furthermore, BEREC (2016) emphasizes that certain directives (e.g., the ecommerce Directive 2000/31/EC as well as the ePrivacy Directive 2002/58/EC) are already applicable to ISS under certain conditions.[6]

Above, we have outlined that the consideration of different regulatory obligations is not limited to *substitutive* OTT communications services only. However, complementary OTT services do not directly exert a negative impact on telcos' existing business models, because the value of the network access increases with the availability of complementary services (Peitz & Valletti, 2015). Moreover, evolving regulatory problems, e.g., with regard to the allocation of revenues from complementary services between OTTs and telcos, are primarily addressed by the net neutrality debate. In this context, it is nevertheless worth investigating whether (most commonly) two-sided OTTs that are perceived as dominant, generally qualify for regulatory obligations. For example, an obligation to grant access to OTT

[5] See: http://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=1_39740.

[6] In fact, the proposal for a (new) ePrivacy Regulation published in January 2017 also considers new (OTT) players as outlined by European Commission (2017c).

platforms would be conceivable if some kind of "essential facility" is alleged. In essence, the Essential Facility Doctrine (EFD) is a concept that specifies the circumstances under which a monopolist controlling a bottleneck (the essential facility) needs to grant access to competitors (c.f., Renda, 2010; OECD, 2000; Graef, Wahyuningtyas, & Valcke, 2015). Although the conditions vary between the US and the EU (c.f., OECD, 2000; for an extensive overview), the common denominator can be seen in the necessity that the bottleneck (i.e., the input) cannot be replicated or purchased by third parties. However, granting access is a severe regulatory intervention and the scientific discussion is yet at an early stage (c.f., Section 4.5). Furthermore, next to the already discussed problems in defining the relevant market, the adaption of known regulatory obligations or concepts like the EFD has to be considered in light of the underlying market model and the resulting economic effects (Krämer & Wohlfarth, 2015). Especially the activities of prominent OTTs operating in a two- or multi-sided market environment (e.g., Facebook, Google Search, AppStores) require special attention because welfare effects strongly depend on the respective market conditions. Here, central points comprise the questions (i) whether these markets can be seen as contestable (Argenton & Prüfer, 2012; Krämer & Wohlfarth, 2015), which would induce that a regulation would be inappropriate, and (ii) whether—under the assumption of an "essential facility"—access obligations would actually increase total welfare, which is questionable from an economic point of view in the context of two-sided markets (Krämer & Wohlfarth, 2015; Verdier, 2013). Moreover, providing evidence for an essential facility is (next to the problems in assessing market power) de facto very difficult in the context of digital goods. For example (and as we will highlight in the following section), evidence for the essentiality of a *specific* data set seems hard to provide because the actual value might be seen in the combination of different data sets from different sources and algorithms trained upon the available data. Therefore, the (justified) high legal barriers for access obligations (for instance, according to the US Essential Facility Doctrine or the EU Article 102 TFEU) seem insurmountable (Graef et al., 2015).

Insight 4 *In general, the provision of OTT services increases the attractiveness of network access from which traditional telcos can benefit. Although some OTT communications services are in (direct) competition with the communications services of traditional telcos, in many cases, the regulatory obligations for both differ—especially with respect to access, interconnection, interoperability, transparency, and data protection obligations. In this context, a harmonization of the regulatory framework that establishes a level playing field by either lifting regulatory obligations for traditional telcos or imposing new rules for (communications) OTTs should be examined; especially with regard to provisions concerning data protection and data retention, but also with respect to transparency and reporting obligations.*

4. The role of data

Many of the OTTs currently perceived as dominant posses extensive user data. This enables to target advertisements or recommendations to the users' interests but also to personalize or improve services that are attractive to users. Consequently, (personal) data might be seen as the key asset of many OTTs and a potential source of market power. Hence, especially if regulatory interventions are discussed, the vital role and peculiarities of data need to be considered. This also requires to address the protection of (personal) data. In the following, we highlight and discuss these issues from a user's, firm's and regulatory perspective.

4.1. Users' attitude and effects of revealing (personal) data

The increasing importance of digitization and the accompanying generation, collection and integration of different heterogeneous data sources induced a new quality of data analysis and information acquisition, which can be summarized under the buzzword "Big Data" (Chen & Zhang, 2014). Providers of digital services use a variety of techniques to collect data from their users. This is not limited to technical means (e.g., cookies), but also comprises services designed in a way that users voluntarily reveal a multitude of personal data (e.g., in social networks). Consequently, users are confronted with the trade-off between a (short-termed) gain in utility by the use of the service and a (long-termed) necessity to protect their privacy.

