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Innovations – challenges for competition law practice

Series of papers on "Competition and Consumer Protection in the Digital Economy"

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Innovations - challenges for competition law practice

A. Introduction

Innovations are a key engine of economic development and a major driver of growth, employment and prosperity in a national economy. They are often associated with trail-blazing discoveries, such as the invention of the steam engine, which essentially triggered the industrialisation process. Today there is much debate about disruptive innovations in the digital economy. One of many examples is the introduction of automated driving. Apart from such radical changes, other developments with less impact can also be of significance, e.g. improvements to existing products or production processes.

Not only do innovations drive the economy as a whole, they also play a major role in the development of individual companies. They are an important factor for competition. According to the insights gained from the Arrow-Schumpeter debate competitive pressure is necessary on the one hand to encourage companies to develop new or improved products and technologies. On the other hand innovative companies must also have a reasonable prospect of being rewarded for such endeavours and investment with an at least temporary increase in market power and, correspondingly, higher profits as a result of the innovation. Some advocate the view that larger and more powerful companies are the more innovative companies. By contrast, the opening of former monopolies to competition, for example, shows that there is a distinctly positive connection between competition and innovations: For instance, the opening of the packaging disposal sector to competition in combination with antitrust measures unleashed a wave of innovation in this sector. This led to huge cost reductions and improvements in the quality of recycling.

The interaction between incentives for the (further) development of products or technologies and competition is also relevant for antitrust practice. Compared to price competition, competition in innovation has played less of a role in the past. However, this does not mean that it is of secondary importance. Especially in innovation-driven sectors such as the pharmaceutical industry or in sectors characterized by increasing automation, e.g. mechanical and plant engineering, the research and development activities of businesses are taken into consideration in an assessment under competition law. In recent years the innovative potential of the Internet has repeatedly been used as an argument for such considerations, especially in cases concerning the digital economy. In addition, with the 9th Amendment to the German Act against Restraints of Competition (German Competition Act, GWB) the legislator has explicitly included innovation-driven competitive pressure in the catalogue of criteria used to assess market power. The aim of the new transaction value threshold in merger control was also to protect innovation-driven competition. The digital economy was in the legislator's

focus when the two amendments were drafted but the amendments are also relevant for other sectors.

In an examination under competition law innovations can become relevant in various contexts. In the case of mergers, for example, they can lead to different effects. On the one hand mergers can restrict competition not only on the product level but also on the research and development (R&D) level. On the other hand, in individual cases they can also improve innovation opportunities and incentives. The same is true of cooperations. They can create considerable benefits, especially if they pool complementary research strategies or factors conducive to the development of innovative products. However, depending on their extent and form, cooperations can also lead to competition problems, e.g. if more far-reaching agreements are concluded which go beyond research activities and include a cooperation on the downstream distribution level or negatively affect competitors. Innovations can also play a role in abuse proceedings, e.g. if competitors are impeded in developing or marketing innovative products.

The answer to the question of how innovation opportunities, incentives and efforts can be adequately considered in an antitrust assessment therefore very much depends on the individual case in question. It is not always easy for a competition authority to determine in a specific case whether shifts in existing market positions are sufficiently likely to occur within the forecast period. In addition, in the assessment of mergers or cooperations there is often a conflict of interest between short-term negative effects such as price increases, and desired medium to long term effects such as the emergence of incentives to innovate. Each individual case thus has to be carefully examined before any decision is taken on whether it is necessary to intervene or, conversely, whether the possibility of a dominant position can be excluded. This alone is reason enough to examine the issues and challenges which innovations pose for competition law practice. The first part of this paper offers an insight into industrial economic research on the subject, identifies relevant categories of innovations for competition law assessment and explains the effects which innovations can have on competition. The second part deals with diverse approaches on how to consider innovations in an antitrust assessment. Here selected case practice is placed within a conceptual framework which takes into consideration categories of innovations identified in economic theory on the one hand and identifiable roles of innovation in practice on the other.

B. Innovations from an industrial economic perspective

Research in industrial economics has examined the issue of innovations from different angles.[1] Firstly, a distinction can be made between different types of innovations (see I.). Findings to support this are available in different strands of literature on industrial economics, e.g. on technical innovations, or on innovative business strategies concerning product quality and product differentiation. A common denominator in all cases is the question as to what makes companies invest in R&D (see II.). Another point of interest for the assessment of innovations under competition law is the interaction between innovation efforts and competition: While innovations can lead to changes in market structure and competition (see III.), the type and intensity of competition can also have an impact on incentives and possibilities to innovate (see IV.). Finally, the effects which intervention by competition authorities and competition law provisions can have on incentives to innovate are also discussed (see V.).

I. Different types of innovations

1. Process versus product innovations

Firstly, innovation can take the form of an improvement in production technology which usually results in a cost reduction. In industrial economics this is described as process innovation. Secondly, an innovation can also consist in a new product being introduced or an established product being developed further or modified. In industrial economics this is referred to as product innovation.[2]

In practice, product and process innovations can go hand in hand with one another.[3] For instance, the introduction of assembly line production to car manufacture is a process innovation which is at the same time based on a (further developed) product innovation, the conveyor belt used in this process.

2. Drastic innovations and incremental innovations

In the industrial economic literature on process innovations, a difference is made between so-called

[1] For a more detailed introduction to the topic cf. e.g. Tirole (1988, "The Theory of Industrial Organization", chapter 10); Bester (2012, "Theorie der Industrieökonomik" (6th edition), Chapter 5); Belleflamme & Peitz (2010, “Industrial Organization: Markets and Strategies”, Chapter 18); in addition Reinganum (1989, “The Timing of Innovation: Research, Development, and Diffusion”, Handbook of Industrial Organization) and Cohen & Levin (1989, “Empirical Studies of Innovation and Market Structure”, Handbook of Industrial Organization).
[2] Cf. e.g. Bester (2012, "Theorie der Industrieökonomik" (6th edition), p. 181).
[3] Cf. e.g. Tirole (1988, “The Theory of Industrial Organization”, p. 389).

drastic and non-drastic innovations.[4] A characteristic feature of drastic innovation is that only the company realising the innovation can remain active in the market whereas its competitors which cannot use this innovation, at least according to industrial economic models, disappear from the market.[5] The description of a process as "disruptive" is on similar lines.[6]

In addition, the term "incremental innovation" is used which is mostly associated with gradual (step-by-step) developments of a product or process. The term thus focuses on the extent of the innovation rather than on its effects (as is the case with the term "drastic innovation").

Incremental innovations do not usually have any extreme effects on the market. Accordingly, they are to some extent comparable to non-drastic innovations. However, cases are also conceivable in which what would seem to be a small innovation actually has considerable effects. One such example is the messenger service WhatsApp, which is now used by nearly half of the German population.[7] During its growth phase, fundamentally comparable services such as Skype and SMS, MMS and e-mail were available and were generally regarded by users as alternative[8] services. In functional terms, therefore, WhatsApp did not introduce a breakthrough innovation with a completely new approach. Nevertheless, the use of WhatsApp spread extensively, even irrespective of its takeover by Facebook. This could be attributed in particular to the realisation of network effects and the attractive technical design of the service for (smartphone) users in combination with the chosen (free-of-charge) business model. This example illustrates that innovations do not necessarily have to be based on novel ideas and also do not necessary involve a significant amount of resources.[9]

In practice, innovations can relate to the chosen business model and e.g. consist in another form of product presentation, another form of financing or another price structure. Based on the theoretical model, these phenomena can be classified as product innovations. In the practical application of competition law, however, the question will often arise as to what extent such business model modifications still fall under the definition of innovation.

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[4] Cf. e.g. Belleflamme & Peitz (2010, “Industrial Organization: Markets and Strategies”, p. 481f.).
[5] A drastic process innovation may take the form e.g. of a reduction of the marginal costs of the innovative company, which enables the company to set a price which, in a monopoly scenario, would be optimal in relation to the reduced costs and which leads to other companies which were in price competition with this company before the innovation no longer being able to compete due to their increased costs.
[6] The term is often associated with the article "Disruptive Technologies. Catching the Wave" by Bower & Christensen (1995, Harvard Business Review). It is mainly used in the context of the digital economy and in this case often also includes new business models which are based on innovative technology and have a disruptive character.
[7] Cf. e.g. http://www.ard-zdf-onlinestudie.de/.
[8] Cf. e.g. Facebook/WhatsApp, Decision of the European Commission of 3.10.2014, COMP/M.7217, paras 28ff.
[9] Cf. also Facebook/WhatsApp, Decision of the European Commission of 3.10.2014, COMP/M.7217, para. 119.

3. Degree of uncertainty of development processes

The degree of uncertainty about the development of an innovation can be another criterion for classifying innovations. Some sectors such as the pharmaceuticals industry are largely characterised by R&D processes which are subject to a considerable degree of uncertainty (e.g. due to long development cycles or the uncertain probability of success of a market launch). Other sectors are generally marked by regular and predictable further developments where the outcome is foreseeable (e.g. regular introduction of new product generations (updates) which differ in little detail from earlier generations). In both cases such developments can represent incremental (product) innovations.

II. Sources of innovation incentives

The question arises as to what generally motivates companies to invest in R&D. Often the prospect of additional profits which require a certain degree of (future) market power, is cited as the driving force behind innovation efforts, whereby additional profits can result from an increase in revenue as well as cost reductions. On the one hand, this can be attributed to Schumpeter's theory that the hope in future monopoly rents from innovations intensifies competition for the market and therefore acts as an incentive for innovative efforts.[10] On the other hand, current competition in an existing product market can also create incentives to innovate because any successful innovation results in a certain lead in the market and, correspondingly, a competitive advantage. This concept is often attributed to Arrow.[11]

The availability and use of protective measures (patents) for novel developments can, for example, create head starts for innovative companies. Innovative companies can, however, benefit from time advantages even without protective measures, at least if the development is not directly imitable. In equal measure the prospective of generating profits from licensing protected developments or the prospect of earning revenue from the sale of such a development (e.g. start-up exit) can create incentives to innovate.

