

# Understanding the New Frontier for Merger Control and Innovation – The European Commission’s Decision in *Dow/DuPont*

AlixPartners

Rameet Sangha



Ben Forbes



Mat Hughes



### 1 Introduction

The European Commission (the Commission) has recently published the initial non-confidential version of its decision in *Dow/DuPont*, a merger between two leading diversified chemical companies with combined global sales of €67 billion.<sup>1</sup> Dow and DuPont are two of only five global firms with R&D activities covering all stages in the crop protection innovation lifecycle from molecule discovery right through to product distribution.<sup>2</sup>

The merger raised issues in relation to product overlaps in crop protection and certain petro-chemicals.<sup>3</sup> However, this chapter focuses on the Commission’s finding that the merger would adversely affect innovation competition, such that its adverse finding was not limited to price and innovation rivalry in specific overlapping markets. Moreover, these adverse effects on innovation were not limited to the loss of potential competition associated with specific “pipeline” products.<sup>4</sup>

As a result of the broad scope of the Commission’s adverse finding, *Dow/DuPont* marked the first time the Commission has imposed a remedy requiring divestment of one party’s global R&D facilities following its investigation of innovation competition. This clearly raises the stakes associated with mergers in markets where competition in innovation is important.

This decision is likely to generate some controversy, not least as the merger was subject to parallel investigation by the US Department of Justice (DoJ). The DoJ worked closely with the Commission and also investigated how the merger would affect the development of new crop protection chemicals. In contrast with the Commission, the DoJ concluded: “*in the context of this investigation, the market conditions in the United States did not provide a basis for a similar conclusion at this time*”.<sup>5</sup> It is not clear whether this different conclusion reflects factual differences or differences in analysis.

This controversy is also strengthened by the fact that only approximately a quarter of the customers contacted by the Commission expected that the merged entity would bring fewer active ingredients to the market than Dow and DuPont would have separately done, having regard to historical declines in innovation following past mergers. More competitors expressed such a view, but competitors’ views are often taken with “a pinch of salt” as they may give negative responses to mergers that increase rivalry.<sup>6</sup> This does not mean that the Commission’s decision is wrong, not least as the Commission had access to more information, including confidential information from the business plans of the Parties and their rivals.

This chapter examines the link between merger control and innovation effects, focusing on the Commission’s assessment of

innovation competition in *Dow/DuPont*. This chapter is structured as follows:

- We first examine the economic literature on innovation, and the link between market concentration and innovation.
- We examine the ways mergers can change the incentive for firms to innovate, drawing on the academic literature, before turning to focus on the Commission’s assessment of how the literature on innovation applied to the facts in *Dow/DuPont*.
- We review the evidence examined by the Commission when assessing innovation effects, and show how much of the analysis was analogous to the assessment of standard unilateral effects in mergers (e.g. with respect to price rather than innovation).
- We conclude by examining what the Commission’s decision implies for practitioners assessing innovation effects in future mergers.

### 2 The Link Between Market Concentration and Innovation: *Shumpeter vs Arrow* and Unification of Their Viewpoints

There is a large body of academic research showing that a key driver of economic growth is product innovation (the introduction of new and improved products) and process innovation (improvements that lower the costs of production).<sup>7</sup> In this context, it is unsurprising that competition authorities are paying increasing attention to innovation. In some ways this is not new since the Commission’s 2004 Horizontal Merger Guidelines note explicitly that “[*effective competition brings benefits to consumers, such as low prices, high quality products, a wide selection of goods and services, and innovation*”].<sup>8</sup>

In innovative or research-intensive industries, such as crop protection or pharmaceuticals, firms compete to capture significant sales from rivals via introducing new and innovative products. In these industries, rivalry to produce new and innovative products may be as or more important as other dimensions of rivalry in other industries (such as on price, quality, or service).

A key question when assessing mergers in innovative industries is how market concentration affects incentives to innovate.

The link between market concentration and innovation has been a subject of longstanding debate in the academic literature, with two schools of thought forming around two pioneering academics in the field, Joseph Schumpeter and Kenneth Arrow.<sup>9</sup>

Schumpeter’s seminal 1942 book emphasised that larger firms operating in oligopolistic markets have greater ability and incentive to invest in R&D as they are better able to capture its benefits – temporary market power is the reward for innovation.<sup>10</sup> Schumpeter

is probably most famous for coining the term ‘creative destruction’, associated with antitrust policies that favour dynamic competition and firms acquiring temporary monopoly power – which provides firms with the incentive to innovate.

Conversely, Arrow argued a monopolist’s incentive to innovate is less than that of a competitive firm as its financial interest is in maintaining the *status quo*. If a monopolist were to innovate, it would gain from sales of the new product, but these sales would come at the expense of its existing products. Hence, Arrow concluded that a firm in a competitive industry (if it has exclusive property rights) has much more incentive to innovate than a monopolist – or to simplify (quoting Shapiro<sup>11</sup>) – “*product market competition spurs innovation*”. Shapiro (2011), and the Commission itself,<sup>12</sup> note that the ideas of Schumpeter and Arrow are not mutually exclusive and can be unified if one focuses on the following three principles:

- **Contestability** – Sales are contestable if, following an innovation, the innovator gains profitable sales from rivals. The more contestable a product area, the greater the incentive to innovate. As Shapiro puts it: “*The prospect of gaining or protecting profitable sales by providing greater value to customers spurs innovation*”. Contestability is greater when customers are not locked in to their existing suppliers and can switch to innovative new products or suppliers.
- **Appropriability** – Appropriability relates to the extent to which the innovator can protect the competitive advantage associated with its innovation and thus capture the returns resulting from the innovation. Appropriability is particularly strong in industries with robust intellectual property rights (IPRs). Higher appropriability creates greater incentives to innovate.
- **Synergies** – Shapiro expressly recognises that “*Combining complementary assets enhances innovation capabilities and thus spurs innovation*”.<sup>13</sup> This reflects the fact that mergers may lead to R&D/IPR synergies when complementary assets can be combined efficiently. In contrast with the contestability and appropriability principles that both relate to *incentives* to innovate, synergies also relate to the *ability* to innovate by making innovation less costly or more feasible.

