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"Artificial Intelligence, Innovation and Competition: New Tools, New Rules?" – Report on the Conference of the Max Planck Institute for Innovation and Competition in collaboration with the MPI Alumni Association in Munich, 5 July 2019

I. Background of the Conference

On 5 July 2019, the annual "Alumni Conference" was co-hosted by the Max Planck Institute for Innovation and Competition in Munich (MPI) and its Alumni Association "Friends and Former Employees of the Max Planck Institute for Innovation and Competition". The conference focused on artificial intelligence (AI) and its implications for intellectual property (IP) and competition law. On the side of the MPI, the conference was organised by the research group on the data-driven economy and artificial intelligence.[1]

The conference was opened by Prof. Dr. *Anna Friederike Busch*, Chairwoman of the Alumni Association and Full Professor at the Federal University of Applied Administrative Sciences. Underlined with examples of its applications

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1 Besides Professors *Drexl* and *Hilty*, the Members of the Working Group are currently *Francisco Beneke*, *Luc Desaunettes*, Dr. *Michèle Finck*, *Jure Globocnik*, *Jörg Hoffmann*, *Daria Kim*, *Heiko Richter*, *Stefan Scheuerer*, *Peter Slowinski*, *Jannick Thonemann* and *Klaus Wiedemann*. Research outputs of the group can be found under the following link: <https://www.ip.mpg.de/en/projects/details/data-driven-economy-the-need-for-regulation-due-to-digitalisation.html> (accessed 11 July 2019).

in the private and public sector, she first highlighted the general importance of AI and then referred to the AI Strategy of the German Government,[2] according to which Germany should become one of the leading countries in this area. As regards the legal framework enabling such a development, the various stakeholders had expressed two major areas of interest and/or concerns, *Busch* pointed out: First, regarding the use of and access to data, and second, concerning the need for transparency and prevention of distortion, discrimination, manipulation and other forms of improper use of AI systems. *Busch* welcomed the fact that to address these challenges and further questions concerning AI, IP and competition law, different spheres of society were represented at the conference, ranging from academia and government to start-ups and big tech firms.

Prof. Dr. *Reto M. Hilty* agreed and emphasized the relevance and the implications of AI for IP and competition law in the ongoing research of both the legal and the economic departments of the Institute. In this regard, he further stressed the role of the working group on the data-driven economy and artificial intelligence, that Prof. Dr. *Josef Drexl* and he initially set up as a response to the legislative activities of the European Commission on data and which has meanwhile advanced into examining the implications of AI for the regulatory framework related to innovation and competition.

II. Artificial Intelligence and Intellectual Property: New Issues – New Rules?

1. Background

The first panel dealt with the implications and potential consequences of AI for IP law and addressed whether AI-based technologies cause a 'paradigm shift'. There is a considerable discussion on whether existing rules need to be adjusted to account for specific challenges raised by AI, and whether new rights and exceptions should be introduced. Above all lies the general question on how the traditional normative theories apply to AI-related inventions, works, and other types of subject matters of IP protection.

2. Keynote (*Julio Diego Raffo*)

The keynote speech was held by Dr. *Julio Diego Raffo*, WIPO's Head of the Innovation Economics Section. He focused on the recent developments in robotics – an early mover in the field of AI – and their implications for the IP system.[3] *Raffo* explained that in the first wave of its adoption (from the late 1980s on), robotics was embraced especially by factories, mainly in the automotive industry. In the second wave (as of 2005), other areas started catching up rapidly. Also, robotics reached consumers through implementation into various consumer goods and services on a massive scale, e.g. in cars, health services, washing machines, vacuum cleaners, smart assistants and other IoT devices. The geographic distribution of robotics has also changed over time: While initially, Japan, USA, and Europe were market leaders, now Asia, and more specifically China, leads the robot market.

There are several reasons for the ultimate commoditization of AI-related robotic products, such as dramatic innovation in materials, mechatronics, sensing object recognition and information processing, and intensified software and hardware integration. Also, hardware is getting less important, and its production costs (especially of sensors) have significantly decreased.

When it comes to patents, the vast majority (approximately 70 %) of relevant applications comes from companies, followed by the public sector and academia. *Raffo* pointed out that the developments sometimes vary from country to country. For example, in China, unlike in most other countries, the proportion of patents filed by academia is declining. The global boom of AI-related robotics patents in the last decade can be mostly attributed to large established companies. This encompasses robotics companies that initially focused on industrial robot production and now embrace new use cases, but also covers outsiders that gained competences in neighbouring fields (e.g. automotive industry), now entering the field of AI and robotics.