Further sources of incentives to innovate can be identified, although these are not dealt with in this paper. These include public promotion programmes or state provisions which e.g. can serve to

[10] Based on the work "Theorie der wirtschaftlichen Entwicklung. Eine Untersuchung über Unternehmergewinn, Kapital, Kredit, Zins und den Konjunkturzyklus" ("The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle") by Schumpeter (1926) or the previous version from 1912.
[11] Based on Arrow (1962, "Economic Welfare and the Allocation of Resources for Invention", chapter in "The Rate and Direction of Inventive Activity: Economic and Social Factors"). In industrial economic research this is also linked to a complex discussion on which protective measures, such as patents, and which possibilities for sharing protected developments, such as licences, should be available, and to what degree, in order to reach a good balance between incentives to innovate and the spread of welfare enhancing innovations.

achieve environmental and transport policy objectives.

In quantitative terms, incentives to innovate arise from the anticipated difference between the (long-term) profit of a company if an innovation is successful and the profit if there is no innovation. Here particular attention is paid to the probability of success of an innovation. In assessing innovation possibilities, companies should generally balance the anticipated difference between revenue with and without innovation against the expected difference between the costs with and without innovation.

Ultimately, incentives to innovate will depend on the ability of the innovating company to earn additional profits which can be generated from the innovation. This basic concept is also the key justification for most protective measures such as patents, utility model protection and copyrights. In the debate about the extent to which such protective measures should be available, this justification is often weighed against the disadvantages of these possibilities. Protecting innovations typically reduces competition to a certain degree. Patents can also be misused and in particular impede innovations which are based on (patent)-protected developments.[12] The implicit balancing between static and dynamic efficiency is also an important part of the discussion on competition law aspects (see also C).

III. Effects of innovations on market structure

The further development of products and the introduction of new products directly lead to a change in market structure which can be more or less pronounced. Technological developments can also bring about (extreme) changes in market structure, at least in the case of drastic process innovations.[13]

Static analysis concepts in this regard can be found in economic literature. These concepts can explain why sectors with many or frequent innovations can experience relatively frequent changes to the market structure. However, they do not generally provide any indications why a sector is characterised by frequent innovations or how that sector will develop in the long term.

[12] For more information cf. e.g. opinion on “Patentschutz und Innovation” ("Patent Protection and Innovation") (2007) of the Academic Advisory Council at the Federal Ministry of Economics and Technology, or Langinier & Moschini (2004, “The Economics of Patents: An Overview”, in: Newman & Rothschild, Intellectual Property Rights and Patenting in Animal Breeding and Genetics).

[13] In detail the effect of innovations can also depend on whether there are any so-called spillover effects (positive effects of an innovation on other companies, e.g. via the transfer of newly acquired knowledge) and whether protective measures are available (e.g. possibility to patent discoveries). In individual cases these aspects can play an important role, e.g. because spillover effects can reduce individual innovation incentives and vice-versa, under certain circumstances justify research cooperations – cf. e.g. D’Aspremont & Jacquemin (1988, "Cooperative and Non-cooperative R&D in Duopoly with Spillovers", American Economic Review).

On the other hand, this literature also provides dynamic analytical concepts. They deal with e.g. medium to long term innovation incentives and how they change due to preceding as well as anticipated innovations, hence long-term market development. In some models the research and development process is described as stochastic. In this process the amount invested in R&D influences the probability that a company will make a discovery which e.g. will enable cost reduction. Accordingly, companies with greater investment in R&D are more likely to make a relevant discovery.[14] However, in view of the uncertainty accounted for in the model, the actual market outcome cannot be predicted.[15] Dynamic analytical concepts also demonstrate that the effects of innovations on market structure can only to a limited extent be examined independently of the opposite effect of market structure on innovations.[16]

IV. Effects of market structure on incentives to innovate

1. Influence of intensity of competition on incentives to innovate

A key conclusion from the industrial economic literature is that the relationship between the intensity of competition and incentives to innovate can differ according to the (model) scenario used. There are scenarios in which innovative activity initially increases with an increase in intensity of competition, but begins to decrease at a certain level with a further increase in intensity of competition. This indicates that, at least in markets which are already concentrated, there is a positive relationship between the existing intensity of competition and incentives for innovation.[17]

Insights on innovations can be found in various strands of literature. Process innovations are addressed by models which examine the reduction of production costs (see a). Product innovations are addressed by models which focus on market entries, the strategic positioning or the choice of product quality of the companies (see b). Moreover, insights can be derived from the literature on so-called patent races, which examines (dynamic) R&D or innovation competition (see c).

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[14] However, these model concepts are not generally designed to establish an absolute cross-sector benchmark for the level of investment and typically also abstract from the details of the development process.

[15] For example, Reinganum (1985, "Innovation and Industry Evolution", Quarterly Journal of Economics) reflects on the recurrent replacement of an incumbent monopolist by an innovative newcomer in line with Schumpeter's concept of "creative destruction". In the dynamic model framework chosen, which illustrates in particular the uncertainty about the extent and timing of the success of investments in innovative efforts, the incumbent supplier has less incentive to innovate than the potential newcomers. The latter therefore invest more than the incumbent supplier, making the (recurrent) replacement of the incumbent supplier (more) likely.

[16] Cf. e.g. Belleflamme & Peitz (2010, “Industrial Organization: Markets and Strategies”, p. 479).

[17] For instance, Aghion et al. (2005, "Competition and Innovation: An Inverted-U Relationship", Quarterly Journal of Economics), show that under certain circumstances there can be an inverted-U relationship, i.e. constellations with few but not too few suppliers are most likely to encourage innovation.

a) Insights from literature on process innovations

One insight gained from this literature is that a monopolist which is not exposed to any potential competition has relatively little incentive for cost-reducing process innovations.[18] This is to be attributed to the fact that, in the event of an innovation, the monopolist can only benefit from the fact that the relatively high profit it already earns without the innovation is replaced by a slightly higher profit. This phenomenon is therefore described as "replacement effect".[19]

In scenarios in which several companies compete with one another, the companies' incentives for innovation tend to be stronger than in a monopoly. In the competition context, it is possibly the innovation which creates the basis for earning substantial profits. The creation of incentives, resulting from more intensive competition with the aim of gaining a (temporary) lead through innovations, is sometimes also described as the "escape competition effect". This occurs when competition is already in place.[20] However, it can counteract the "replacement effect" in the monopoly situation if the monopolist sees itself exposed to potential competition and reacts to this with its own (additional) innovative efforts.[21] Overall both effects indicate that an intensification of competition increases incentives for innovation and the loss of competition reduces incentives for innovation.

However, in specific individual cases opposing effects can occur, which can weaken an otherwise positive relationship between incentives for innovation and intensity of competition. This can, for example, be attributed to the fact that a company's individual output volumes decrease with an increasing number of competitors. This also reduces incentives to invest in reducing variable costs of production (insofar a kind of "size effect"). At the same time an intensification of competition in the form of less product differentiation can also increase incentives to invest in cost reductions.[22] This illustrates exemplarily that a differentiated approach is necessary.[23]

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[18] The reason for this is that a monopolist can usually receive only a part of the (additional) social surplus which the innovation would create. This is to be attributed firstly to the fact that the quantity which the monopolist produces is generally too small; secondly, that in the case of cost reductions, the monopolist usually also reduces its price and does not internalise the resulting consumer surplus.

[19] Cf. Tirole (1988, "The Theory of Industrial Organization", p. 392), based on Arrow (1962, "Economic Welfare and the Allocation of Resources for Invention", chapter in "The Rate and Direction of Inventive Activity: Economic and Social Factors").

[20] Cf. e.g. Aghion et al. (2005, "Competition and Innovation: An Inverted-U Relationship", Quarterly Journal of Economics).

[21] A monopolist can accordingly have an interest in patenting its own innovations, which can later act as barriers to entry; for more information cf. Gilbert & Newbery (1982, "Preemptive Patenting and the Persistence of Monopoly", American Economic Review).

[22] Cf. Vives (2008, "Innovation and Competitive Pressure", Journal of Industrial Economics).

[23] Other literature supporting this theory includes e.g. the analysis of Belleflamme & Vergari (2011, "Incentives

b) Insights from literature on product innovations

The findings from literature on process innovations can to some extent also be applied to certain types of product innovations. In the case of a monopoly, for example, the above-mentioned "replacement effect" can be observed in the same way in product innovations. Incentives for an innovation-driven cost reduction and incentives for an innovation-driven improvement in quality can be very similar because both can result in a strategic advantage for the innovating company. Insights can be gained in particular from research which focuses on market entries, the strategic positioning of companies or their selection of product quality, findings on incentives for product developments and product launches (product innovations).

For example, some research shows that a monopolist's incentives to invest in a product innovation can be too strong or too weak, depending on its cost and demand structure.[24] This can be attributed in particular to the fact that product innovations, unlike process innovations, which are designed to improve production technology or reduce costs, can change customers' willingness to pay. Ultimately the product quality offered by the monopolist can be too high or too low. The underlying problem, i.e. companies which are powerful or have superior market power are strongly guided by the change in (marginal) willingness to pay, tends to diminish with increasing intensity of competition.

Insights can also be gained from papers which analyse product differentiation in oligopoly models.[25] In some scenarios it can be found that, in markets in which there is (more) intensive competition because e.g. of less product differentiation, less companies enter the market than in markets with less homogeneous products and hence less intensive competition. This is due to the fact that the surplus required to cover the cost of market entry is lower with increasing competition. Accordingly, in specific case scenarios the relationship between the intensity of competition and production innovations can be negative,[26] based on a similar type of phenomenon as the "size effect" in process innovations".[27] These models can also explain why incentives to innovate vary according to (anticipated)

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to Innovate in Oligopolies", Manchester School). Ishida, Matsumura und Matsushima (2011, "Market Competition, R&D and Firm Profits in Asymmetric Oligopoly", Journal of Industrial Economics) also illustrate that asymmetric costs between competitors can influence incentives for innovation in different ways; in particular, increasing competitive pressure can create positive as well as negative innovative effects depending on the company's individual cost situation within a market. Schmutzler (2013, "Competition and Investment – A Unified Approach", International Journal of Industrial Organization) concludes in an overall context that the connection between the intensity of competition and investments in process innovations is complex.