Especially business models in the field of the sharing economy "force" market participants to expose parts of their privacy and share these information with the public, e.g., details concerning the location and the furnishing of their apartments, as well as contact details. This, in turn, can facilitate discrimination. For example, empirical studies show that the ethnicity of an apartment owner has an influence on the required monthly rent (Bertrand & Mullainathan, 2004). Additionally, it is more difficult for an individual to protect her privacy the more others expose their personal data (Acquisti, Brandimarte, & Loewenstein, 2015). This can imply negative economic consequences for these individuals, for example, as insurance rates increase (or do not equally decrease) only because certain information (i.e., personal data) is not exposed to the insurance company in order to protect one's privacy (in contrast to the potential majority of other insured persons). These externalities have to be taken into account but are not yet considered by data protection rules.

The developments just stated led to a debate concerning the amendment of the regulatory framework to handle data, in particular, regarding data protection. In principal, the protection of personal data (or privacy protection, respectively), has two dimensions (Acquisti et al., 2015): On the one hand, data protection has the connotation of protecting data against unauthorized access. On the other hand, data protection refers to an individual's granted rights over the usage of her personal data. Especially with regard to the latter dimension, the effectiveness of data protection in digital business models is questionable. Although service providers in the EU generally have the obligation to ask for permission to collect and process personal data, in many cases, especially if a service is provided for free, users grant this permission carelessly. Moreover, it is non-transparent for users how and where their personal data is stored and processed.

Handling personal data responsibly cannot be addressed by regulatory instruments alone. A central point in defining an appropriate regulatory framework can thus be seen in the right balance between the public duty of care and a right to informational self-determination. From a scientific perspective, the so called "privacy paradox" (Acquisti, 2004; Acquisti et al., 2015; Norberg, Horne, & Horne, 2007) has to be considered in this context. The privacy paradox states that the expressed attitude towards data protection

significantly deviates from the observable actions of information exposure. Although one may be inclined to argue that especially uninformed individuals are prone to becoming victims of the privacy paradox (Kshetri, 2014), this phenomenon can indeed also be observed for informed individuals (Acquisti, 2004).

From a scientific perspective, it is still an open question to which extent the degree of data protection is a relevant strategic variable for firms in the digital economy. On the one hand, empirical studies showed that customers did not change their buying behavior after they were informed that their data was transferred to third parties (Bélanger & Crossler, 2011). On the other hand, empirical studies also showed that customers were more likely to be willing to pay higher prices for (more) privacy preserving services (Tsai, Egelman, Cranor, & Acquisti, 2011). In Germany, for example, 86% of the participants in an online survey stated that they have dealt with the privacy settings of their social network and 77% stated to have changed them afterwards (Huth, Arns, & Budde, 2011). Nevertheless, there generally seem to be great differences between nationalities and age groups in how individuals reveal personal data (Acquisti et al., 2015). However, there are indications that the awareness and importance of data protection in the digital economy has increased over time, which subsequently induced actions for (more) privacy protection (Acquisti et al., 2015; Goldfarb & Tucker, 2012; Stutzman, Gross, & Acquisti, 2012).

Insight 5 *The individually expressed attitude towards data protection oftentimes significantly deviates from the observable actions of information exposure ("privacy paradox"). Consequently, a responsible handling of data cannot be addressed by regulatory interventions alone. A central point in the definition of an appropriate regulatory framework can thus be seen in determining the right balance between public duty of care and informational self-determination.*

4.2. Data as an economic good

Many of today's digital business models, especially those primarily financed through advertisements, rely on the collection and analysis of comprehensive data of the visitors of their websites in order to be able to place targeted advertisements (c.f., Monopolkommission, 2015a). Even ecommerce business models, which per se do not require data collection on a personal level, significantly rely on the collection of data about users and their website usage, e.g., to provide individual prices (price discrimination) or personalized offers. This data is not only used to increase sales, but also for cost side efficiency gains, e.g., for inventory optimization. In almost all cases website operators place so called cookies (i.e., small text files) on the visiting user's computer. In this vein, an explicit recognition of a user is possible when she visits the website again—potentially, even across different websites (so called "tracking"). This technique can be valuable for a user, e.g., because an ecommerce shop may be able to restore the shopping basket if the user unintentionally left the website. However, it is particularly useful for service providers as it facilitates to create a comprehensive user profile without the necessity of an explicit user registration. Although users can refuse to accept cookies or delete placed cookies manually or automatically, the usage of the website may thereupon be uncomfortable or not possible at all. In the consultation on the EU ePrivacy Directive, several stakeholders have therefore called for a stricter regulatory approach which discourages and limits services' use of cookies and so-called tracking walls (c.f., European Commission, 2017b). However, firms already deploy services that circumvent these obligations. For example, Facebook is able to observe the usage behavior of their users on other (non-Facebook) websites if they click on "Like" buttons, or use their Facebook credentials for registration ("Login with Facebook"). These techniques, however, are not targeted by this regulation as they explicitly require the user's consent. Additionally, firms may also integrate data from a variety of different sources (i.e., services) across all areas of life (e.g., Facebooks acquisition of WhatsApp).