From an innovation policy perspective, the role of government is of special importance. Apart from passing regulation and setting standards, governments have played a large supporting role in the described developments, for example by funding R&D, by creating R&D institutions and networks, and by incentivising technology transfer and collaborations.

Looking at the relationship between AI and the IP system, *Raffo* stressed that the decrease of hardware complexity and the standardisation of AI tools facilitate copying and/or replicating of the technologies of other firms. While in the first wave, significant capital and engineering were required to compete in the market, today "only a computer" is needed. As a consequence, almost everybody can compete in a given market. *Raffo* ultimately predicted that if it proves easy to copy the AI embedded in the products and unless firms find other ways of appropriating their innovations, such as keeping the AI in the cloud and not on the device, there might be more patenting of AI-related inventions in the future.

3. Panellists' Statements

Dr. *Stefano Baruffaldi*, Assistant Professor at the University of Bath and Affiliated Research Fellow at the MPI, responded by emphasizing the distinction between robotics AI and AI in general. He also distinguished between symbolic AI, which was prevalent in the 1990 s, and neural AI, where China is already now the world leader. In his view, AI significantly impacts innovation strategies, and there is a particular need and challenge to understand the diffusion of AI-related technologies, which are "obscure" to some extent. In this regard, *Baruffaldi* questioned whether the gazette format of the patent system is the optimal medium for the diffusion of AI inventions. Further, he emphasized the impact of data protection and copyright law for the diffusion of AI-based technologies.

In his statement, *Michael Fischer*, German and European Patent Attorney, presented AI as the technological answer to big data. The dramatic increase in computational power allows the widespread use of AI technologies, which enables the analyses of immense datasets. While AI can be applied in almost any technical field, he warned that the "black box problem" (the difficulty to explain what a neural network exactly does and why) poses particular problems for its usage in safety-sensitive situations, such as self-driving cars.

With regard to patenting of AI, *Fischer* drew a parallel to patenting pharmaceuticals: both are trial and error processes. In pharmaceutics, clinical studies can be used to show a technical effect to obtain a patent, and the same is true for test results of AI algorithms. Moreover, AI research-

2 See "Strategie Künstliche Intelligenz der Bundesregierung", available at <https://www.bmbf.de/files/Nationale_KI-Strategie.pdf> (accessed 11 July 2019).

3 The WIPO Reports relevant to the topic are the following: "Breakthrough Innovation and Economic Growth", 2015, available at <https://www.wipo.int/edocs/pubdocs/en/wipo_pub_944_2015.pdf>; "Breakthrough technologies – Robotics, innovation and intellectual property", 2015, available at <https://www.wipo.int/edocs/pubdocs/en/wipo_pub_econstat_wp_30.pdf> and "WIPO Technology Trends 2019: Artificial intelligence", 2019, available at <https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf> (all accessed 11 July 2019).

ers are now combining different AI methods (e.g. neural networks) in an experimental way, as pharmacists "mix liquids and see what comes out". According to *Fischer*, AI originated from the ivory tower of academia and has become a "democratised" tool which nowadays enables everybody to make an invention (and to obtain a patent) with relatively little effort.

He further emphasised that many issues pertaining to computer-implemented inventions (CII) are also immanent to AI. In both cases, sufficiency of disclosure and clarity of a patent application can be problematic. Besides, CII patents in general, and AI patents in particular, are difficult to enforce due to the difficulty to prove an infringement. Furthermore, a method, an apparatus, a computer-readable medium, and a system claim should be used when patenting AI-related inventions to obtain the widest scope of protection.

Fischer concluded that albeit AI poses new issues for patent law, no paradigm shift is needed. He sees the current patent law system as well suited to solve these issues. Activities of the EPO, e.g. the updating of the Guidelines for Examination in 2018,[4] have already helped to achieve this goal.