[24] Cf. Spence (1975, "Monopoly, Quality, and Regulation", Bell Journal of Economics).

[25] In addition there are numerous other models dealing with strategies to enter the market and/or hinder market entry which are not featured in this paper.

[26] Cf. e.g. Salop (1979, "Monopolistic Competition with Outside Goods", Bell Journal of Economics), or (more generally) Polo (2016, “Entry Games and Free Entry Equilibria”, appearing in: Corchon & Marini, Handbook of Game Theory & Industrial Organization).

[27] However, in the case of process innovations, the quantity produced is of greater significance.

market size. However, the papers mentioned here are based on static models using certain simplifying assumptions (e.g. symmetric companies with the same cost structures and exogenous entry costs). For this reason they abstract from some factors which are relevant in practice.

c) Insights from literature on innovative competition

The above statements have so far primarily addressed the interaction between competition at product level and incentives for innovation. However, there are also approaches which analyse competition in R&D, i.e. innovation competition in the strict sense, e.g. in the form of competition to be the first to achieve a certain development through intensive research efforts before other equally research-active companies.[28] In this case the element of uncertainty, in particular, and often also the timescale or the decision when investments are made, play an important role.[29]

Some models which deal with competition between what at the outset are symmetric companies for a certain development - e.g. obtaining a patent ("patent race")[30] – demonstrate that with an increasing number of competitors, companies will invest less in research. This is due to the fact that the probability of being the first to achieve a development decreases with an increasing number of research-active companies.[31] In many scenarios however, the total amount of expenditure in R&D spent by all the competitors increases with increasing competition. A reduction in the number of competitors would therefore lead to higher expenditure on R&D for the individual company, but reduce total expenditure and therefore the overall likelihood of success or prolong the period anticipated for successfully achieving the development in question.[32]

Apart from situations in which symmetric companies compete with one another for the same (single) development, many other, more complex constellations are possible. For example, there can be differences between the companies' likelihood of success, individual companies can pursue several similar research projects in parallel, or the companies could have differently developed technologies or

[28] Reinganum's dynamic model can be regarded as a connecting factor (1985, "Innovation and Industry Evolution", Quarterly Journal of Economics) which best links this literature with the previous assessment, cf. Schulz (2007, "Review of the Literature on the Impact of Mergers on Innovation", ZEW Discussion Paper No. 07-061; 2008 appearing in Journal of Strategic Management Education).
[29] Cf. e.g. Belleflamme & Peitz (2010, “Industrial Organization: Markets and Strategies”, p. 487ff.).
[30] In the models on so-called patent races used in this paper it is generally assumed that only those companies benefit from the development which are the first to succeed in achieving it, i.e. the corresponding protective measures are presumed to exist.
[31] In interpreting the results of these basic models, however, one needs to consider in particular that in order to simplify the analysis it is assumed that every company focuses its research on one product only, whereas in reality there are also companies which work on several developments which can be substitutable with one another. This can in individual cases cause cannibalisation effects similar to the replacement effect.
[32] Cf. presentation in Bester (2012, "Theorie der Industrieökonomik" (6th edition), p. 189ff.).

knowledge and therefore different costs from the outset. More dynamic scenarios are also feasible, in which companies regularly try to catch up with leading technology.[33] There are numerous different models which are highly complex but which, at the same time, often provide only fairly weak statements because they depend on many assumptions.[34]

2. Effects of changes in market structure on innovation incentives

The relationship between changes to market structure, in particular corporate mergers, and innovations or incentives to innovate, is addressed at the conceptual level in comparatively few papers.[35] Firstly, this could be due to the fact that there is already quite extensive research on the more general relationship between competition and innovations (see above). Many results of this research indicate that at least in markets which are already concentrated, a loss of competition reduces incentives for innovation.

On the other hand, insights from classical oligopoly models, for instance on the effect of mergers on price competition, can occasionally be applied. For example, incremental product innovations can in many cases also be perceived as investments in product quality. Mergers or similar horizontal agreements can thus not only lead to unilateral effects in the form of price increases but also in the form of a reduction in quality and, consequently, less investment in product innovations.

The literature which deals explicitly with the relationship between changes in market structure and incentives to innovate, points to various effects.[36]

In many cases mergers can cause not only negative price effects among the parties concerned but also negative effects on investments in process innovations. These can additionally reinforce negative price effects. However, the negative effects can be weakened, e.g. if the synergies are such that the cost-reducing investments of one of the parties have a cost-reducing effect on the other parties

[33] For more information on economic growth issues, cf. e.g.: Aghion, Harris & Vickers (1997, "Competition and growth with step-by-step innovation: An example", European Economic Review). The term "quality ladder" is also sometimes used in literature on economic growth.
[34] Cf. e.g. Stefan (2016, "Patents and Patent Races. Do We Need Them? How Should We Behave?", doctoral thesis submitted at Humboldt Universität Berlin, chapter 5).
[35] Cf. e.g. Schulz (2007, "Review of the Literature on the Impact of Mergers on Innovation", ZEW Discussion Paper No. 07-061; 2008 which appeared in the Journal of Strategic Management Education) or Haucap & Stiebale (2016, "How Mergers Affect Innovation: Theory and Evidence from the Pharmaceutical Industry", DICE Discussion Paper No. 218).
[36] In addition to the two models selected as examples below, there are also some papers which discuss the overall effect of changes in market structure, which results from single effects on competition at the product and innovation level. These also contain elements of the often relatively complex dynamic models on patent races and illustrate, in particular, that it can be necessary to balance the short-term negative effects against the long-term positive effects of mergers, cf. e.g. Marshall & Parra (2017, "Mergers in Innovative Industries: The Role of Product Market Competition", working paper).

to the merger. However, in many cases the total investments by the parties are less due to mergers. This reduction in investment is also often not compensated for by the higher investments of competitors as a possible result of the merger.[37] This outcome appears especially interesting in view of the argument sometimes used by several telecommunications companies that the loss of competition and the resulting realisation of larger profits create incentives for investment.[38]

As already illustrated, "size effects" can play a role in process innovations. Accordingly, incentives to innovate tend to increase with increasing output volume with the result that mergers can have positive effects on incentives to invest. In certain constellations these positive effects can be based on larger (joint) output volumes of the parties and, in individual cases, can lessen negative effects in other competition dimensions. Using size effects it can also be shown that the effects of a change in structure can differ between the companies within a market; in the case of a merger these can differ in particular between the parties on the one hand and uninvolved competitors on the other.[39]

Where (efficiency) effects such as e.g. the synergy effects already mentioned indicate a positive relationship between increasing market concentration and innovations, it may also be considered whether the presumed increase in concentration is indispensable to generate positive innovative effects. Comparisons between the effects of horizontal mergers and those of less extensive cooperations can be found in several papers.[40] In non-horizontal mergers any possible positive effects are assessed by taking the possibilities of contractual agreements as a means of comparison.[41] These comparisons show that there may be less anti-competitive ways of achieving positive innovation effects.

In addition to theoretical papers there are also studies in the literature which empirically examine the relationship between innovations (or research efforts) and market structure, especially the intensity of competition.[42] Naturally, these studies follow cross-sectional approaches, e.g. across different

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[37] Federico, Langus & Valletti come to a similar conclusion (2017, "A Simple Model of Mergers and Innovation", Cesifo Working Paper).
[38] Cf. Motta & Tarantino (2016, "The Effect of a Merger on Investments", CEPR Discussion Paper No. DP11550).
[39] Cf. Kleer (2008, "The Effect of Mergers on the Incentive to Invest in Cost-Reducing Innovations“, Economics of Innovation and New Technology). However, it is questionable which of the various sets of assumptions on the internal organisation of the parties to the merger used in this model framework seem realistic, and to what extent the static model chosen limits the relevance of the results.
[40] Cf. e.g. Motta & Tarantino (2016, "The Effect of a Merger on Investments", CEPR Discussion Paper No. DP11550), Ferrett & Poyago-Theotoky (2016, "Horizontal Agreements and R&D Complementarities: Merger versus RJV", International Journal of the Economics of Business) and Kleer (2008, "The Effect of Mergers on the Incentive to Invest in Cost-Reducing Innovations"“, Economics of Innovation and New Technology); see also footnote 13.
[41] Cf. e.g. Bishop et al. (2005, “The Efficiency-Enhancing Effects of Non-Horizontal Mergers”, Report of RBB Economics commissioned by the European Commission).
[42] Cf. e.g. Haucap & Stiebale (2016, “How Mergers Affect Innovation: Theory and Evidence from the Pharmaceutical Industry”, DICE Discussion Paper No. 218) or Ornaghi (2009, “Mergers and Innovation in Big Pharma”, International Journal of Industrial Organization) on the effects of mergers in the pharmaceutical industry.

markets, different countries or different mergers, to identify underlying connections. In view of the many (possibly opposing) effects and some ambivalent results, only limited information can be derived from these findings to evaluate individual cases. For this reason this paper does not include further illustration.