The economic value of data—especially the value of user profiles—is not easy to determine. As an example, consider the acquisition of WhatsApp by Facebook in 2014. As Facebook also offers a messaging functionality in its social network, one of the reasons might be seen in the reduction of future competition. However, Facebook payed approximately USD 19 bn for the messaging service which at that time had roughly 600 mn users and an annual revenue of only USD 10.2 mn. Thus, Facebook payed USD 31.7 per user (for the data), who hitherto payed a yearly fee of USD 1 for the service at most. This asymmetric valuation not only illustrates that the perceived value of data might differ significantly between users and service providers, but also that data itself can be seen as a relevant economic asset.

Insight 6 *Comprehensive personal data is a valuable economic asset in the digital economy because it enables personalized offers and targeted advertisements. Service providers use different techniques to obtain (personal) data,* e.g., *designing the service accordingly, placing cookies or tracking pixels, offering their service at third-party websites, or by acquiring other service providers. If data-driven service providers or the competitive effects of an acquisition are analyzed, these techniques and the resulting availability of user profiles have to be taken into consideration.*

4.3. Data ownership

It has been argued that even free services are "too expensive" and that users should be able to financially participate from the exploitation of their data (Lanier, 2014; Laudon, 1996). However, this monetary compensation would require that users are aware of the actual value of the generated data and of the consequences associated with data use. Certainly, this transparency is currently not warranted. Legal scholars discuss these aspects referring to the term "data ownership" (c.f., Hornung & Goeble, 2015; for a discussion with regard to connected cars). This discussion leads to the question to what extent (personal) data, generated by the mere usage of a service or product, can be sold at all under the current legal framework. On the one hand, service providers made monetary investments to acquire and collect data and should therefore somehow be authorized to use this data (especially in comparison to other service providers). On the other hand, users should have the control over their personal data, which qualifies them to look at or force deletion of personal data stored by service providers. This claim is derived from the right to informational self-determination (see above), which is, for example in Germany, constitutionally grounded (c.f., German basic law Article 2(1) in conjunction with Article 1(1)), and

consequently, not alienable.[7] In this spirit the "right to be forgotten" is also embedded in the new GDPR. Consequently, the unalienable privacy rights with regard to *personal* data interfere with the monetarization of these.

Thus, the discussion on data ownership has to focus on other, non-personal data arising from digital transactions. However, the distinction between personal and non-personal data is oftentimes difficult, because de-anonymization through aggregation and statistical combination of different non-personal data is feasible (Ohm, 2010; Wang, Leon, Chen, & Komanduri, 2013). This gives rise to de facto personal data, which, however, is not subject to the same data protection rules as data that is classified as personal data ex-ante (Roßnagel & Scholz, 2000). Moreover, it is not yet predictable which data will (potentially) become relevant in the future. This insight has already been formulated by the German Federal Constitution Court in 1983 in the course of the national census decision, in which it stated that there is no irrelevant data in the age of automated data processing (c.f, court decision 65, 1 as of December 15, 1983).

Non-personal data can comprise, e.g., technical parameters arising at the user and the service provider from the transmission of data. Obviously, such data is less relevant for the setup of an individual user profile and therefore of subordinate interest for both parties involved. However, the importance of this type of data can gain momentum in the context of the Internet of Things (IoT), where it arises from machine-to-machine communication. However, according to the current legal opinion in the EU, nobody owns non-personal data (Hornung & Goeble, 2015). In principle, such data can thus be marketed by all parties involved in the data generation, data transmission and data storage. This said, there might be a necessity to define a "data processing law" exceeding the scope of existing data protection laws.