Since Schumpeter and Arrow published their seminal works, there have been many theoretical and empirical studies examining the link between competition and innovation – generating a variety of results. It is beyond the scope of this chapter to discuss all these works. In our view, Gilbert (2006) summarised the debate well when he said:

*“The many different predictions of theoretical models of R&D lead some to conclude that there is no coherent theory of the relationship between market structure and investment in innovation. That is not quite correct. The models have clear predictions, although they differ in important ways that can be related to market and technological characteristics. It is not that we don’t have a model of market structure and R&D, but rather that we have many models and it is important to know which model is appropriate for each market context.”*<sup>14</sup>

In *Dow/DuPont*, the Commission reviewed the academic literature and focused on the conclusions that it felt fit the facts of the industry in question (crop protection). We discuss below some of the mechanisms through which mergers can change incentives to innovate, as well as the specific facts in the *Dow/DuPont* case that led to the Commission’s requirement for divestment of DuPont’s R&D facility.

### 3 How Mergers can Change Incentives to Innovate

To understand the effects of a specific merger on competition in innovation, it is important to understand the change in incentives

caused by the merger. However, there lies the difficulty with measuring innovation effects – the incentives for firms to innovate are naturally complicated and will vary depending on the specific facts of the industry and firms in question.

Gilbert (2006) describes the incentive to innovate as simply “*the difference in profit that a firm can earn if it invests in R&D compared to what it would earn if it did not invest*”.

Considering the incremental profits from innovation highlights an obvious anti-competitive effect of mergers between rivals on innovation incentives, along the lines highlighted by Arrow. In particular, a firm’s incentives to innovate are reduced to the extent that these efforts cannibalise the sales of its existing products. Accordingly, following a merger with a rival, the merged firm’s incentives to innovate may be reduced to the extent that the sales won as a result of these efforts are taken from the merging party’s products, as opposed to those of other rivals. The US Horizontal Merger Guidelines explain this potential adverse effect on innovation incentives in the following terms:

*“The first of these effects [“reduced incentives to continue with an existing product-development effort”] is most likely to occur if at least one of the merging firms is engaging in efforts to introduce new products that would capture substantial revenues from the other merging firm. The second [“reduced incentive to initiate development of new products”], longer-run effect is most likely to occur if at least one of the merging firms has capabilities that are likely to lead it to develop new products in the future that would capture substantial revenues from the other merging firm. The Agencies therefore also consider whether a merger will diminish innovation competition by combining two of a very small number of firms with the strongest capabilities to successfully innovate in a specific direction.”*<sup>15</sup>

Accordingly, concerns relating to innovation competition will principally arise in concentrated markets where innovation is an important feature of competition, *and* the parties are important innovators.

Gilbert (2006) emphasises that innovation incentives:

*“...depend on many factors including: the characteristics of the invention, the strength of intellectual property protection, the extent of competition before and after innovation, barriers to entry in production and R&D, and the dynamics of R&D”*.<sup>16</sup>

It is worth considering each of these factors in turn, and thinking about how they apply in the context of a horizontal merger between rivals:

- *The characteristics of the invention* refers to the type of innovation, such as whether innovation competition relates to products or to processes. This effect is closely related to IPRs as some studies find that IPRs are much less effective at protecting process innovation than product innovation.<sup>17</sup> If firms compete in relation to process innovations, a merger can enable a firm to apply its more innovative processes across a greater scale (the two firms combined instead of just within one firm) and thereby generate efficiencies.<sup>18</sup> This does not mean that mergers in markets where process IPRs are important cannot generate merger efficiencies, but simply that process IPRs tend to be less effective than product IPRs (and this must be judged by reference to the specific market in question).
- *IPRs*, including patents, are important to protect the gains from R&D and innovation efforts. Stronger IPRs allow an innovator to earn rewards from its innovation without the innovation being copied by rivals, i.e. that the innovator can ‘appropriate’ the gains from its innovation. Greater IPR protection means greater appropriability, which provides greater incentive to innovate.<sup>19</sup> It follows then if IPRs or

patents are relatively weak and unable to protect a firm from rivals replicating the innovative product or process, then this naturally lowers the firm's incentive to make the investment in the first place. However, the less effective IPRs are *pre-merger*, the greater the potential for a merger to increase incentives for a firm to innovate. This is because the merger can *increase* the appropriability of the innovation (i.e. the degree to which the innovator benefits from the innovation) – whereas pre-merger some of the gains from the innovation might have gone to the rival firm, following the merger those gains are internalised within the merged entity.