In methodical terms, however, these empirical studies show that there are different methods of operationalising the term innovation or quantifying innovation activities. The factors to be taken into account can be assigned to the categories of either input or output. It would seem obvious to place on the input side factors such as expenditure on R&D, which can be assessed in proportion to the turnover generated. Factors which can be placed on the output side, depending on the sector at hand, are quantities such as the number of new patents in a certain period or the number of new products brought onto the market. In this connection it should be discussed to what extent a specific reference to a product market can be established. As these quantity values have the disadvantage that they cannot give a complete picture of the quality or novel nature of the innovation, it can be helpful to use other variables (in addition), such as e.g. the number of patent citations (frequency of citation of existing patents in subsequent patents, especially in consideration of the relevance of the patents)[43] or a list of selected product launches which fulfil specific criteria.[44]

V. Effects of antitrust intervention on incentives to innovate

There are individual articles in the theoretical literature on how intervention by the competition authorities (or competition law provisions) effect incentives to innovate. These articles address a possible conflict between the static and dynamic perspective, or static and dynamic efficiency, respectively.[45] This can arise in particular if short-term undesirable effects or practices, such as a high price level on an existing product market, provide decisive and desirable incentives for (process or product) innovations in the medium to long term.

Measures undertaken by the competition authorities which have a positive effect on competition for the market (i.e. directly or in the short term in favour of entry candidates) and are to the disadvantage of a strong incumbent supplier, can influence incentives to invest. As a result of such an intervention, entry candidates may have better possibilities and/or stronger incentives to enter into a

[43] Cf. e.g. Trajtenberg (1990, "A Penny for Your Quotes: Patent Citations and the Value of Innovations“, RAND Journal of Economics) or Harhoff et al. (1999, “Citation Frequency and the Value of Patented Inventions”, Review of Economics and Statistics).
[44] Cf. for more information e.g. Smith (2005, "Measuring Innovation", The Oxford Handbook of Innovation).
[45] Cf. also Kathuria (2015, "A Conceptual Framework to Identify Dynamic Efficiency", European Competition Journal) on the term of dynamic efficiency, which, from a practitioner's point of view, might be considered as unclearly defined.

market. However, in certain constellations the effect of such measures can ultimately be negative, i.e. counter-productive. This can happen if entry candidates have to assume that (e.g. in the case of a successful product innovation) they will have to expect similar interventions in future and that they may therefore be quickly replaced by other newcomers, which will ultimately reduce their profit prospects and their incentives to innovate.[46]

VI. Interim conclusion

In summary, market structure not only affects innovations but innovations in turn also affect market structure. This interaction can be best assessed in more complex dynamic models. Nonetheless, in the scientific literature static models are often used to illustrate possible effects. Considerable research therefore remains necessary in order to appropriately identify and assess the interaction between market structure and innovative activity.

However, it can be concluded from the current state of research that several factors have to be considered when assessing how changes to market structure affect incentives to innovate, e.g. the existing intensity of competition at the outset, cost differences or the degree of product differentiation. At the moment many results seem to suggest that at least in markets which are already highly concentrated, a further loss of competition reduces incentives to innovate.

However, in specific individual cases changes to market structure which increase concentration could also positively affect incentives to innovate. This can result in a conflict between static and dynamic analysis. For example, in assessing a merger or cooperation it might be necessary to balance short-term negative effects such as price increases, against long-term positive effects such as increased incentives to innovate. Whereas in the examination of a merger under competition law different economic approaches and empirical methods have already been established to identify short-term effects, this has been much less the case for dynamic effects. This asymmetry is due to the fact that static models are much more frequently used in industrial economic literature to illustrate effects caused by mergers or cooperations.[47] The question of how to weigh short and long-term effects against each other in an assessment under competition law is also closely linked with the conflict between static and dynamic analysis. General statements on this cannot be made.

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[46] Cf. e.g. the dynamic model of Segal & Whinston (2007, "Antitrust in Innovative Industries", American Economic Review), which addresses this effect in the context of the recurrent replacement of an incumbent monopolist.

[47] See also Evans & Hylton (2008, "The Lawful Acquisition and Exercise of Monopoly Power and Its Implications for the Objectives of Antitrust“, Competition Policy International).

C. Assessment of innovations under competition law

In addition to e.g. prices or the choice and quality of goods and services, innovations are a parameter of market power and competition which is already recognised in competition law practice.[48] Competition authorities therefore have to consider, for instance, whether incentives and possibilities to innovate can be negatively influenced by changes to market structure leading to more concentration or whether companies' powerful market positions can be challenged by innovative competitors. The following section categorises selected cases in a structure which outlines the different ways in which innovations can be relevant in a competitive assessment.[49]

In the case practice of the European Commission and the Bundeskartellamt, innovations have up to now been considered in the context of the current innovation-driven or potential competition on an existing product market (see I.). Innovations have also been discussed in the context of competition in a product market which does not yet exist (see II.).

However, innovations are not only the subject of theories of harm or a factor used to assess market power. Mergers or cooperations in R&D can also create efficiencies which are taken into consideration in a competitive assessment (see III.).

Sometimes companies merge or cooperate whose R&D activities are not (yet) manifested in specific future products. Accordingly this raises the question whether a focus solely on markets which already exist or on foreseeable future markets poses the risk that long-term market and competition developments will go unconsidered. In the recently concluded case of the Dow/DuPont merger[50] the European Commission therefore examined the effects of the merger on innovation competition by also using a more abstract approach which was not linked to a specific product market (see IV.).

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[48] Cf. e.g. Commission, Guidelines on the assessment of horizontal mergers, Official Journal C31/5, 05.02.2004, p. 5-14, paras 8, 38; Guidelines on the assessment of non-horizontal mergers, Official Journal C265/7, 18.10.2008, p. 6-25, para. 10; BKartA, Guidance on Substantive Merger Control, paras. 5, 22, 48, 97f. 118. In the last ten years the OECD Competition Committee has also held several panel discussions on innovations and competition, also in the context of the Digital Economy, see http://www.oecd.org/competition/digital-economy-innovation-and-competition.htm.

[49] Similar structuring approaches can also be found e.g. in Glader (2006, “Innovation Markets and Competition Analysis: EU competition Law and US Antitrust Law”), Drexl (2012, "Anticompetitive Stumbling Stones on the Way to a cleaner World: Protecting Competition in Innovation without a Market", Journal of Competition Law & Economics) and Kern (2014, "Innovation Markets, Future Markets, or Potential Competition: How should Competition Authorities Account for Innovation Competition in Merger Reviews?”, World Competition).

[50] Dow/DuPont, Press release of the European Commission of 27 March 2017, COMP/M.7932. In addition to the more abstract approach mentioned here which was not linked to a specific product market, the Commission used further approaches to assess the merger's effect on innovation activities which focused in particular on the progress of different R&D activities. In doing so the Commission examined specific product developments before their market launch in addition to existing products. For a summary overview cf. also European Commission (2017, "Dow/DuPont: protecting product and innovation competition", Competition merger brief 2/2017, p. 1-8).

I. Innovation activities on existing product markets

1. Decline in innovation activities as theory of harm

Mergers or cooperations can lead to a decline in incentives and possibilities for innovation with the result that effective competition on an existing product market is significantly impeded. The competitive assessment can differentiate between the focus on effects on current innovation-driven competition between companies already established in the market (a) and on effects on potential competition by innovative companies (b).

a) Current innovation-driven competition

Changes in market structure which create more concentration can restrict innovation-based competition. This competition is often described as "innovation competition". As this term is not consistently used in the literature, however, in the following sections this paper refers to "current, innovation-driven competition" whenever competition in product and process innovations occurs within existing product markets.

A decline in current innovation-driven competition can occur, for example, if an important innovator and hence innovation pressure between the merging companies is eliminated as the result of a merger. In the General Electric/Alstom merger case[51], the European Commission had expressed concerns that the merger would eliminate one of General Electric's major competitors on the market for high pressure gas turbines. This could have led not only to price increases but also to a decline in current innovation-driven competition. The merger was cleared under the condition that key elements of Alstom's high-pressure gas turbine business were sold to Ansaldo. The aim of the commitments was to enable Ansaldo to adopt a similar role as Alstom on the market for high-pressure gas turbines. In this way, according to the Commission, not only could effective competition be maintained but also account taken of the long-term effects of the merger on innovations.

In the same way mergers or cooperations can restrict the incentives and possibilities of competitors to innovate. As to the vertical merger Intel/McAfee[52], the European Commission established that Intel, the leading manufacturer of computer processors and chipsets, would have been able to impede the development of security software for end products by McAfee's competitors. In particular, Intel could have hindered the operation of competing security solutions for Intel processors and chipsets.

[51] General Electric/Alstom, Decision of the European Commission of 8.09.2015, COMP/M.7278.
[52] Intel/McAfee, Decision of the European Commission of 26.01.2011, COMP/M.5984.

It could also have refused competitors the necessary information for the development of the software, depriving them of the possibility to use the functions of Intel processors and chipsets in the same way as McAfee. The Commission cleared the merger subject to conditions.

Similar innovation-based theories of harm can also play a key role in abuse proceedings. A prominent example of this is the European Commission's Microsoft tying case:[53] Microsoft's tying of the Internet Explorer browser to the dominant PC operating system, Windows, led to the exclusion of competitors and hence considerably restricted innovation over a long period. This can be illustrated by the fact that over a period of five years Microsoft did not launch a new version of the Internet Explorer and was able to maintain its strong market position in spite of competitors which were by no means technologically inferior.[54] In a similar fashion the refusal of access to information on the interoperability of Microsoft's server operating system restricted the possibilities and incentives of competitors to innovate, and thus technological developments.[55]

Another practical example of the positive effect of intervention by competition authorities on quality and innovation competition is the liberalisation of the market for the recovery and recycling of sales packaging discarded by private end consumers. With a number of amendments to the law and competition enforcement measures the monopoly situation was gradually transformed into a competitive market. The opening-up of this sector to competition was accompanied by concerns that this could have negative consequences for the quality and reliability of the waste management system. Following its evaluation of the situation the Bundeskartellamt was able to prove that the collection of waste packaging in yellow bins and glass containers functions just as well as before liberalisation and recycling quotas have not fallen. In addition to the substantial savings in costs, the introduction of competition to this sector also unleashed a wave of innovation in technology for sorting the mix of waste material in the yellow bin, resulting in higher quality recycling.[56]

b) Potential competition

The established concept of potential competition applied in the examination of mergers under competition law is also an appropriate method to examine the effects of changes to market structure on innovation incentives and possibilities.