In principle, the commercialization of exploitation rights of personal data can be based on the regulatory framework for intangible goods mutatis mutandis (Hornung & Goeble, 2015). However, several problems due to the mere nature of data arise. On the one hand, personal data often stems from social interaction (e.g., communication). Thus, it seems questionable whether data can exclusively be associated to a single individual (Hornung & Müller-Terpitz, 2015). On the other hand, a negotiation with the service provider on equal footing seems to be unlikely anyhow (Hornung & Goeble, 2015). Consequently, even if a legal obligation for service providers to purchase data would be introduced, the resulting price would likely be zero. However, there are initial concepts of third-party providers that act as data intermediaries trying to establish a marketplace for personal data by aggregating and processing data coming from diverse data sources in order to make it attractive for potential data purchasers.[8] It remains to be seen if these business models will be successful.

In this context, it has been proposed that digital service providers should be compelled to offer a fee based (advertisement free) service that does not aim at collecting personal data, in addition to a free (ad financed) service (c.f., e.g., Monopolkommission, 2015a). Although this implies that data inherently has a certain value because the user is per se able to pay for the service with "money" instead of "data", this approach is accompanied by several practical problems, which make this suggestion questionable. First, the fee based service does not eliminate the collection of personal data per se, which could still be used for targeting at a later point in time. Second, if it would be profitable to offer both service variants, then providers would already do so (e.g., offering a freemium service). Therefore, it is very likely that service providers seek to avoid the obligation by charging prohibitive prices for the fee based service, which would in turn require an ex-post price regulation. Given the variety of different digital services and the problems of assessing market power, this is clearly infeasible.

Insight 7 *The right to informational self-determination is often constitutionally grounded, and embedded in the GDPR by the "right to be forgotten". It therefore cannot be alienated. Consequently, in the EU, the sale of personal data for the purpose of economic profit generation is in general not possible. Moreover, because of a lack of bargaining power, it is questionable whether individual users are able to negotiate a positive price for their personal data at all. However, data marketplaces, which aim at pooling bargaining power are emerging. Non-personal data that arises from the usage of digital services is not exclusively assigned to any of the parties involved, and can thus, in principle, be marketed by anyone. Hence, there might be a necessity to define a "data processing law" that augments the existing data protection laws.*

4.4. Data and market power

From a regulatory perspective it has to be scrutinized to which extent data represents a basis for market power and if so, whether and how the access to data should be regulated. On the one hand, as outlined above, the collection and analysis of data—especially personal data—may lead to a competitive advantage. However, this only applies if data is used to offer individualized or extended services (Acquisti & Varian, 2005). However, providing a service that satisfies the users' demand better does (of course) not constitute market power and is particularly no indication for the abuse of it. However, it is argued that superior data may not only temporarily lead to a dominant market position, but—due to the increased user interaction that results from the better service—enables the dominant firm to improve the quality of its data basis faster than potential competitors and may thereby lead to a permanent advantage (Argenton & Prüfer, 2012). In other words, this could result in entry barriers, which again challenge the assumption that digital markets are contestable, and thus, may indeed constitute market power (Argenton & Prüfer, 2012; Krämer & Wohlfarth, 2015; Schepp & Wambach, 2016).

On the other hand, several counterarguments can be formulated: First, the described centralization of users' activities at one provider is not necessarily problematic and might—in light of network effects and the ability to better satisfy users' demand due to superior data—even be evaluated positively from an economic point of view; although this might be accompanied by the manifestation of market power. However, an *abuse* of market power, of course, would still have to be tackled effectively. Second, although contestability in a relevant market might be challenged with respect to de novo market entry, this may not be true for other established firms in related

[7] We address the concrete scope of the right to informational self-determination in Section 4.6.

[8] For example, http://www.datacoup.com or http://www.commodify.us and related, http://meeco.me/.

markets, which have a dominant market position with respect to data collection themselves. For example, if Google tries to exploit its market power in the search market, Facebook, arguably having a comparable data quality, might be attracted to enter that market (additionally, c. f., Section 2.2). However, the concern that only a handful of companies are able to collect comprehensive data remains (Acquisti et al., 2015). Third, the collected user data becomes outdated quite fast, e.g., because personal living conditions are changing. Keeping the data up-to-date might induce additional effort, i.e., costs. In essence, this means that also firms currently perceived as dominant need to innovate at steady pace, and have to build up users' trust in the long-run in order to retain their users' activity and to acquire new users (especially if personal data is processed). Maintaining users' trust and the need for steady innovation may restrict the possibilities to exploit potential market power. In this context, opt-in rules for the collection of data as commonly propagated by consumer rights groups might even strengthen already dominant firms, because newcomers (e.g., start-ups) oftentimes do not enjoy users' trust to the same extent as established firms (Campbell, Goldfarb, & Tucker, 2015). Fourth, more data is not necessarily better data. The analysis of larger datasets is not only more complex from a technical perspective, but also more error-prone which is known as the curse of dimensionality in statistics. For example, specific problems arise from an increased variance of the estimators due to overfitting, multi-collinearity of the influencing variables hampering the interpretability of statistical models, as well as spurious correlations, which result from low observation density in high dimensional spaces (Hastie, Tibshirani, Friedman, & Franklin, 2005). Thus, the statistical challenge of big data is to identify the relevant influencing variables and observations. Therefore, Google, for example, uses only a fraction of its available data to optimize its search algorithm (Haucap, 2015).