- *The extent of competition before and after innovation*: this links back to the *Schumpeter vs Arrow* debate referenced above – does innovation thrive when competition (often measured using concentration as a proxy for competition) is higher or lower? How does innovation change the degree of competition? If, for example, the innovating firm expects less competitive pressure following innovation, it may have greater incentives to innovate (and thus capture the profits from lower competitive pressure) relative to a world where competition is unchanged.
- *Barriers to entry in production and R&D*: when fixed costs to R&D and entry barriers are particularly high, innovation is likely left to a limited number of large firms, leaving smaller competitors unable to compete for new product markets.<sup>20</sup>
- *Dynamics of R&D*: there is an extensive literature on patent races, in which firms compete to be the first to discover a new product (a type of competition that is common in, for example, the pharmaceuticals industry). In essence, the belief that a firm is ahead in the race to innovate becomes self-reinforcing. Firms will compete aggressively when their knowledge as to who is ahead in the race (or their R&D stock) is similar, but can drop out of the race altogether if they believe that a leading rival is much closer to securing exclusive rights than they are.<sup>21</sup> Accordingly, in a merger context, a merger with a strong rival innovator might reduce the competitive pressure to launch new products as quickly, subject to any merger efficiencies that may lower the cost or feasibility of new product launches.

The Gilbert (2006) article cited above continues as follows:

*“Economic theory does not offer a prediction about the effects of competition on innovation that is robust to all of these different market and technological conditions. Instead, there are many predictions and one reason why empirical studies have not generated clear conclusions about the relationship between competition and innovation is a failure of many of these studies to account for different market and technological conditions.”*<sup>22</sup>

This emphasises that one cannot generalise about innovation effects. Crucially one must examine the market and technological conditions that apply in each case. The next section of this chapter therefore examines the specific facts of the *Dow/DuPont* case that led the Commission to conclude that the merger would harm innovation competition, and that the only suitable remedy for this was to divest DuPont's global R&D organisation (including pipeline products at the discovery stages and R&D facilities and employees, except for a few limited assets to support the retained business).<sup>23</sup>

#### 4 How did the Industry Facts in Dow/DuPont Match the Theoretical Points Just Discussed?

The Commission's analysis of innovation in *Dow/DuPont* examines innovation at two levels of the crop protection industry: first at a more detailed level ('innovation spaces'); and second at a broader crop protection industry level.

1. *Innovation spaces*: Firms' research and development efforts target discoveries based on particular combinations of crops or pests, and thus may comprise active ingredients (AIs) that could be used in several downstream product markets. Innovation spaces are therefore wider than individual crop protection markets.<sup>24</sup> The Commission examined the Parties' innovation in particular spaces (i.e. group of crop/pest combinations), as well as at an industry level. It focused in particular on overlaps in lines of research and early pipeline products. A line of research is *“the set of scientists, patents, assets, equipment and chemical class(es) which are dedicated to a given discovery target whose final output are successive pipeline AIs targeting a given innovation space”*.<sup>25</sup>
2. *Industry level*: Dow and DuPont are two of only five global firms active at each stage of the crop protection innovation lifecycle, namely: discovery of new molecules; development of the molecule; mixture/formulation (including obtaining regulatory consents); and access to distribution. The other three firms are BASF, Bayer and Syngenta. The Commission found that being integrated at each stage of the innovation process, and having broad access to global markets mattered because: a firm's downstream distribution activities (i.e. knowledge of customer demands) can inform its upstream discovery and development activities, and at the same time having access to global markets downstream was important for generating revenues streams and profits to fund the upstream R&D.<sup>26</sup> The Commission also found high barriers to entry and expansion in R&D in crop protection.<sup>27</sup>

The Commission's theory of harm in this case was as follows: *“market features of the crop protection industry suggest that rivalry (or competition) is likely an important factor driving innovation, and that a merger between important rival innovators is likely to lead to a reduction in innovation”*.<sup>28</sup>

The Commission found that rivalry was an important factor driving innovation in the crop protection industry, and that a merger between important rival innovators (i.e. the Parties) was likely to reduce innovation relative to the situation that would prevail in the absence of the transaction. This was supported by the economic literature: *“the literature on competition and innovation suggests that competition is a positive driver of innovation in concentrated markets”*.<sup>29</sup> To support this finding the Commission cites a number of studies that suggest a positive relationship between competition and innovation, some with merger-specific findings.<sup>30</sup> Nevertheless, the Parties cited a paper by Vives (2008), which highlights that with increased rivalry, firms reduce output and invest less in R&D.<sup>31</sup> However, the Commission highlights that the finding rests on an assumption that equilibrium output would have remained unchanged with a reduction in the number of firms (which is questionable), and that the result could easily be reversed with a change in that particular assumption. In summary:

*“the Commission considers that whilst the results of the papers summarised in the preceding paragraphs do not apply directly to uncertain product innovation, overall these papers indicate that the intensity of competition between rival innovators is positively associated with market-wide innovation, absent specific forms of efficiencies. A merger between two significant and close competitors is therefore likely to reduce the level of innovation by each of the merging parties”*.<sup>32</sup>

The Commission supported its theory of harm with evidence relating to five key points,<sup>33</sup> discussed in turn below.

#### (i) Individual crop protection product markets are contestable on the basis of innovation

The importance of contestability was noted by Shapiro and mentioned above: when firms innovate in a contestable area, they attract profitable sales, which creates the incentive to innovate in the

first place. The Commission found that crop protection markets are contestable and customers are not locked in. Better products can win shares from rivals.<sup>34</sup> In this environment, competitive rivalry increases innovation incentives.