Daria Kim, Research Fellow at the MPI, pointed out that at the EU level, there are currently no active or pending legislative proposals relating to AI and IP. She referred to the 2017 European Parliament Report which called on the European Commission to develop the criteria for 'own intellectual creation' for copyrightable automatically generated works.[5] However, in her view, the Commission responded in a rather cautious way when issuing its Communication on AI in 2018, noting that reflection is needed on the interaction between AI and IP rights.[6] Further, the 2019 Resolution of the European Parliament underlined the need to monitor the efficiency and relevance of IP rights, and to conduct fitness checks.[7]

Kim stressed that the success of AI depends on various factors, especially academic research publications, open-source tools and resources, availability of data, and patents. However, there is still uncertainty about the particular contribution of each element for the success of AI. Even though an impact analysis would pose methodological challenges, it would be highly needed.

With regard to the relevance of patent protection, *Kim* highlighted the finding of the 2019 WIPO Report: Less than 1 % out of 340,000 AI-related patent families have faced litigation, and so far, none of the litigated patents concerned deep learning.[8] She remarked that it can be hard to detect patent infringements, and further raised the question whether AI-related patents can and will *de facto* be infringed at all, given their technological complexity and the pace of development.

The next speaker, *Daniel Schönberger*, Google's Head of Legal for Switzerland and Austria, turned to copyright law. With regard to the use of training data, he emphasised that Art. 4 of the new EU Copyright Directive[9] provides for an exception for data mining not only for publicly funded but also for commercial research. In his view, this exception also covers machine learning. He further explained that "AI creations" are currently not protected by law. In his view, this is favourable, as additional incentives are not needed for them.[10] The major challenge for copyright protection is to delineate the necessary human creative intellectual contribution. In the case of the AI-generated Belamy painting,[11] it could be argued that there was no human creative input on one hand, or that there was a human contribution in choosing the training data on the other hand. Furthermore, randomness is anyhow an aspect that is not unknown to art. Lastly, *Schönberger* noted that while the academic discussion mostly focuses on fine arts, there are other equally important AI-based techniques, such as automated journalism.

Finally, *Alina Wernick*, researcher at the Alexander von Humboldt Institute for Internet and Society, discussed the usage of AI in the health sector. There, AI can be used, *inter alia*, to assist diagnostics and treatment decisions. However, even though there is high demand for such technologies, numerous obstacles (e.g. transparency, safety, and trust) prevent its diffusion. According to *Wernick*, technology acceptance poses a significant obstacle for the dissemination of AI technology in the health sector. One way to improve acceptance is to benchmark the accuracy of health algorithms by devising standardized input data sets. In such a case, an AI model would be submitted to a platform, where it would run over an undisclosed test data set. As different AI models of different providers would run over the same test data set, this would foster comparability. The test outcomes could be published on a scoreboard.[12]

The International Telecommunication Union and the World Health Organisation have already established a focus group on "Artificial Intelligence for Health", which is responsible for establishing a standardized assessment framework for health-related AI models.[13] With the aim to enable their comparison, the group shall define use cases and devise a public training data set and a test data set. *Wernick* concluded by referring to open issues, such as the problem of creating a representative data set and disclosing confidential data to test applications, and more generally, the balancing of the standard setting process transparency with the need to maintain the composition of test data set secret from AI providers.

4. Discussion

In the subsequent discussion, *Raffo* pointed out that one can learn a lot from the ICT sector when it comes to standard-setting. However, he also highlighted the difference of the involved players: While the ICT sector is principally composed of an established number of big companies, AI concerns a variety of players of very different sizes. Therefore, it would be difficult to determine the players which should take part in negotiations. Also, smaller players could

4 See European Patent Office: Guidelines for Examination in the European Patent Office, November 2018 Edition, available at <https://www.epo.org/law-practice/legal-texts/guidelines.html> (accessed 11 July 2019).

5 European Parliament: Report with recommendations to the Commission on Civil Law Rules on Robotics, 27 January 2017, 2015/2103 (INL), 10-11.

6 European Commission: Communication on Artificial Intelligence of Europe, 25 April 2018, COM(2018)237 final, 15.

7 European Parliament: A comprehensive European industrial policy on artificial intelligence and robotics, 12 February 2019, 2018/2088(INI), 20.

8 WIPO Technology Trends 2019: Artificial intelligence (supra note 3), 111.

9 Directive (EU) 2019/790 of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC, OJ L 130, 17 May 2019, 92-125.

10 See *D. Schönberger*, Deep Copyright: Up- And Downstream Questions Related to Artificial Intelligence (AI) and Machine Learning (ML), ZGE/IPJ 10 (2018), 35-58.