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[53] Microsoft (tying), Decision of the European Commission of 16.12.2009, COMP/C-3/39.530.
[54] Microsoft (tying), Decision of the European Commission of 16.12.2009, COMP/C-3/39.530, para. 54.
[55] Microsoft, Decision of the European Commission of 24.03.2004, COMP/C-3/37.792, para. 694ff.
[56] See final report (in German) "Sector Inquiry into Compliance Schemes - Interim results of the opening-up of the sector to competition"; Bundeskartellamt 2012, www.bundeskartellamt.de

For instance, a merger between an incumbent company and a potential competitor can result in a decline in innovations.[57] For a merger with a potential competitor to have significant anti-competitive effects, according to the Commission's Guidelines on the Assessment of Horizontal Mergers two basic conditions must be fulfilled.[58] First, the potential competitor must already exert a significant constraining influence on the scope of action of the other party or there must be a significant likelihood that it will grow into an effective competitive force. Second, there must not be a sufficient number of other potential competitors which could maintain sufficient competitive pressure after the merger. The competition authorities should therefore regularly examine the likelihood of the market entry of potential competitors. Moreover, a market entry should be possible in the short term and sustainable, in order to prevent negative developments in competition.[59]

In merger cases in the pharmaceuticals industry, which is characterised by long product development periods, the Commission considered the first condition as fulfilled if the potential competitor participating in the merger could present so-called "phase II products", i.e. pharmaceuticals in a late stage of development.[60] In the Pfizer/Hospira case[61] for example, the European Commission was concerned that after its acquisition of Hospira, Pfizer would have delayed or discontinued the development of a phase III pharmaceutical for the treatment of auto-immune diseases. This pharmaceutical, which was still in the development stage, was a biotechnological medicinal product equivalent to the established product "Infliximab" which was developed and marketed by a third company. At the time of the examination Hospira also marketed a biosimilar of Infliximab. Were Pfizer to have delayed or stopped these development activities, the potential competition provided by the new phase III pharmaceutical would have been eliminated.[62]

The assessment whether the market entry of potential competitors is sufficiently likely, foreseeable and sustainable, is likely to be considerably different in very dynamic markets than in markets in which there are less innovation dynamics. This applies for instance to the digital economy or sectors which benefit from increasing automation possibilities or innovations generated by digitalisation.

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[57] It is also plausible that a merger might raise barriers to entry, impeding innovations of potential competitors, cf. e.g. Telefónica UK/Vodafone UK/Everything Everywhere Joint Venture, Decision of the European Commission of 04.09.2012, COMP/M. 6314.

[58] Cf. Commission, Guidelines on the assessment of horizontal mergers, Official Journal C31/5, 05.02.2004, p. 5-14, para. 60.

[59] Cf. Commission, Guidelines on the assessment of horizontal mergers, Official Journal C31/5, 05.02.2004, para. 74.

[60] Cf. e.g. Merck/Schering-Plough, Decision of the European Commission of 22.10.2009, COMP/M.5502; Novartis/GSK Oncology Business, Decision of the European Commission of 19.12.2015, COMP/M.7872, Pfizer/Hospira, Decision of the European Commission of 04.08.2015, COMP/M.7559.

[61] Pfizer/Hospira, Decision of the European Commission of 04.08.2015, COMP/M. 7559.

[62] Unlike generics, equivalent biosimilars are not completely identical with the original product but are produced in a different manufacturing process or have different ingredients.

Here the number of plausible potential competitors is, for instance, often not limited, as is usually the case in less dynamic markets, to companies already active in neighbouring product markets. Furthermore, in dynamic markets entries can occur at relatively short notice if the barriers to entry are lower. Development processes which last several years and can be easily observed by competition authorities, and on which they can base their assessment, are more likely to be the exception. At the same time special factors can reduce the probability of market entries. In the case of internet service providers, for example, the success of the product can often depend on network effects. These can act as structural barriers to entry, for example when users of an established platform have only little or no incentive to switch to a new platform.[63] Accordingly, in dynamic markets the question often asked is whether existing innovation activities help to counteract market power (see C.I.2) or whether they are restricted by a merger or cooperation or the conduct of a company.

c) Digital economy and the new transaction value threshold in merger control

In the digital economy business models often have a platform character (for more detail see C.I.2.b).[64] In such a business model a provider serves several different customer groups at the same time, e.g. users of an app and advertisers wishing to place advertisements in this app. In many cases such services are funded primarily through the advertising side whilst the users on the other side of the platform are provided with the service free of charge or at a relatively low price. Furthermore, the introduction of new services which generate indirect network effects, can cause a so-called "chicken and egg problem". This occurs when, at least for one customer group, the service is only attractive if it is already used by the other customer group or this is at least foreseeable. This can result in a significant initial customer reluctance to use new services, which makes their launch on the market difficult. The problem can be largely alleviated by the provider subsidising the service at first. At least in their introductory phase, product innovations are therefore often offered without monetisation, i.e. ad free or at least free of charge for the user side.

For both reasons mentioned above, innovative services, especially those that have a potentially "disruptive" character, and are therefore of great significance for the future competition process, often have no or only low turnover. Accordingly, especially in the digital economy, turnover volumes often reflect neither a provider's actual current market position nor its future competitive potential.

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[63] For more in-depth information cf. BKartA, B6-113/15, Working paper – Market Power of Platforms and Networks, June 2016, p. 87ff.

[64] For more information cf. BKartA, B6-113/15, Working Paper – Market Power of Platforms and Networks, June 2016, and the particular section B.II.4 on the free use of services.

This situation resulted in a protection gap in the merger control system,[65] and one of the aims of the 9th Amendment to the GWB was to close this gap. The new Section 35 (1a) GWB thus now defines a threshold which is based on the transaction value. Accordingly, in the case of the acquisition of a target company with a low turnover, the "value of the consideration for the acquisition" based on the purchase price of the targeted acquisition is used as an indicator for the competitive significance of the target company and therefore used as the threshold criterion. The key motivation behind the introduction of this new criterion was on the one hand the need to be able to control the acquisition of (potential) competitors with great innovation potential by incumbent providers in the digital economy. The aim of such acquisitions from the perspective of the purchaser can be, in particular, to eliminate the innovation potential of the target company in order to protect its own range of products and services. On the other hand, the legislator also had private research and development in mind, e.g. in the pharmaceutical and technology sectors. In these sectors too, the turnover potential of a company is only realised after its sale if its business model is aimed at developing technologies or products.[66] However, these types of concentration are only subject to merger control provisions if the target company has substantial domestic operations. A company can be assumed to be active on the domestic market e.g. if its free offers are taken up by users in that market or if the company carries out (market-related) R&D activities in the domestic market. Criteria to measure the relevance of the domestic activity vary according to sector or market maturity.[67] In the case of internet platforms, the number of users can, for instance, be used as the criterion. Higher requirements should be set to identify appropriate criteria as evidence of the relevance of domestic activity if the target company pursues R&D activities in the domestic market.

2. Innovations as a counterbalance to market power

In a dynamic market environment, which can result from a high degree of innovation-driven competitive pressure, market power might not be sustainable. Accordingly, market positions which at first seem powerful can be counterbalanced by certain factors, e.g. because the market leader is likely to

[65] Cf. also Monopolies Commission, Competition Policy: The challenge of digital markets (Special Report no. 68), para. 451ff.
[66] Cf. Federal Government bill, Bundestag Printed Paper 18/10207, p. 70ff. In the merger cases covered by the threshold, a detailed differentiation can be made between whether anticipated harm would affect a future market (e.g. in the case of a pharmaceutical ingredient prior to its approval) or an already existing market (for instance in the case of an online service about to enter the market). In the latter case further differentiation could be made as to whether there is an actual or (as yet) potential competitive situation.
[67] Cf. Federal Government bill, Bundestag Printed Paper 18/10207, p. 75.

be replaced within the foreseeable future or its scope of action is limited due to a high degree of innovative activity.

a) Factors of innovation-driven market dynamics

One factor which can influence the degree of market dynamics is the market phase, i.e. the market's stage of development. In expanding markets, in particular, innovations can enable swift market entries or quick shifts in market share.[68] For instance, in examining the Lanxess/DSM merger which affected the sector of production and sale of rubbers, the Bundeskartellamt established that the merger concerned innovative products. The merger therefore did not affect a mature market but a dynamic (and at the same time cyclically volatile) market. In the assessment whether there was any collective dominance , the degree of anticipated market growth and further innovations expected made coordinated conduct between the companies unlikely.[69]

The intensity of innovation and thus market dynamics can also depend on the existence and duration of established product life cycles.[70] For instance there are common business strategies in some sectors, such as the IT sector, which aim at shortening product life cycles and introducing (incremental) product innovations at regular intervals. In this way companies offer their existing customers an incentive to repurchase or replace their (possibly relatively durable) products because of further product developments. This can lead to considerable innovation and market dynamics.[71] By contrast a company can also prolong the life cycle of its product by patenting it. The prospects of earning additional revenue from this can also trigger innovations. Patent pools or reciprocal license agreements, e.g. with a view to establishing basic patents between competitors, can also promote innovation competition. However, they can also result in competitors quickly taking up the competitive moves of individual manufacturers, which would diminish the incentives for effective competition in innovation. This would make genuine technical advances the exception.