The Commission concluded that this view was not contradicted by the fact that firms also have incentives to innovate in order to address the risk of products becoming less effective over time (e.g. as pests become resistant to certain active ingredients), competition from generics, or the risk of regulation forcing the withdrawal of products. However, these factors do increase the competitive pressure that firms face to innovate, and this may reduce the appreciability of the change in innovation incentives associated with a merger between rivals.

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**(ii) Strong IPRs in the crop protection industry mean that appropriability is already high**

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The Commission found that due to strong IPRs in the crop protection industry, the original innovator can be expected to reap the benefits from its innovation. IPRs ensure that rivals cannot imitate the successful innovation, in other words appropriability is high. The Commission also found that “*the transaction is unlikely to significantly increase appropriability on the basis of the mechanisms identified in the economic literature*”.<sup>35</sup>

The Commission relied here on two conditions from the literature that are associated with high appropriability:

- limited spillovers or imitation from innovation (i.e. innovating firms can capture the value of innovation without significant effect on competitors); and
- the innovation taking place is largely product based rather than process innovation (emphasising that economies of scale are likely significant under product innovation, but not under process innovation).

The Commission concludes that “[b]oth conditions are satisfied in the crop protection industry. The Commission therefore considers it unlikely that the Transaction would lead to greater innovation incentives by increasing appropriability, as suggested by the Parties”.<sup>36</sup> In other words, because the crop protection industry already has high appropriability (due to adequate IPRs), the transaction is unlikely to increase appropriability beyond pre-merger levels. Therefore, any lessening of competition in innovation will not be outweighed by an increased incentive to innovate on appropriability grounds.

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**(iii) Innovation is mostly based on product innovation**

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The Commission found that innovation in crop protection relates primarily to product innovation, manifesting itself in new products (AIs). Process patents exist, but relate mostly to specific products.<sup>37</sup>

If innovation is related to process rather than to products, then a merger might enable such innovations to apply over a larger scale and generate countervailing effects that tend to increase innovation.<sup>38</sup> In the present case, the Commission found that innovation was mostly based on product innovation, with the result that such potential countervailing effects did not apply in this transaction.<sup>39</sup> However, this does not preclude a specific efficiency defence based on the facts, albeit the Commission rejected this possibility in *Dow/DuPont*.

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**(iv) Consolidation between rival innovators is unlikely to be associated with efficiencies**

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The Commission notes that “*the transaction is unlikely to lead to*

*greater overall innovation on the basis of its effects on product market competition*”.<sup>40</sup> The Parties argued that under certain conditions, the relationship between product market competition and innovation follows an inverted-U relationship – i.e. less competition can increase innovation until a market becomes highly concentrated. However, the Commission dismisses the relevant literature as a very specific theoretical model that does not apply to merger analysis or to this transaction. In summary: “*the Commission considers that the arguments raised by the Parties on the alleged ambiguous relationship between product market competition and innovation do not to [sic] invalidate the application of the innovation theory of harm to the present Transaction, as set out in the main body of the Decision*”.<sup>41</sup> (Again, this observation does not preclude there being a merger-specific efficiency defence.)

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**(v) The fear of cannibalisation of own existing products is a disincentive to innovate that is likely reinforced by a merger between rival innovators**

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The Commission notes that “*a merger in innovative industries generates standard unilateral effects in innovation*”. Firms operating in innovative industries with a small number of rivals will compete on innovation just as firms in other context may compete on factors such as price, quality and service.<sup>42</sup> The unilateral effects associated with innovation are analogous to unilateral effects associated with prices. As discussed above, prior to the merger, the two firms have an incentive to compete and capture profitable sales from each other through introducing new and innovative products or services. Post-merger, this effect is internalised within the merging party and the incentive to maintain that same rivalry through innovation can be diminished as introducing new products is more likely to result in cannibalisation of the firm’s own sales. The firm will factor the lost profits from cannibalised sales into its decision about whether to undertake innovation in that area. Such effects can be viewed as standard unilateral effects applied to innovation rather than other dimensions of competition such as price.

Note that cannibalisation in this context does not relate simply to a new product taking sales from one of the Parties’ existing products, but also to new products cannibalising sales from potential innovative future products.<sup>43</sup>

**Comment**

While the Commission’s point that reduced rivalry arising from fewer competitors will result in a reduction in innovation is supported by the literature, there remains a question over the magnitude or materiality of the reduction in innovation. Just how significant is the associated (future) harm to consumers? While the magnitude of unilateral effects relating to price are routinely estimated or modelled in mergers, the magnitude of innovation effects is not.<sup>44</sup> To put the point differently, the above arguments made by the Commission suggest that the effects of the merger on innovation competition warranted close consideration across crop protection markets. However, they are insufficient to demonstrate that any reduction in innovation competition would be both likely and appreciable in connection with the *Dow/DuPont* merger. In the next section we review the various categories of more specific evidence examined by the Commission. Of the evidence, it seems that the Parties’ internal documents were most significant in supporting the conclusion that innovation effects would be material. Indeed, it is striking that the Commission’s decision makes extensive reference to internal documents to evidence its arguments, even if these documents are highly redacted in the current non-confidential version of its Decision.