11 See, for instance, *J. Jones*, A portrait created by AI just sold for $432,000. But is it really art?, Guardian, 26 October 2018, available at <https://www.theguardian.com/artanddesign/shortcuts/2018/oct/26/call-that-art-can-a-computer-be-a-painter> (accessed 11 July 2019).

12 *T. Wiegand et al.*: WHO and ITU establish benchmarking process for artificial intelligence in health, The Lancet, 2019, Vol. 394, No. 10192, 9-11; *M. Salathé/T. Wiegand/M. Wenzel/R. Kishnamurthy*, Focus Group on Artificial Intelligence for Health. White Paper, 2018, available at <https://www.itu.int/en/ITU-T/focusgroups/ai4h/Documents/FG-AI4H_Whitepaper.pdf> (accessed 11 July 2019).

13 For more information, see <https://www.itu.int/en/ITU-T/focusgroups/ai4 h/Pages/default.aspx> (accessed 11 July 2019).

find themselves in a difficult situation during the negotiations. *Fischer* agreed that standardisation will be one of the big issues for the future. However, standardisation will also facilitate infringements detection. He predicted that as in the ICT sector, patent pools will be created also in the field of AI.

Baruffaldi drew a parallel to the software patent debate. He stressed that AI poses an additional problem of the black box and of being an extremely fast-moving field. Also, he highlighted another shortcoming of the current patent system: Disclosure does not keep pace with the speed of development. As a result, developers would often disclose their neural networks by publishing them online in working papers. *Raffo* agreed, but pointed out that it would be a big "shock" to change the current patent system.

In the further discussion, *Hilty* pointed out that the elements of AI cannot be easily reverse-engineered and can often be protected as trade secrets. Therefore, one could wonder whether there is actually a need for patent protection for AI. Furthermore, he emphasised that while both in the field of AI and in the pharmaceutical sector, trial and error is used as a discovery method, investments for AI appear to be much lower than in the pharmaceutical sector. He wondered whether this should not be reflected in lowering protection.

The last question from the audience stressed the need to also discuss what happens when AI starts creating by itself. *Hilty* responded by stating that for now, this is science fiction. *Raffo* agreed and concluded by stating that we should first tackle many other issues that already exist.

III. Artificial Intelligence and Competition: The Impact on Law and Policy

1. Background

The second panel of the conference reflected on the role of competition law in the context of AI. The panel was opened by *Drexl* who described competition law as the other side of the coin which has to be considered together with IP law. The fact that even without patent protection, innovations in the field of AI are booming might indicate that no protection is needed. He referred to the shortcomings of the traditional competition law as an *ex post* mechanism and opened the floor by asking – also with regard to the UK Furman report[14] – whether the use of algorithms should in any way be regulated.

2. Keynote (*Monika Schnitzer*)

The keynote speech was given by Prof. Dr. *Monika Schnitzer*, Full Professor for comparative economics at the Ludwig Maximilian University Munich as well as Member of the Board of Academic Advisors to the Federal Ministry for Economic Affairs and Energy and Member of the German Commission "Competition Law 4.0". She focused on the use of algorithms for pricing decisions, where she identified two potential issues: Algorithms might facilitate collusion, and can be used for personalised pricing.

Regarding the risk of algorithmic pricing collusion, *Schnitzer* emphasised the need to differentiate between two generations of algorithms: adaptive and learning ones. Adaptive algorithms (algorithms of the first generation) are programmed to evaluate the market situation, based on which they propose an optimal pricing decision. These algorithms might raise some concerns regarding collusion because they allow competitors to adjust their prices at high frequencies. However, this type of algorithms does not generally converge to collusion, unless they are deliberately programmed to lead to a collusive outcome. If this were the case, competition authorities could easily prove the collusive intent of the market players by simply looking at the software code.

According to *Schnitzer*, learning algorithms (algorithms of the second generation) are more problematic from a competition policy view. Based on machine learning methods, these algorithms learn actively. Recent economic literature[15] highlighted that even without human interference, such algorithms could lead to collusive outcomes in the majority of cases. Here, competition law appears poorly equipped, as it requires the proof of explicit coordination. Therefore, *Schnitzer* discussed tree possible legal solutions: The first option is an *ex ante* regulation of pricing algorithms, which would require market authorisation of such algorithms. It would, however, be hard to establish in advance a list of algorithms that should necessarily be prohibited. Namely, as they can adapt their behaviour to the competitive environment they are confronted with, algorithms might react differently in different situations. Also, one could think of an *ex post* regulation punishing tacit collusion. Here, the challenge is to define the criteria for determining tacit collusion. A last solution could be a *per se* prohibition of algorithmic pricing. However, *Schnitzer* regards such regulation as going too far and advises not to introduce it.