Insight 8 *The effect of superior data, which,* e.g.*, enables to offer targeted products or personalized services, may lead to a non-transient competitive advantage. This is likely the case if superior data leads to increased user interaction, such that the service provider is able to improve its data quality faster than its potential competitors. In principle, this may increase entry barriers and questions the contestability of the market. However, users may benefit from a single service provider,* e.g.*, if network effects are important. Additionally, the possibility of supply-side substitution and the need to innovate at steady pace to retain a competitive advantage may reduce the possibilities to exploit a dominant market position.*

4.5. Access to data

The access to data can be the basis for competitive distortions, especially if a dominant firm restricts the access to data, which is seen as a necessity for effective competition (Monopolkommission, 2015a). In this context, access has (also) to be understood in a technical sense, because data is most frequently retrieved via technical interfaces (i.e., Application Programming Interfaces, APIs). Furthermore, it is useful to differentiate between access requests of other firms, and (end) user requests, i.e., users trying to obtain access to their data in order to transfer it to another service. In the following discussion, we focus on access requests by other firms.

In the EU as well as in the US, several legal cases of data access requests have already been documented although not all have resulted in legal decisions, because often out-of-court settlements were reached (Graef et al., 2015). Moreover, the legal opinion differs significantly between the US and the EU. Generally, it seems to be more likely that data access requests will be granted in the EU. However, access requests from other firms also require evidence that there is no economically viable alternative to the data requested (Graef et al., 2015). This evidence will be hard to provide for individual data sets, especially as not the isolated data set itself, but the linkage of many coherent data sets and their analysis is important. Therefore, each single data set seems to be dispensable.

Moreover, the quality and the level of data access plays a crucial role. Considering data quality, there can be substantial differences, e.g., (i) if data is provided immediately or with time delay only, (ii) how much data can be retrieved per request, and (iii) which interfaces and data formats are provided by the service provider (Graef et al., 2015). Furthermore, data access is feasible at several degrees of granularity, ranging from raw data (e.g., direct, unstructured user input) to attributed user profiles.

As an example, consider the case of a search engine. It can be argued that the value of a search engine resides in the development of the algorithm, which provides useful recommendations based on unstructured user input. Of course, the search engine delivering the best results will also be the one consulted most often, which leads to superior data, which can again be used to optimize the search engine's algorithm (see Section 4.4). Therefore, it has been suggested to grant competitors access to the raw data of search engines, i.e., the user's input, so that competitors can develop search algorithms under similar preconditions (Argenton & Prüfer, 2012). These aspects are discussed under the keywords "Open Data" and (related) "Open Innovation". On the other hand, this argumentation is not applicable to all digital services because in other digital industries the innovation can already be seen in the way in which user data is generated (e.g., Twitter). For these services, granting direct access to user input, or obligating them to immediately share the entered data, would destroy innovation incentives. Furthermore, the de-anonymization of data is facilitated by sharing raw data, which negatively affects users' privacy, as no effective data protection is present in this case (additionally, c. f., Section 4.3 and Section 4.6).

Insight 9 *Accessing the data of other firms is justifiably subject to high legal barriers (*e.g.*, c. f., Essential Facility Doctrine). It has to be further examined under which preconditions and in which granularity and quality the access to raw data ("open data") is a useful regulatory device to promote innovation and to counteract the possible concentration of market power without jeopardizing data protection.*

4.6. Data protection

In the EU, the scope of data collection and analysis is limited by the regulations concerning data protection, yet mainly determined by the EU Data Protection Directive 95/46/EC. However, it is applied differently in the individual member states. Moreover, special regulations may be applied for specific areas if needed. At the EU level, especially the ePrivacy Directive (2002/58/EC) for communications services has to be mentioned which has been complemented by the Cookie Directive (2009/136/EC) in 2009 and has recently been revised (c.f., COM (2017)10 final). Additionally, the EU Directive concerning telecommunications data retention is worth mentioning, although it has been declared void by the EU Court of Justice in 2014. However, on member states' level, regulations concerning

telecommunications data retention still exist (e.g., in the United Kingdom or Germany).