## 5 Additional, Traditional, Types of Evidence Reviewed to Assess the Commission's Innovation Theory of Harm

In addition to reviewing how the facts in this particular industry matched the economic theory in relation to innovation, the Commission reviewed evidence analogous to the evidence that the Commission typically reviews in cases not specifically focused on innovation, namely: (a) the Parties' internal documents; (b) evidence from past concentrations; (c) industry structure and concentration at industry level as well as in particular innovation spaces; (d) the closeness of competition (in innovation) between the merging parties; and (e) changes in current and future product market competition.

### (a) Evidence from the parties' internal documents

The Parties' internal documents made clear that part of the synergies from the transaction would arise from elimination of duplication in R&D programmes and rationalisation of costs associated with R&D. The Parties' initial presentation to investors stated that they intended to "*rationalize and prioritize spending as it relates to breeding, biotechnology and discovery programs*" and "*[e]liminate duplicative R&D programs including breeding, traits and chemical discovery*".<sup>45</sup> The discussion of further internal documents is largely redacted from the published decision, but one is left with the clear impression that they supported reduced competitive pressure on the merged business to innovate. Indeed, in discussing the case in a personal capacity at a GCR Live panel in Brussels in July 2017, Giulio Federico of the Commission emphasised that "*Dow/Dupont was driven in large by the body of evidence – in particular initially on the significant R&D cuts that Dow and DuPont planned as part of their synergies plan*".<sup>46</sup>

Reducing expenditure on R&D would have the effect of reducing innovation competition in the short term<sup>47</sup> (the Commission had identified overlaps in the parties' development pipelines),<sup>48</sup> reducing the associated product market competition in the longer term, as well as reducing innovation in the medium- and long-term.<sup>49</sup> These longer-term effects add greater scope to cause harm than the shorter-term effects.

The Commission also references a "*report submitted by the Parties stating that cannibalisation concerns could affect post-Transaction innovation incentives when a Party's early pipeline product overlaps with the other Party's existing product portfolio*".<sup>50</sup>

It seems to us that the internal documents provided the clearest evidence that R&D efforts would be reduced materially post-transaction, and that this would have a negative effect provided that competitors would not increase their innovative efforts in response. The Commission found that rivals with R&D discovery capabilities would not be likely to offset the post-merger reduction in innovation output by the merging parties as they have differentiated research strengths and capabilities, face capacity limits at pre-development and development level, and would not have the incentive to compete aggressively in this way.<sup>51</sup>

### (b) Evidence from past concentrations

To inform its view of the likely impact of concentration on innovation, the Commission looked at historical evidence of what had happened to innovation following several decades of concentration in the crop protection industry.<sup>52</sup>

The Commission reviewed evidence on concentration in the R&D aspect of the crop protection industry since 1960. The Commission's decision contains a figure showing that the number of companies involved with crop protection discovery in the US and Europe fell from a peak of 51 in 1960 to 40 in 1980, then more than halved to 17 in 1990, before falling further to 12 in 2000 and to just six in 2010.<sup>53</sup> Simultaneously, R&D expenditure by the largest five firms had reduced. R&D as a percentage of revenues had decreased "*suggesting a reduction in the innovation effort*".<sup>54</sup> The Commission also cited evidence that R&D expenditures had fallen in real terms (1994–2010),<sup>55</sup> and the rate of innovation output (measured by the number of AIs in development) had also fallen between 2000 and 2013.<sup>56</sup>

Reviewing the evidence in the published decision, some questions arise that cannot be answered from the public decision alone. For example, why would the rate of introducing AIs remain constant over time, regardless of mergers? For example, how does the rate of introduction of AIs interact with the number and variety of commercial crop varieties grown, which will no doubt have changed over time? How much of the fall in AIs is attributable to stricter regulation in Europe, and the greater cost of introducing a new AI?<sup>57</sup> Overall, the Commission found that concentration had, at best, not improved innovation and, more likely, had harmed it. The Commission also found that the negative trend in innovation in crop protection had particularly affected the EEA, which was relevant as Dow and DuPont are two of the few companies innovating with a focus on Europe.<sup>58</sup>

In our view, this evidence from past-mergers is in itself not compelling since: (i) one cannot isolate the effect of mergers from all the other factors that affect a firm's ability and incentive to innovate (including regulation, which has become progressively more onerous). In other words, correlation does not prove causation unless one controls for all the other factors that influence firms' abilities and incentives to innovate; and (ii) this does not address the specific effects of the merger in question.

### (c) Market structure: concentration in innovation both at the industry level and in innovation spaces

At the industry level, the Commission found that the merger reduced the number of integrated global R&D firms from five to four. Innovation concentration was thus high at the crop protection industry level.<sup>59</sup> In other contexts, a reduction in the number of large competitors from five to four is not automatically a competitive problem (as smaller competitors remained focused on particular geographies, such as Japan, or particular stages in the innovation lifecycle). There was also some competition from generics, even if the Parties and the Commission disagreed as to the extent this was a material competitive constraint in practice.