The second part focused on personal pricing (or price discrimination), which consists of charging consumers different prices for the same product. The use of personalised pricing has been facilitated by the rise of AI, which allows to infer the willingness to pay of a specific customer from the data collected about her. These practices are legal as long as they comply with other laws, such as consumer protection and anti-discrimination laws. The market effect of personal pricing depends on the competitive setting. According to *Schnitzer*, in monopoly constellations, discriminatory practices could lead to the appropriation and expansion effect. In contrast, the effects are ambiguous in competitive markets, as they will depend on the number of firms using personalised pricing, the possibility of firms to access the same data, and the ability to learn from previous transactions. Since the economic effects of personalised pricing might be positive, their *per se* prohibition would be inappropriate. Rather, the question is how to monitor the use of such algorithms. In this regard, *Schnitzer* underlined the difficulty to "look into" the algorithms – also from the trade secrets perspective – and the challenge to impose transparency obligations on the market players.

Schnitzer concluded that competition law should be re-evaluated to be made capable of facing new challenges raised by AI. Most importantly, regulation should keep markets competitive, which could e.g. be achieved by granting access to data of monopolists.

3. Panellists' Statements

In her statement, Dr. *Niamh Dunne*, Associate Professor at the London School of Economics, stressed that the European Commission is already dealing with the use of algorithms by companies. She enquired into how the Commission has so far applied EU competition rules to the new challenges created by AI technologies. First, *Dunne* referred to the Commission's decisions on vertical restraints concerning resale price maintenance. She pointed out that the en-

14 See "Unlocking digital competition, Report of the Digital Competition Expert Panel", 2019, available at <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/785547/unlocking_digital_competition_furman_review_web.pdf> (accessed 11 July 2019).

15 See, for example, *E.Calvano/G. Calzolari/V. Denicolo/S. Pastorello*, Algorithmic Pricing: What Implications for Competition Policy?, 2018, available at <https://ssrn.com/abstract=3209781> (accessed 11 July 2019).

forcement of Art. 101 cases in this field has suddenly increased with the rise of e-commerce where AI plays an important role. In these decisions,[16] the Commission recognised that the widespread use of monitoring software and pricing algorithms allows the manufacturer to better track deviations from the imposed prices by resellers. As the Commission saw an Art. 101 infringement by object, *Dunne* concluded that although companies used new tools, the Commission applied "old rules". She criticized that the Commission could at least have discussed it under the rule of reason, as is done in the U.S.

Second, *Dunne* referred to the ongoing investigations into the business conducts of Amazon and Apple, and to the Google Shopping case relative to self-preferencing practices.[17] By interfering with the algorithm, Google as a platform provider demoted competing products and hereby granted preferential treatment to its own products. According to *Dunne*, the Commission actually applied a new theory of harm in this case without explicitly disclosing that it made "new law". *Dunne* assumes that otherwise, a fine could not have been imposed. She concluded that the Commission should at least have admitted that it is making a new law, as the German *Bundeskartellamt* did in its debatable *Facebook* decision.[18]

Dr. *Thorsten Käseberg*, Head of the unit "Competition and Consumer Policy" at the German Federal Ministry for Economic Affairs and Energy, noted that despite the critical debate, one must not forget that in general, algorithms produce significant economic efficiencies.

He emphasized that when it comes to digital platforms, access to data, and data portability, there have been considerable discussions and enforcement activities over the last years. The advanced state of debate is reflected in several reports[19] as well as in the proposal for an amendment of the German Act against Restraints of Competition, which his Ministry will publish in August. This proposal will address anti-competitive tipping effects, expand the obligations of dominant platforms, and also address data-related issues (update of the German essential facilities doctrine[20] and contract-related rules tackling relative market power).

Looking at competition and AI in particular, however, *Käseberg* regarded the debate as somewhat different. While he recognized that "new tools" have already been developed, one should be careful with introducing new rules, given the current stage: In his view, market evidence on true machine learning algorithms appears still anecdotal. Therefore, it is important to further observe the problems that arise in the markets. Also, *Käseberg* noted that when it comes to competition enforcement, we cannot only expect a legal debate, but also a technological arms race.