The EU's data protection law is mainly characterized by the principle of prohibition, i.e., it generally prohibits companies (and the state) to process personal data except where certain exceptional cases exist or explicit consent has been provided by the individual concerned (Hornung, 2013). In the US, no comparable data protection rules exist. Most notably, the principle of prohibition does not exist. However, certain sectors are subject to specific regulations (e.g., determining the creditworthiness or in the healthcare sector).[9] Furthermore, case law, regulations concerning the tapping of telephone lines (c.f., Electronic Communications Privacy Act, which, however, only applies to ECS and not to ISS, c. f., Section 3), and voluntary directives of the Federal Trade Commission (FTC, Fair Information Practice) exist. Summarizing, data protection rules in the US are currently far less strict compared to the EU regulations. This, among others, recently led to the termination of the Safe Harbor treaty between the US and the EU.

Deduced from the national peculiarities just outlined, representatives of the internet economy argue that the EU's (and especially the German) data protection rules hamper innovation (FAZ, 2015), because companies in the EU are unable to collect and utilize data the same way US-based companies are able to (c.f., Section 4.2). Additionally, high compliance costs arise due to the mere necessity to fulfill the data protection guidelines (Koske et al., 2014).

However, current data protection guidelines are criticized to be outdated both in the US and in the EU. For example, in the US a debate whether self-commitments according to the rules of the FTC (which are equivalent to the EU data protection rules in a broader sense) should at least partially have a binding character evolved (Nissenbaum, 2011; Reidenberg, 1999; Schwartz, 1999). Furthermore, in the EU, there are major differences with respect to the implementation of data protection guidelines in the member states. Consequently, companies might have an incentive to (re-)locate their headquarters to a better suited member state with regard to data protection (Hornung, 2012).

However, in May 2018, the General Data Protection Regulation (GDPR, Regulation 2016/679) becomes effective in the EU. Although the GDPR will generally apply a less stringent standard as, e.g., the current German national legislation—especially with respect to the data protection regulations in the telemedia act (TMG §§12ff) as well as lacking basic principles for anonymization and pseudonymization according to the Federal Data Protection Act §3a ("Bundesdatenschutzgesetz", BDSG)—the GDPR is formulated as an EU "regulation". Thus, it is binding in all EU member states equally without further degrees of freedom and so, harmonizes data protection rules EU-wide. Consequently, the GDPR effectively counteracts the forum shopping of service providers that has become common. Moreover, the regulation is supposed to be binding for all services available to users in the EU; irrespective of the location of the provider's headquarter.

According to Hornung (2013), the new core elements of the GDPR are inter alia the "right to be forgotten" (Regulation 2016/679, Article 17) as well as the "right to data portability" (Regulation 2016/679, Article 20). Although both articles in principle strengthen consumers' interests, they may be afflicted with legal as well as practical problems, which could make these articles ineffective in practice. For example, the right to be forgotten is conditional on an appropriateness clause. Additionally, the individual may not necessarily know where her data is stored and who needs to be contacted in order to exercise her rights. Besides, the right may be in conflict with the liberty of press and media ("right to remember"), which can be of sui generis design throughout different member states (Hornung, 2013). With regard to the right to data portability, feasibility issues arise not only with respect to linked data sets (e.g., if the complete (user) profile should be ported from a social network, c. f., Gans, 2017), which are not ported, but also with respect to the compatibility of different data formats. Providers which heavily invested into the lock-in of their users will arguably be quite innovative in designing information systems hampering the possibility to port data; especially as the current regulation only considers data portability, but not interoperability between different services (Hornung, 2012). However, the regulation can be effective and favor competition in the case of less complex data (c.f., Monopolkommission, 2015a; Wohlfarth, 2017).

Furthermore, the GDPR includes instruments to protect data by technical means (e.g., "data protection by design and by default", c. f., Regulation 2016/679, Article 25). This comprises data protection friendly default settings ("privacy by default"), criteria for data breach notifications, criteria for data protection impact assessments (c.f., Regulation 2016/679 Section 3), as well as suggestions to create incentives to protect (personal) data by means of certification and seals (Hornung, 2011, 2013; Hornung & Hartl, 2014). However, the specific legal implementation of the GDPR and especially the specific aspects mentioned above are currently relatively vague. Additionally, it remains unclear whether these (market) incentives will be effective as long as data protection is not perceived as strategic variable by firms (Hornung, 2012).