Our reading of the decision is that innovation concentration in certain *innovation spaces* was a critical factor behind the Commission's finding that the merger created a competitive problem in innovation, together with the finding that rivals would be unlikely to increase their innovation efforts in response to a reduction in innovation by the merged entity.<sup>60</sup> This is because when examining specific innovation spaces (which are narrower than the industry level), the Commission found that concentration was even higher than at industry level as not all five globally integrated R&D firms are present in each space. Interestingly, the data presented by the Commission in support of this general point did not relate directly to R&D in specific innovation spaces, but rather to whether firms made sales within a particular product area in individual EEA countries.<sup>61</sup> The Commission also presents a rationale as to why

concentration in innovation spaces is likely to be higher than at industry level – namely that individual markets are relatively small and so are unlikely to attract all suppliers. In addition, the Commission appeared to discount BASF (one of the global market leaders) as being a weaker competitor in herbicides and insecticides based on its share of “high quality” patents (excluding mixtures) in these categories (0–5% between 2000 and 2015).<sup>62</sup>

In our view, this greater concentration in specific spaces is an important feature, which adds credibility to the Commission’s theory of harm.

#### (d) Closeness of innovation competition between the parties

When considering unilateral effects in horizontal mergers generally, it is standard practice to examine how closely the merging Parties compete, and whether they compete more closely with each other than with rivals. The Commission in this case found not only that there were few globally integrated R&D rivals in the crop protection industry, but that the merger brought together two particularly close innovation competitors both at industry level and also in particular innovation spaces.<sup>63</sup>

The Parties disputed these points by arguing that they are not particularly close innovators compared to other players. For example, they are ranked fourth and fifth globally in terms of both turnover and R&D spend, and the merged entity would only have a 20–30% share of all patent applications behind Bayer and BASF between 1990 and 2015.<sup>64</sup>

In reaching its findings in this regard, the Commission drew on evidence from internal documents (much of which is redacted from the published decision) and a review of the parties’ research pipelines and patents in particular product areas. The Commission examined the parties’ shares of the number of patents as well as evidence on patent citations, which are an indicator of the quality of a patent – the more widely cited a patent (particularly externally) the higher its quality. The Commission found that the Parties had relatively high combined shares of patents, and are important and close innovators for new active ingredients in crop protection, in particular for herbicides and insecticides. In presenting this patent analysis, the Commission considered that it was most appropriate to consider a period between 2000–2015 (since this was more recent than the period from 1990–2015 referred to by the Parties), excluding mixtures (so as to focus on new AIs), and the Commission found that this generated a combined patent share for the merger entity of 40–50% to 60–70% of external patent citations based on the top 10% and top 25% of patents in insecticides and herbicides (but 20–30% in fungicides).<sup>65</sup>

#### (e) Efficiencies and countervailing effects

The Parties suggested that the transaction would generate efficiencies, and two categories of these were merger specific:<sup>66</sup>

- efficiencies in R&D: namely, removal of duplicative assets and using R&D assets more efficiently; and
- combining complementary strengths in R&D.

The Commission was willing to accept an argument put forward by the Parties that “a merger between innovators could in principle lead to economies of scale and/or scope which could reduce the cost of carrying out R&D and thus at least partially offset the loss of innovation competition between the merging parties”.<sup>67</sup> However, in this case the parties did not advance evidence proving the alleged efficiencies were “verifiable, merger-specific, and likely to be passed on to consumers”.<sup>68</sup> As the burden of proof was on the parties,

the Commission did not comment further on the parties’ general arguments about whether the efficiencies may increase incentives to innovate.

It is not possible to comment substantively on this point.<sup>69</sup> It is possible that there was no credible efficiencies defence, since the Parties’ merger rationale may have focused on the merged entity reducing its innovation efforts.

#### (f) The remedy

The Commission concluded that, post-transaction, the merged entity would have lower incentives to achieve the same level of innovation as pre-transaction, and that this would lead to a significant loss of effective competition in the industry.<sup>70</sup>

In view of the serious concerns the Commission had regarding the likely reduction in innovation competition post-transaction, the only remedy to restore pre-merger levels of innovation competition was a requirement to divest an entire global R&D facility to a firm outside the global integrated R&D firms. FMC has since agreed to purchase DuPont’s facility.<sup>71</sup>

## 6 Conclusion: Proceed with Caution in Innovation Cases

The Commission’s theories of harm, the economics of unilateral effects, and the evidence reviewed in this matter were not novel departures from a normal unilateral effects case in a horizontal merger. The application of these theories and evidence in an innovation setting was also not novel, although the remedy (divestiture of a global R&D facility) was.

The basic economic questions in this innovation case come back to those faced in most mergers, namely:

- How do firms compete? This case involved a heavy emphasis on innovation competition, whereas one might more commonly focus on factors such as price or quality.
- How does economic theory suggest the incentives of firms might change post-merger?
- What evidence is there about closeness of competition between the merging parties and other rivals?
- What evidence can one obtain from “natural experiments” or previous mergers?
- Crucially, what do the merging parties’ internal documents suggest about their plans post-merger?<sup>72</sup>

The Commission’s focus on innovation in the present case was understandable given the importance of innovation in the crop protection industry. The Commission’s findings and ultimate remedy were very fact-specific, which the Commission clearly views as being designed to ensure that innovation continued at pre-merger levels in a situation where the Commission had concluded based on theory, the application of evidence, and the parties’ own documents, that it would otherwise fall post-merger.

Ultimately, innovation specific effects can influence the scope of the theories of harm and therefore the nature (and extent) of the remedies imposed. The *Dow/Dupont* case shows that when firms compete in R&D and innovation, the impact of the transaction on innovation must be considered in light of economic theory and the specific facts of the industry and transaction in question.