Market dynamics can also be technology-driven. For instance, process or product innovations in upstream areas, such as the improvement of technical possibilities to manufacture a product or perform a service, can create significant innovation opportunities. These can in turn enable market entries or shifts in market share.[72]

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[68] Cf. BKartA, Guidance on Substantive Merger Control, para. 48.
[69] Lanxess/DSM, Bundeskartellamt, Decision of 19.04.2011, B3-143/10, para. 85ff.
[70] Cf. also Seagate/Samsung, Decision of the European Commission of 19.10.2011, COMP/M.6214, para. 71 and para. 544.
[71] Cf. e.g. Adobe/Macromedia, Bundeskartellamt, Decision of 23.12.2005, B7-162/05, para. 51.
[72] Cf. Adobe/Macromedia, Bundeskartellamt, Decision of 23.12.2005, B7-162/05, para. 45f. and BKartA, B6-

b) Market power and innovative potential of the Internet

Businesses active in the digital economy and the services they provide often have platform and network elements.[73] These are characterised in particular by network effects which can take different forms. Such platforms enable direct interaction between several user groups between which there are indirect network effects. These indirect network effects can involve self-reinforcing effects and therefore a tendency towards concentration. This is the case if they have mutually positive network effects, i.e. if users on one side of the platform benefit from an increasing number of users on the other side. Accordingly, indirect network effects can be an indicator of market power, at least in cases where a platform has a considerable lead over its competitors.

However, a leading platform's position can still be vulnerable in spite of pronounced network effects, especially if other companies succeed in quickly attracting a large number of users through innovations and in this way benefit from network effects themselves.[74] Insofar innovations make it possible to overcome obstacles that would otherwise have blocked market entry. The digital economy is characterised by a certain innovative potential of the internet. In the case of even very strong market positions held by individual companies, this raises the question of how sustainable and solid these positions are and whether they can be challenged by anticipated (disruptive) innovations.[75]

There is also the question of where the internet's special innovation potential originates. Although there are some approaches to clarifying these specific issues, no differentiated concept has so far been established.[76] It should therefore always be examined in each individual case whether the Internet's innovative potential or other factors with the potential for disruptive changes can challenge a company's strong market position.[77] The examination can also conceptually distinguish between current innovation-driven competition in the market and potential competition from innovative businesses.[78]

In competition law practice, for example, in the context of the assessment of the Microsoft/Skype merger, the European Commission reasoned on the grounds of the innovative power provided by the

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113/15, Working Paper – Market Power of Platforms and Networks, June 2016, p. 84ff.

[73] Cf. for more detail BKartA, B6-113/15, Working Paper – Market Power of Platforms and Networks, June 2016, in particular section B.II.5 on the innovative potential of the Internet and potential competition.

[74] Cf. BKartA, B6-113/15, Working Paper – Market Power of Platforms and Networks, June 2016, p 56.

[75] Cf. BKartA, B6-113/15. Working Paper - Market Power of Platforms and Networks, June 2016, p. 80f.

[76] Cf. BKartA, B6-113/15 Working Paper - Market Power of Platforms and Networks, June 2016, p. 81ff. Special factors which could be taken into consideration here are the scalability of business models, targeting possibilities, experimental possibilities in combination with performance indicators and reduced transaction and distribution costs. In addition, many innovations are likely to have been based on developments in the (upstream) areas of information and (tele)communication technology.

[77] Cf. BKartA, B6-113/15, Working Paper – Market Power of Platforms and Networks, June 2016, p. 84.

[78] Cf. BKartA, B6-113/15, Working Paper – Market Power of Platforms and Networks, June 2016, p. 86.

market for video telephony which was still developing. The Commission focused on specific innovations in communication services in which the innovation cycles were found to be short.[79] It concluded that there was strong innovative pressure in the market which, among other aspects, limited the market power of the parties to the merger in spite of a 90 % market share.[80] In addition the European Commission assumed a fast growing (potential) market with low barriers to entry as the necessary software was easily available for download and free of charge.[81] Without the European Commission actually mentioning this concept, the case was thus also about limiting market power by means of potential competition.[82]

In the Bundeskartellamt's examination of a merger between two large online dating platforms[83], the current innovative pressure in the online dating market, which could affect the basic structures of the online dating platforms, was a significant factor. This was not affected by the merger itself and, from the Bundeskartellamt's perspective, was a specific factor in counterbalancing market power.[84] Similar to the findings of the European Commission in the Facebook/WhatsApp case, in the dating platforms case the change in user behaviour, due especially to mobile internet use and the new possibilities associated with this, played a significant role.[85] The mobile applications enabled users to look for contacts within a specific radius of their current location based on search criteria like gender, search area and age group and, optionally, to arrange a direct personal contact. These apps are optimised for the typical ways in which mobile devices are used and quickly became very successful. Market players regarded this development to some extent as a potentially disruptive innovation because they believed it could fundamentally challenge the web-based business model that is largely based on longer computer sessions.

Ultimately, in the wake of the 9th amendment to the GWB, these concepts for considering "innovation-driven competitive pressure" have now acquired a distinct legal basis in the newly created Section 18 (3a) GWB. The criteria introduced in the new section are specific market power factors which characterise multi-sided markets and networks. These include in particular the aspect of the effects of innovation potential in the digital economy. However, the explanatory memorandum on the 9th amendment to the GWB also states that the decision to be taken is not merely whether shifts in existing market positions are likely to occur during the forecast period set by the competition authority,

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[79] Microsoft/Skype, Decision of the European Commission of 07.10.2011, COMP/M.6281, para. 81ff.
[80] Microsoft/Skype, Decision of the European Commission of 07.10.2011, COMP/M.6281, para. 120ff.
[81] Microsoft/Skype, Decision of the European Commission of 07.10.2011, COMP/M.6281, para. 69ff.
[82] BKartA, B6-113/15, Working Paper - Market Power of Platforms and Networks, June 2016, p. 83.
[83] OCPE II Master/EliteMedianet, Bundeskartellamt, Decision of 22.10.2015, B6-57/15; in particular this led to the merging of the two dating platforms Parship and ElitePartner.
[84] OCPE II Master/EliteMedianet, Bundeskartellamt, Decision of 22.10.2015, B6-57/15, para. 174ff.
[85] Facebook/WhatsApp, Decision of the European Commission of 3.10.2014, COMP/M.7217, para. 116, and OCPE II Master/EliteMedianet, Bundeskartellamt, Decision of 22.10.2015, B6-57/15, para. 178ff.

which would already rule out the assumption of market dominance. It is therefore necessary to examine in each case to what extent the market position is expected to be challenged; abstract vulnerability expected at some unspecified point in the future will not be sufficient.[86] Due to its undisputed importance, the innovation aspect, in particular, will also have to be considered in the assessment of cases which do not involve any multi-side markets or networks.[87]

II. Innovative activity targeted at future product markets

Another concept used to take account of the innovative activity of businesses under competition law is to assume "future markets". This concept is applied when merging or cooperating companies are active in the development of new products which are not interchangeable with existing products in terms of demand-side substitutability but, when launched, will create a new market. A merger or cooperation can then result in the parties to the merger or even third companies cutting back or even ceasing their R&D activities. As a consequence innovation might be delayed, become less likely or not happen at all. The new market would therefore develop later or might not even materialise. On the other hand, further barriers to competition (e.g. reduced price competition) or market power could be expected on the future market. The future markets concept requires that R&D activities must be attributable to specific, new products. The R&D activities of future competitors must therefore be observable or identifiable by the competition authority. Otherwise only more abstract examination concepts can be considered which are not linked to a specific product market (see IV).

Explicit statements on the future markets concept can be found, e.g., in an older decision of the European Commission in the Ciba-Geigy/Sandoz merger case.[88] In the decision the Commission stated that in order to fully assess the competitive situation in the pharmaceuticals industry it was necessary to examine the products which are not yet on the market but which are at an advanced stage of development. The potential for these products to enter into competition with other products (which are either at the development stage or already on the market) could be assessed only by reference to their characteristics and intended therapeutic use. According to the decision the Commission had to

[86] Cf. Federal Government bill, Bundestag Printed Paper 18/10207, p. 51.
[87] Cf. Federal Government bill, Bundestag Printed Paper 18/10207, p. 48.
[88] Ciba-Geigy/Sandoz, Decision of the European Commission of 17.06.1996, IV/M.737. Similar statements are also found in Glaxo Wellcome/Smithkline Beecham, Decision of the European Commission of 08.05.2000, COMP/M.1846, and in Pfizer/Warner-Lambert, Decision of the European Commission of 22.05.2000, COMP/M.1878. Future markets were also addressed in the cases Allied Signal/Honeywell, Decision of the European Commission of 01.12.1999, COMP/M.1601, and DaimlerChrysler/Deutsche Telekom/JV, Decision of the European Commission of 30.04.2003, COMP/M.2903.

examine the R&D potential not only in terms of its importance for existing markets, but also for future markets.[89] The indicators cited for this potential were the number of cooperation agreements with and stakes in US undertakings and research establishments and hence the access to patents, as well as the existence of medicinal developments at an advanced stage. However, in this particular case it could not be determined with sufficient certainty that the merger would create or strengthen a dominant position on a future market.[90]

In the Tokyo Electron/Applied Materials merger case[91] the Bundeskartellamt examined inter alia whether the merger of two producers of equipment for the manufacture of semiconductors (chips) would lead to the restriction of competition on not yet existing markets for the production of equipment for the manufacture of 450 mm wafers. At the time of the merger only wafers up to a size of 300 mm were manufactured, but research was already being done to explore the possibility of using 450 mm wafers. In order to increase the size of the wafer it was necessary to redesign the entire equipment used in the semiconductor manufacturing line. However, there was no interchangeability between the equipment already available and that in the development stage. The examination came to the result that neither an early concentration of the new markets nor a termination of the R&D activities nor a delay in innovation by the parties to the merger could be predicted with the necessary degree of reliability.[92]

Similar to the concept of current innovation-driven competition or potential competition in existing product markets, in defining future markets it should also be assessed how likely the R&D activities are to be successful and lead to a market-ready product. Assessing the competition situation on a market which does not yet exist poses additional challenges because the conditions of competition and the competitive forces cannot yet be directly observed. Whereas on an existing market at least the currently active suppliers are known, these would first have to be identified for a market which does not yet exist. It would also have to be estimated whether competitors would still enter the market after a successful innovation or be impeded from doing so e.g. by protective measures such as patents.