Ingo Hoffmann, Managing Director at ADI Innovation AG and Strategic Advisor to the "Cyber Valley Initiative", reflected first on the risk of collusion. AI will not only lead to more collusion, but also to new forms of collusion. Relying on reinforcement learning, Google DeepMind's algorithm AlphaGo was indeed able to beat the world's best player of Go by developing strategies that no human being had used before. *Hoffmann* asked what would happen if such a technology was used for pricing strategies. But he also noted that the use of these algorithms can lead to efficiencies. Therefore, the right balance in the application of competition law has to be found. Second, *Hoffmann* emphasized that access to data is key for developing innovative AI solutions. For making more data accessible, especially for SMEs, *Hoffmann* referred to data pooling as a possible way forward. At the same time, he warned that data sharing is still exposed to many uncertainties, such as the application of competition and data protection laws, on which one should focus more intensively. Finally, *Hoffmann* warned that the EU tends to regulate emerging technologies too quickly, before having fully understood the functioning of the products and markets. This poses a risk of hindering competition and innovation.

Finally, Dr. *Vikas Kathuria*, Senior Research Fellow at the MPI, raised the issue of economies of scope in AI ecosystems. He noted that their most important elements, namely data, algorithms, and know-how, are prone to economies of scope. According to him, the possibility to put an algorithm to a different use leads to the fact that the same company is often present in different and various markets. As a consequence, conglomerate ecosystems emerge. The best example of this phenomenon is Facebook which is currently planning even its own virtual currency. This can potentially distort the markets (e.g. by self-preferencing and leveraging), and poses significant challenges for competition law. Economies of scope also influence the way we understand potential competition. He explained it by referring to the *Facebook/Instagram* decision of the UK CMA (then OFT).[21] However, according to *Kathuria*, there is no need to reinvent the wheel: Competition law is fit enough to face these new challenges, as it was in the case of standard-essential patents.

4. Discussion

In the subsequent discussion, *Drexl* emphasised that discrimination is a particularly sensitive issue also for competition law. This is especially so against the risk of the emergence of a so-called ordinal society, in which access to economic resources of citizens depends on their digital ratings. Digitalisation could also have implications for the future understanding of consumer welfare, for which identifying the link between data protection and competition rules has become the most obvious challenge. *Käseberg* added that a pure violation of data protection laws would not amount to an infringement of competition law *per se*, as competition law requires a causal link with the alleged abuse of dominance.

In his concluding remarks, *Drexl* stated that the discussion proved that IP rights in immaterial assets are not necessarily needed to enhance digital innovation, and that *de facto* control of these assets can already work as a means to charge a price for their use by third parties. According to *Drexl*, the discussion further showed that competition law issues have so far remained unrelated to IP rights. But he also stressed that IP could aggravate these problems; especially the potential availability of *sui generis* database protection in the AI context could lead to further restrictions to the access to data.

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16 See Commission decisions in cases *Asus* (AT.40465), *Denon & Marantz* (AT.40469), *Philips* (AT.40181) and *Pioneer* (AT. 40182).

17 See European Commission, Case AT.39740 – *Google Search* (Shopping).

18 Bundeskartellamt, Case B6-22-16 of 6 February 2019 – *Facebook*.

19 The following Reports were mentioned: *H. Schweitzer/J. Haucap/W. Kerber/R. Welker*, Modernisierung der Missbrauchsaufsicht für marktmächtige Unternehmen, 2018, available at <https://www.bmwi.de/Redaktion/DE/Publikationen/Wirtschaft/modernisierung-der-missbrauchsaufsicht-fuer-marktmaechtige-unternehmen.pdf?__blob=publicationFile&v=15>; *J. Crémer/Y.-A. de Montjoye/H. Schweitzer*, Competition Policy for the Digital Era, 2019, available at <http://ec.europa.eu/competition/publications/reports/kd0419345enn.pdf> and Unlocking digital competition, Report of the Digital Competition Expert Panel, 2019, available at <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/785547/unlocking_digital_competition_furman_review_web.pdf> (all accessed 11 July 2019).

20 § 19 (2) No. 4 of the German Act against Restraints of Competition (GWB).

21 UK Competition and Markets Authority (then Office of Fair Trading), Case ME/5525/12 of 14 August 2012.