In short, advisors need to be alive to the possibility of innovation competition being examined in future cases, and the economic theory and types of evidence required to assess whether the theory matches the facts of the industry and transaction in question.

## Endnotes

1. Case COMP/M.7932, Commission decision of 27 March 2017 (published 12 October 2017). Unless otherwise indicated, references to paragraph, page and annex numbers within this article relate to this merger decision.
2. Paragraph 1955.
3. The Commission reached an adverse finding associated with the supply of crop protection products associated with some 100 markets. The scope of the Commission's adverse findings is summarised in its Competition Merger Brief 2/2017 – Article 1, “Dow/DuPont, protecting product and innovation competition” by Alexander Bertuzzi, Soledad Blanco Thomas, Daniel Ooubluq, Johan Jonckheere, Julia Tew, and Thomas Desienhofer.
4. Where the competition concern relates to the loss of potential competition between the parties, due to the expectation that in the absence of the merger one or both of the parties are likely to launch new products, with the consequence that product market competition would be reduced due to the merger. The Commission routinely examines product- and pipeline-level innovation in mergers, perhaps most frequently in connection with pharmaceutical mergers.
5. DoJ press release dated 15 June 2017 (<https://www.justice.gov/opa/pr/justice-department-requires-divestiture-certain-herbicides-insecticides-and-plastics>). The DoJ still required various divestments.
6. Paragraph 1984.
7. See, for example, Federico, G., Langus, G., & Valletti, T. M., “Horizontal Mergers and Product Innovation: An Economic Framework”, 2017; OECD, “Policies That Support Growth Based on Innovation and Information Technology,” Chapter 4, in “A New Economy? The Changing Role of Innovation and Information Technology in Growth”, 2000; Aghion, P., Blundell, R., Griffith, R., Howitt, P., & Prantl, S., “The effects of entry on incumbent innovation and productivity”, *The Review of Economics and Statistics*, 91(1), 20-32, 2009; Katz, M. L., & Shelanski, H. A., “Mergers and innovation”, *Antitrust Law Journal*, 74(1), 1-85, 2007; and Aghion, P., & Griffith, R., “Competition and growth”, 2005.
8. “Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings”, Official Journal C 31, 05.02.2004, paragraph 8. Section 6.4 of the US Horizontal Merger Guidelines (2010), issued jointly by the DoJ and Federal Trade Commission, indicate that the agencies may investigate whether a merger may reduce innovation competition.
9. This section is a very brief overview of the academic literature relevant to the point made in this article. For a fuller summary of the literature see: Shapiro, C., “Competition and innovation: did Arrow hit the bull's eye?” In “The rate and direction of inventive activity revisited” (pages 361–404). *University of Chicago Press*, 2011.
10. Schumpeter, J.A., “Capitalism, Socialism and Democracy”, 1942.
11. Shapiro (2011), page 362.
12. European Commission – “EU merger control and innovation”, *Competition Policy Brief*, April 2016.
13. Shapiro (2011), pages 364–365.
14. Note 8, pages 164–165.
15. US Horizontal Merger Guidelines, section 6.4.
16. Gilbert, R., “Looking for Mr. Schumpeter: Where Are We in the Competition-Innovation Debate”, *Innovation policy and the economy*,” 2006, page 162.
17. Levin, R. C., Klevorick, A. K., Nelson, R. R., Winter, S. G., Gilbert, R., & Griliches, Z., “Appropriating the returns from industrial research and development”, *Brookings papers on economic activity*, 1987(3), 783–831.
18. Shapiro (2011), page 392.
19. Shapiro (2011), page 388.
20. Carrier, M. A., “Two puzzles resolved: of the Schumpeter-Arrow stalemate and pharmaceutical innovation markets”, *Iowa L. Rev.*, 93, 393, page 401, 2007.
21. Other factors that influence a firm's decision to remain in the race include its patent valuation (or prize value), discount rate, and the incremental cost of adding R&D stock.
22. Gilbert (2006), page 162.
23. We do not discuss the details that led to the Commission requiring divestment of overlaps in existing products, namely overlaps in pesticides and certain petrochemical products (acid co-polymers and ionomers).
24. Paragraph 351.
25. Paragraph 1958.
26. The Commission examined whether firms active at one part of the vertical chain alone or in combination with firms at a different part of the vertical chain could exercise a constraint on the parties in R&D and concluded they could not (sections V.8.6.3 and V.8.10.6).
27. Paragraph 2226.
28. Paragraph 2000.
29. Annex 4, Section 4.1.3.
30. See, for example, Motta and Tarantino (2016), Lopez and Vives (2016), and Algion *et al.* (2005).
31. Xavier Vives (2008), “Innovation and competitive pressure”, *Journal of Industrial Economics*, 56(3), page 423. Also referenced at footnote 32 of *Dow/DuPont*.
32. Paragraph 59.
33. Paragraph 2001.
34. Paragraph 2052.
35. Annex 4, Section 5.
36. Annex 4, paragraph 93.
37. Paragraph 2065.
38. Paragraph 2066.
39. Paragraphs 2046 and 2065-66.
40. Annex 4, Section 4.2.
41. Annex 4, paragraph 85.
42. Firms may of course compete on combinations of these factors – competing on innovation does not preclude competing on price and other factors.
43. Paragraph 2108.
44. The Commission comments on the relative magnitude of a reduction in product competition and innovation competition in paragraphs 282–283.
45. Paragraph 3033 and Figure 160.
46. *Global Competition Review*, Volume 20, Issue 7, “Untangling innovation in EU merger control”, edited transcript of its July 2017 panel discussion.
47. Paragraph 3056.
48. Paragraph 3021.
49. Paragraph 3057.
50. Paragraph 3020.
51. Paragraph 2019.
52. Section 8.5.
53. Figure 99 at paragraph 2124, citing Sparks (2013).
54. Paragraph 2125.
55. Paragraph 2127.