Insight 10 *The EU data protection is mainly characterized by the principle of prohibition, which generally prohibits companies (and the state) to process personal data except certain exceptional cases exist or explicit consent has been provided by the individual concerned. In the US, no comparable data protection regulation exists. Most notably, the principle of prohibition does not exist. However, certain sectors are subject to specific regulations (*e.g.*, determining the creditworthiness or in the healthcare sector). New core elements of the GDPR are inter alia the "right to be forgotten", the "right to data portability", as well as measures to protect data by technical means, including criteria for data breach notifications. The GDPR is binding for all (digital) services available to EU users, i.e., irrespective of the location of the provider's headquarter. However, due to practical problems in the implementation and a lack of market incentives, it has to be seen to which extent these new rules and induced incentives improve data protection in practice.*

5. Conclusions

This article tackles three important areas deemed relevant in order to define a coherent regulatory framework and to account for the

[9] Specifically, the Fair Credit Reporting Act and the Health Insurance Portability and Accounting Act.

specific peculiarities of digital markets: challenges associated with assessing market power in digital markets (Section 2), challenges in harmonizing different regulatory obligations for digital services (Section 3), and the role of data in the digital economy (Section 4). Finally, we compile the most important aspects for each of these areas.

5.1. Assessing market power

A pivotal reason for regulatory interventions is the (potential) abuse of market power. In the current regulatory framework of the EU, this requires that market power in the relevant market is ascertained, and subsequently, that an abusive action in the relevant market has been observed (competition law) or is deemed very likely (sector-specific regulations). However, the formal proof that a firm has market power is yet based on traditional instruments to define the relevant market that are questionable in the context of digital services from a practical as well as economical point of view. Specifically, the highly dynamic nature of digital markets is per se in conflict with static approaches to define the relevant market (e.g., by means of the SSNIP test). Suggestions to modify the SSNIP test, e.g., to account for two-sided market environments, exist. However, these extensions require a high amount of data, which is often infeasible to obtain; and even if the relevant market could be defined properly, traditional proxies to evaluate market power, such as market shares, often do not provide sufficient evidence in digital markets. In fact, digital markets and services are oftentimes characterized by strong concentration tendencies due to direct and indirect network effects. Consequently, instead of purely focusing on demand-side substitution, rather supply-side substitution and potential competition (contestability) may be considered in evaluating a firm's dominance. In many cases, it will be decisive whether a currently dominant firm is able to sustain a superior data basis in the medium- and long-term due to higher user interaction. Arguably, this may manifest the dominant market position.

Consequently, not a service's price, which is frequently set to zero (for end users), but rather innovations (e.g., in algorithms or business models) seem to be the relevant strategic parameter in digital markets. Thus, especially the foreclosure of innovative competitors needs to be encountered effectively. In particular, this requires an acceleration of competition law proceedings. However, due to the simultaneously increased complexity of defining the relevant market and the retention of the current practice to determine market power using the HMT, which exacerbates the assessment of market power, the exact opposite may occur.

Simultaneously, considerations to adjust the thresholds for merger control, as suggested by the Monopolkommission (2015a) seem appropriate in order to protect substitutive competition: revenues (alone) are no sufficient signal for a firm's economic importance in the digital economy.

Finally, the common practice to determine market power by considering market shares in the relevant market can be questioned more generally (additionally, c. f., Kaplow, 2015). Additionally, the increased complexity of these apparently objective and accepted instruments questions the legal certainty that these instruments provide. Consequently, alternative approaches, relinquishing the definition of the relevant market and solely assuming that the mere possibility to abuse market power already implies market power, might be taken into consideration in the context of digital markets. For example, using a Direct Effects Approach could resolve problems associated with the definition of the relevant market and accelerate proceedings. However, due to missing precedents in the legal practice, the suitability of a Direct Effects Approach for digital markets has to be further analyzed.