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[89] Ciba-Geigy/Sandoz, Decision of the European Commission of 17.06.1996, IV/M.737, para. 42.
[90] Ciba-Geigy/Sandoz, Decision of the European Commission of 17.06.1996, IV/M.737, paras. 95-106.
[91] Tokyo Electron/Applied Materials, Bundeskartellamt, Decision of 14.11.2013, B5-138/13, para. 327ff.
[92] The Antitrust Division of the US DOJ also found reasons for considerable concerns about the proposed merger. In particular, these also applied to competition on future product markets. The Antitrust Division also seemed to have pursued an approach which was detached from product markets and which concluded that the merger would eliminate competition between the parties to the merger as future partners of customers for the development of new solutions for semiconductor manufacture; cf. Hill, Rose & Winston (2015, "Economics at the Antitrust Division 2014-2015: Comcast/Time Warner Cable and Applied Materials/Tokyo Electron", Review of Industrial Organization). Ultimately the parties did not pursue the project further.

Predictions about the structure of the yet unknown demand side would also have to be made.[93]

In analysing future markets, conclusions can possibly be drawn from neighbouring existing markets, e.g. if the innovation in question is a significant further development of a product which is already available (as was the case in the Tokyo Electron/Applied Materials merger which involved the manufacture of equipment for 450mm wafers), or affects sectors with long development periods (e.g. in the pharmaceuticals industry). It is more difficult to reach conclusions if innovations lead to completely new products or the markets are very dynamic. This in turn raises the question of whether such anticipated dynamics will be stifled by the merger or cooperation or conversely, whether they are likely to counter competition concerns.

III. Innovations and Efficiency Gains

In individual cases mergers can bring about positive efficiency effects, enabling innovations which can generally counteract negative effects. Insofar efficiencies can play a role in the examination of mergers. In practice it should be examined whether the merger project in question is indispensable to achieve the claimed positive efficiency effects.

Nevertheless, in many cases efficiencies ultimately cannot compensate for a merger's negative effects. In some cases at European level, the parties to a merger have used efficiencies as an argument, but most of these were ultimately rejected by the European Commission or considered as not relevant for the decision.[94] The TomTom/Teleatlas case, a vertical merger, should be mentioned in this context as the Commission took into account the efficiencies created by the merger in assessing the possible effects of the restriction of access to inputs (input foreclosure).[95] In particular, the Commission found that the aim of the parties to produce "better maps - faster" would probably be achieved, creating an improved incentive situation for investments in new products.[96] However, also in this case, irrespective of the efficiencies identified, the merger was not expected to have any negative impact on competition.

Like the Commission, the Bundeskartellamt also sets strict criteria for an efficiency defence. These

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[93] These challenges indicate in particular that abuse of dominance proceedings are likely to be incompatible with the "future markets" concept.

[94] The European Commission takes proven efficiencies into account in its merger control proceedings. These must be timely and benefit consumers in the relevant markets, be merger-specific (i.e. the efficiencies cannot be achieved to a similar extent by less anti-competitive alternatives) and verifiable. Cf. European Commission, Guidelines on the Assessment of Horizontal Mergers, para. 76ff.

[95] TomTom/Tele Atlas, Decision of the European Commission of 14.05.2008, Comp/M.4854, para. 192.

[96] TomTom/Tele Atlas, Decision of the European Commission of 14.05.2008, Comp/M.4854, para. 244ff. Without the merger there would have been the risk of a so-called "hold-up problem", meaning that the parties would have been more reluctant to make relation-specific investments.

include the market reference of the efficiencies and proof of a close connection with the merger, the substance of the efficiencies claimed and the standard of proof.[97] There is a merger control concept in German competition law which is similar to some extent and which takes the form of a balancing clause. In the SES/DPC merger the Bundeskartellamt found that a dominant position had been strengthened in the provision of satellite transponder capacity and technical services for Pay TV.[98] However, by applying the balancing clause the authority cleared the merger because it created overriding improvements in the conditions of competition in the end customer market for pay TV. The opening of the technical platform as a result of the merger enabled the market entry of alternative pay TV offers and improved possibilities and incentives for product innovations.

Anti-competitive agreements are exempted from the prohibition of cartels if they contribute to promote technical or economic progress while allowing consumers a fair share of the resulting benefit. In accordance with the Block Exemption Regulation, research and development agreements are exempted if they fulfil certain requirements, particularly with regard to the usability of the results. Moreover, the Block Exemption Regulation only applies to companies which, in terms of the developments envisaged in the cooperation, are not competitors or do not exceed a certain size (25% of the combined market share on the relevant markets). It does not apply to hardcore restrictions and certain obligations regarding copyrights and licensing possibilities.[99] However, the benefit of the Block Exemption Regulation can also be withdrawn, e.g. if the R&D agreement substantially restricts the development efforts of third parties, or if it would restrict competition in innovation on a specific market or eliminate effective competition in R&D.[100]

For instance the Bundeskartellamt examined a cooperation the aim of which was to introduce a new P2P payment function to the online payment system "paydirekt". The banks participating in the "paydirekt" joint venture jointly developed this payment system but compete with one other in other areas. Although a substantial number of banks operating in Germany are involved in implementing the new payment function, the cooperation improves the conditions of competition on the market for online payment systems. Ultimately the Bundeskartellamt had no objections to this cooperation and

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[97] Cf. e.g. Edeka/Kaiser´s Tengelmann, Bundeskartellamt, Decision of 31 March 2015, B2-96/14, para. 380ff; Klinikum Esslingen/Kreiskliniken Esslingen, Bundeskartellamt, Decision of 14. Mai 2014, B3-135/13, para. 285ff.
[98] SES/DPC, Bundeskartellamt, Decision of 28.12.2004, B7-150/04.
[99] Cf. Commission Regulation (EU) No. 1217/2010 of 14 December 2010 on the application of Article 101 (3) of the Treaty on the Functioning of the European Union to certain categories of research and development agreements ("R&D BER"). No exemption is provided for agreements on the obligation not to challenge the validity of intellectual property rights after completion of the research and development, or on the obligation not to grant third parties licences to manufacture contract products or to apply the contract technologies unless the agreement provides for the use of the results of the R&D by at least one of the parties in the agreement and this takes place within the internal market.
[100] Cf. Recital 21 of the R&D BER.

did not take up the project because it led to a product innovation.[101] These cases show that a cooperation in the area of research and development can generate significant positive efficiencies. However, projects or agreements must be examined on a case by case basis, taking their structure or form as well as market circumstances into consideration. In individual cases even R&D cooperations with positive effects can substantially restrict competition.

IV. Innovation activities with no identifiable reference to any product market

The application in competitive assessment of the concepts of current innovation-driven competition or potential competition on existing or future product markets requires that the R&D activities of businesses are at least "observable" to the competition authority.[102] Innovative activities can only be attributed to existing or future markets if they have an identifiable reference to specific products.

Sometimes companies merge or cooperate whose R&D activities cannot (yet) be related to tangible (future) products or are not specifically observable or verifiable in investigations. The established concepts for antitrust assessment mentioned above do not cover these cases. Nevertheless changes to market structure which lead to more concentration can also have negative effects on innovations and, in a dynamic perspective, also on competition on (future) product markets. For example, two merging companies with research programmes in the same area could reduce their R&D activities because the "innovation competition" between them no longer exists. As a consequence this could also indirectly impede competition on a (future) market, even if this cannot (yet) be specifically named and defined. This raises the question of how such effects can be adequately predicted or taken into account in the competitive assessment.

A concept which originated in the USA in the nineties, is the assumption of so-called "innovation markets".[103] This is based on the idea that the analysis of traditional product markets can be applied to R&D. In the case of a merger, it is examined whether due to the unilateral or coordinated effects of the merger, the merging companies have the incentive to reduce their R&D activities on an upstream "innovation market". However this approach has not been without criticism in the past.[104] One of the complaints is that the theory of harm is very abstract and there is no direct link to specific products, so that there is no proof of an actual restriction of competition on specific product markets. It is also argued that R&D activity is not comparable with a classical product market because

[101] Cf. Bundeskartellamt, Press Release of 12 April 2017.
[102] Kern (2014, "Innovation Markets, Future Markets, or Potential Competition: How should Competition Authorities Account for Innovation Competition in Merger Reviews?", World Competition).
[103] The concept dates back to Gilbert & Sunshine (1995, "Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets", *Antitrust Law Journal).*
[104] Cf. e.g. Barth (2004, "Innovationsmärkte in der Fusionskontrolle", Wirtschaftsrecht und Wirtschaftspolitik Volume 187, p. 100-109).

there is no opposite market side (demand). It has therefore been argued that the demand-side substitutability concept cannot be applied.[105] The US competition authorities have meanwhile moved away from the innovation markets concept which was also unable to gain recognition in Europe in this specific form.

In Europe there are indications for categorising R&D-based innovation competition in the same way as the cooperations already mentioned, in particular in the Guidelines on the application of Article 101 TFEU to horizontal cooperation agreements.[106] In the context of the relevant markets the guidelines differentiate between existing markets on the one hand and "competition in innovation (R&D efforts)" on the other. In the last category a further differentiation is made between two scenarios.[107]

In the first scenario, which e.g. can be encountered in the pharmaceutical industry, specific "R&D poles" can already be identified at an early stage of the innovation process, which aim at creating a new product or new technology. The competitive relationship between different "R&D poles" can be determined by the fact that the target products of the development process are (later) sufficiently interchangeable with one another. This first constellation is also addressed in the Guidelines on the Application of Article 101 TFEU to technology transfer agreements. In this case it could also be analysed whether after the agreement there will be a sufficient number of competing "R&D poles" left to maintain effective competition in innovation.[108]

The second scenario is one in which no "R&D poles" can be identified because the innovation activities of a sector are not as clearly structured as in the first scenario. It is explicit in the Horizontal Guidelines that in such a case the Commission only tries in exceptional circumstances to determine the "impact of a cooperation on innovation". It usually limits its examination to existing markets which are related to the cooperation. Whereas the approach in the first scenario (competing R&D poles) shows analogies to the future markets concept, this approach, which is only used in exceptional circumstances, appears to go well beyond this. However, it is not further defined in the Guidelines.

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[105] See e.g. Drexl (2012, "Anticompetitive Stumbling Stones on the Way to a cleaner World: Protecting Competition in Innovation without a Market", Journal of Competition Law & Economics) and Kern (2014, "Innovation Markets, Future Markets, or Potential Competition: How should Competition Authorities Account for Innovation Competition in Merger Reviews?", World Competition).

[106] Cf. European Commission, Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements ("Horizontal GL"). In the previous version of the Guidelines the term "innovation markets" was explicitly used (e.g. para. 56 old version: "The competitive relationship between the parties has to be analysed in the context of affected existing markets and/or innovation markets." In the current version this term only appears in the heading of an example (Horizontal GL, para. 147).

[107] Cf. European Commission, Horizontal Guidelines, para. 112ff.

[108] Cf. European Commission, Guidelines on the Application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements, para. 26.

In its recent decision in the merger case Dow/DuPont[109], which concerned in particular crop protection products and petrochemical products, the European Commission considered the R&D activities of the merging companies in its competitive assessment without establishing a specific link to existing or future markets. Its conceptual approach chosen to deal with the merger case thus appears to follow the second scenario described in the Horizontal Guidelines. In doing so the Commission used the terms "innovation competition" (as opposed to the product and price competition which it also examined on specifically named product markets) and "innovation spaces" (as opposed to product markets).[110] The Commission firstly took account of the overlapping lines of research and early pipeline products of the parties. The theory of harm which it examined was therefore the likely discontinuation, delay or redirection of these activities.[111] Secondly, it also examined the R&D efforts and results of the parties and their (few) competitors across the sector. The theory of harm examined in the analysis was based on the structural reduction of incentives to innovate, which leads to a significant loss of innovation competition in the sector. It was based on the finding that the research results of one of the parties cannibalise the profits of the other party, and that this effect is internalised with the merger and reduces incentives to initiate research and development.[112] Different categories of factors and information were used to analyse this theory of harm, in particular an analysis of the effects of previous market consolidation, the development of product market shares with the focus on products with new ingredients, ongoing developments (pipelines), the (low) number of research active competitors, shares of individual companies in total R&D expenditure, the assessment of patent portfolios and the (competitive) closeness of the parties in the development of new ingredients/products and their significance as innovators.

The merger was cleared by the Commission subject to conditions. The parties to the merger will divest both specific assets of Dow's petrochemical business to a suitable buyer as well as a major part of DuPont's pesticide business, including its R&D capacities. Overall the aim is to ensure that both the short-term effects on price and innovation competition and current innovation-driven competition as well as the medium to long term effects on innovation competition expected from the merger are

[109] Dow/DuPont, Press release of the European Commission of 27 March 2017, COMP/M.7932.
[110] Cf. presentation "Assessing innovation effects in Dow/Dupont – breaking new ground or déjà-vu?" of 05.05.2017, downloadable at https://www.americanbar.org/content/dam/aba/events/antitrust_law/2017/05/20170505_gss_dow_dupont.authcheckdam.pdf (downloaded on 13.09.2017), and European Commission (2017, "Dow/DuPont: protecting product and innovation competition", Competition merger brief 2/2017, p. 1-8).
[111] This approach was at least compatible to some extent with the "future markets" concept.
[112] Cf. also RBB Economics (2017, "An innovative leap into the theoretical abyss: Dow/DuPont and the Commission's novel theory of harm", RBB Brief 54).

counter-balanced.[113]

In a competitive assessment the consideration of R&D activities of businesses which cannot (yet) be assigned to specific (future) products or are not specifically observable, raises theoretical and practical issues. This approach, for instance, does not strictly differentiate between R&D programmes and innovations. An increase in R&D will not necessarily give rise to an increase in innovations. On the contrary, the probability that an R&D activity will lead to in an innovation depends on other factors, in particular the quality of R&D. The orientation of R&D programmes can also play a role. Another related question is how the competitive position of the participating companies and third parties can be adequately assessed.[114] Expenditure on R&D, for example, could provide a first indication. At the same time even cost-intensive research programmes do not always result in an innovation. In the Dow/DuPont case, in addition to input factors, the Commission therefore also used further indicators on the output side such as the commercial success of the innovations of the participating companies or the number of their patents and patent citations.[115] Moreover, economic theory shows that under certain conditions changes to market structure which increase concentration can also positively affect incentives to innovate, e.g. if due to the absence of protective measures (e.g. patents) additional revenue from innovations cannot otherwise be earned. Any positive effects would have to be examined in relation to negative effects on competition.

D. Conclusion and questions

Depending on the subject of investigation, innovations can play different roles in an examination under competition law. In case practice concepts on the consideration of innovations have been established which are mainly based on existing product markets. The identifiable theories of harm are based on economic insights according to which, at least in concentrated sectors with diminishing competition, negative innovation effects can be expected.

The consideration of innovations in merger control, abuse or cartel proceedings often poses special challenges. For example, R&D processes are often associated with considerable uncertainty because

[113] Cf. Dow/DuPont, press release of the European Commission of 27 March 2017, COMP/M.7932, and European Commission (2017, "Dow/DuPont: protecting product and innovation competition", Competition merger brief 2/2017, p. 1-8).
[114] Cf. also Barth (2004, “Innovationsmärkte in der Fusionskontrolle”, Wirtschaftsrecht und Wirtschaftspolitik vol. 187, p. 191-201).
[115] Cf. presentation "Assessing innovation effects in Dow/Dupont – breaking new ground or déjà-vu?” dated 05.05.2017, downloadable at https://www.americanbar.org/content/dam/aba/events/antitrust_law/2017/05/20170505_gss_dow_dupont.authcheckdam.pdf (downloaded on 13.09.2017), slide 12.

not every R&D activity leads to a market-ready product. Mergers, cooperations or competition-relevant practices can also have different effects on innovations. This can result in a conflict between positive and negative effects depending on the observation period. In contrast to a short-term perspective (static approach), in a long-run perspective dynamic effects are also taken into account which can either reinforce or counteract short-term effects.

Against this background there is an ongoing debate about the right amount of antitrust intervention in innovation-driven markets. On the one hand the risk of over-enforcement is pointed out because the connection between concentration and innovation is not always clear and not all the influencing factors can be identified. Over-enforcement in such cases could reduce incentives for innovation and harm long-term innovation dynamics.[116] On the other hand under-enforcement, i.e. a misplaced policy of non-intervention by a competition authority, could impede competition, reduce incentives to innovate and in the long term weaken innovation-driven competition. A general hands-off approach in innovative sectors would therefore seem inappropriate from a competition point of view. A competition authority needs to carefully examine in each individual case whether its intervention is necessary. The challenge that competition authorities face is to further develop and refine concepts for examining innovation-related cases. This in particular raises the following questions:

Reduction in innovation as theory of harm

- There are many reasons to assume that at least in markets which are already concentrated, any loss of competition will reduce incentives to innovate. Are there any scenarios where this would not be the case? Which? Which indicators might help to identify such constellations in practice?
- How can the dynamic effects of a merger or cooperation with regard to innovations be assessed in addition to its static effects? Which concepts are available? How can opposing static and dynamic effects be adequately assessed?
- In which cases can the innovation-promoting effects of a restriction of competition be classified as efficiencies?
- Can innovation efforts be inefficiently high (e.g. excessive product variety; particularly high product quality which is not mass-market oriented; excessive investment in R&D to obtain a patent)?
- In assessing the commitments undertaken by a company, how can account be taken of the long-term effects of a merger on innovations?

[116] Cf. e.g. RBB Economics (2017, "An innovative leap into the theoretical abyss: Dow/DuPont and the Commission's novel theory of harm", RBB Brief 54).

- The transition from minor product modifications, such as a new form of product presentation, to an innovation is often seamless. Is it necessary in an assessment under competition law to make a clear distinction? Which criteria would have to be used?

Innovation as a counterbalance to market power

- How can it be established whether existing innovation activities help to counterbalance a potentially powerful position or whether they are more likely to be restricted by an envisaged project or the conduct of a company?
- In a market environment which is characterised by disruptive innovations, market power might not be sustainable. To what extent does this also apply to incremental innovations (product cycles)?

Standard of proof and forecast uncertainty

- How can a company's competitive position in R&D be adequately evaluated, especially if the R&D activities cannot be directly observed?
- Whereas various concepts and empirical methods have been established to measure the short-term effects of a merger or cooperation in a competitive assessment, the dynamic effects of such projects, which are often expected to have a longer term effect, can perhaps only be determined with a lower degree of reliability. Which standard of proof should be set for the examination and assessment of dynamic effects?
- In view of the potential conflict between the static and dynamic perspective, how can the duration and beginning of the forecast period be chosen if the competitive assessment involves products or technologies which are still in the development stage? Should restrictions of competition which might occur far into the future on product markets which do not yet exist be taken into consideration?
- In the case of restrictions of competition in emerging markets, in particular, and in the assessment of innovative activities without a relevant product market, should the standard of proof be lower, or should it be even higher, especially in view of the usually higher (forecast-) uncertainty in such cases?

Dynamic markets and the digital economy

- Is the digital economy particularly innovation-friendly? If so, are incentives to innovate stronger or even excessive? What can be said in favour of and against a general "internet defence"?
- Is intervention in young, developing (digital) markets necessary to avoid negative consequences in the long term ("keep markets open")?

- Are the consequences of unnecessary antitrust intervention (type I errors) less harmful in dynamic markets, perhaps due to the greater "self-healing powers" of the market?
- To what degree can the future markets concept used up to now in other sectors be applied to the digital economy? Can the assessment of innovative activities without a specific reference to a product market also be applied to the digital economy?
- What are the pros and cons of issuing preliminary injunctions to quickly react to negative developments?