5.2. Harmonization of regulatory obligations and level playing field

Due to digitization and digital convergence, the boundaries of once clearly separated regulatory realms are increasingly blurring. This becomes particularly obvious considering communications services. Traditional telcos, which are defined by their technical characteristic to convey electronic signals are nowadays in direct competition with OTT communications services, which oftentimes do not establish a connection to the public telecommunications network and are subsequently not classified as communications but information services. The resulting regulatory obligations differ significantly and are considered to impede fair and equal competition. Therefore, BEREC (2016) suggested to revise the definition of communications services on an EU level. However, the revised definition suggested in the European Electronic Communications Code (c.f., COM (2016) 590 final), which proposes to distinguish interpersonal communications services based on their use of traditional telephone numbers, seems odd in a world of all-IP Next Generation Networks.

This should also be taken as impetus to review the current regulatory framework for communications services with regard to the proportionality of the defined obligations in the age of digital, ubiquitous interconnectedness, and in light of new market participants, services and applications. On the other hand, duties to collaborate and transparency requirements might also be imposed on information services. This would not only be beneficiary in terms of consumer protection, but would also allow regulatory authorities to better assess further regulatory needs. However, it should be taken into account that intermodal competition strengthens due to digital convergence. Consequently, this might rather allow to lift superfluous regulatory requirements than to establish new ones. This not only affects the area of telecommunications services, but also other regulated markets experiencing structural changes, e.g., transportation services in the context of the sharing economy or digital media in the context of ebooks.

5.3. The role of data and data protection

Data is an important economic asset in digital markets, because it enables digital service providers to offer personalized services that are attractive to users. Therefore, data can be the basis for market power. On the other hand, the continuous development of innovative business models, which try to gather data rather than money, might be the nucleus for the Schumpeterian “creative destruction” in the digital economy and the driving innovative force in this industry. However, a regulatory framework has to consider not only the financial dimension of data but also the aspects affecting the personal rights of individual users. Consequently, regulatory certainty with

regard to the access to data as well as the possibilities of data collection and analysis are of paramount importance. To keep up innovative performance, the protection of data-related innovation rents as well as the possibility to develop innovative, personalized services needs to be ensured. Simultaneously, possible path dependencies and self-reinforcing effects, which increasingly encourage the centralization of data and thereby manifest market power, need to be prevented.

It can be stated that the barriers to get access to competitors' data are currently rather high; especially as it seems impossible to prove (i) market power and (ii) the imperative nature of the requested data. Therefore, it seems likely that the ability to collect comprehensive user profiles is confined to only a few firms in the future; however, this does not necessarily mean only one firm. In some cases, it may be feasible to grant access to raw data so that competition on the basis of algorithms evolves. However, this needs to be evaluated on a case-by-case analysis and additionally increases the danger of de-anonymization.

With regard to the possibilities to collect and analyze data, uneven competition because of diverging data protection standards between the EU and the US, but also between different EU member states, can be noted. Although data protection obligations might be perceived to reduce competitiveness, (strong) data protection (rules) can also lead to competitive advantages in the future. Additionally, the GDPR will harmonize data protection in the EU and will also be binding for non-EU services available to users in the EU. However, due to the feasibility of automated, comprehensive data analysis (i.e., big data), as well as due to a lack of bargaining power of users, it has to be noted that the GDPR still leaves room for regulatory scope.

Regulatory models that require the economic participation of users in the course of analyzing their data (data ownership), or obligations that compel service providers to (also) offer a fee-based, data-minimizing service seem not very meaningful from an economic perspective, because the envisaged pricing can easily be circumvented (e.g., setting zero or prohibitive prices, respectively). However, price regulation is apparently no more feasible and desirable. Additionally, there currently is no legal regulation for non-personal data that arise from the usage of a digital services. Consequently, there might be the need to establish a "data processing law" beyond the scope of data protection.

With regard to data protection, the question of an appropriate level of duty of care arises. Alternatively, one may call for more self-regulation (e.g., setting appropriate incentives to protect personal data, e.g., data protection seals or certificates). This also affects the role of technical data protection (e.g., privacy-preserving analytic methods), which has been envisaged as an element of the GDPR, but has been defined only insufficiently. Finally, one may consider more profound changes in the regulatory framework which do not only address the collection and analysis of data, but instead focus on addressing specific data applications that are deemed unwanted by society (e.g., insurance tariffs that are based on car data). Similar sector-specific data protection regulations already exist in the US, e.g., with regard to the determination of creditworthiness or in the healthcare sector. If the emphasis of data protection is put on applications, rather than collection, some of the problems associated with the lack of users' bargaining power could be addressed more directly. Furthermore, if the usage (i.e., exploitation) of personal data is forbidden for certain applications, the incentive to collect data might be reduced in the first place, which may strengthen the acceptance of, and trust in those services that are wanted by and useful to society.

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