56. Paragraph 2133 and Figure 103, citing Phillips McDougall.
57. Paragraph 2156.
58. Paragraph 2158.
59. Section 8.6.
60. Paragraph 2019.
61. Paragraph 2363.
62. Paragraphs 2368–2370.
63. Sections 8.7–8.8.
64. Paragraph 2424.
65. Sections 8.7–8.8 and Annex 1 (paragraph 96).
66. Paragraphs 3266–3274.
67. Annex 4, paragraph 108.
68. [http://ec.europa.eu/competition/publications/cpb/2016/2016\\_001\\_en.pdf](http://ec.europa.eu/competition/publications/cpb/2016/2016_001_en.pdf).
69. However, it is worth observing, to paraphrase one of Dennis Carlton's comments on revising the US Horizontal Merger Guidelines, that it is important to take account of merger related reductions in fixed costs that enhance firms' incentive to invest in R&D and thus potentially generate new (or higher quality) products and services. See: Dennis W. Carlton; "Revising the horizontal merger guidelines", *Journal of Competition Law & Economics*, Volume 6, Issue 3, 1 September 2010, Pages 619–652, <https://doi.org/10.1093/joclec/nhq007>.
70. Section 8.10.
71. [http://europa.eu/rapid/press-release\\_IP-17-2182\\_en.htm](http://europa.eu/rapid/press-release_IP-17-2182_en.htm).
72. The decision contains a discussion of the evidentiary value of post-integration planning documents in section 8.10.2, and makes the point that their probative value is affected by whether they were drawn up before the knowledge of preliminary competition concerns.



**Ben Forbes**

AlixPartners  
6 New Street Square  
London, EC4A 3BF  
United Kingdom

Tel: +44 20 7098 7457  
Email: [bforbes@alixpartners.com](mailto:bforbes@alixpartners.com)  
URL: [www.alixpartners.com](http://www.alixpartners.com)

Ben is a Vice President in AlixPartners' European competition practice, which is part of a broader litigation practice. He has over eight years of experience as an economist advising on a range of competition and regulatory matters. He has particular experience in relation to market investigations and mergers, including acting for HSBC in relation to the CMA's market investigation into retail banking and in advising on various mergers (including a recent retailer merger cleared unconditionally at Phase 1: *JD Sports/Go Outdoors*). He has written several pieces on the economics of merger control including co-authoring two chapters in the Third Edition of '*UK Merger Control: Law and Practice*', November 2016. He has also worked more generally on competition and litigation matters relating to financial services and telecoms.

**Rameet Sangha**

AlixPartners  
6 New Street Square  
London, EC4A 3BF  
United Kingdom

Tel: +44 20 7098 7692  
Email: [rsangha@alixpartners.com](mailto:rsangha@alixpartners.com)  
URL: [www.alixpartners.com](http://www.alixpartners.com)

Rameet is a Director in AlixPartners' European competition practice, which is part of a broader litigation practice. She has more than 15 years of experience in advising companies involved with competition proceedings in the United Kingdom, Europe, and South Africa. Clients benefit from Rameet's expertise in a range of competition matters, from mergers to market or sector investigations, abuse-of-dominance allegations, competition litigation, and damages assessments. Her experience spans a range of industries with particular focus on financial services and life sciences.

She is co-author of the Third Edition of '*UK Merger Control: Law and Practice*', November 2016.

**Mat Hughes**

AlixPartners  
6 New Street Square  
London, EC4A 3BF  
United Kingdom

Tel: +44 20 7098 7400  
Email: [mhughes@alixpartners.com](mailto:mhughes@alixpartners.com)  
URL: [www.alixpartners.com](http://www.alixpartners.com)

Mat is a Managing Director in AlixPartners' European competition practice, which is part of a broader litigation practice. He has over 25 years of experience as an anti-trust economist and in dealing with competition authorities and specialist utility regulators in relation to all aspects of competition law. Mat started his career as an economist at the UK Office of Fair Trading, and until March 2013 was Chief Economist at Ashurst LLP. Mat has worked on a diverse range of mergers, including over 30 Phase 2 UK mergers and a large number of Phase 1 mergers, including acting for JD Sports in relation to the *JD Sports/Go Outdoors* merger.



AlixPartners has a multi-disciplinary practice covering economics, forensic accounting, and information management services (such as e-discovery and applied data analytics). The firm also has post-merger integration experts who provide evidence on efficiencies in mergers, and restructuring experts who advise on "failing firm" viability issues. Combined with AlixPartners' industry expertise, this wide-ranging capability allows us to create robust evidence and analysis on the issues that matter most to the case. This included advising on *JD Sports/Go Outdoors*, cleared unconditionally by the CMA at Phase 1, *BT/EE*, which was cleared unconditionally by the CMA at Phase 2, and various Phase 2 EU mergers such as *H3G/O2* (acting for EE) and *Nynas/Shell* (which was cleared unconditionally on the basis of a combination of the exiting firm defence and merger efficiencies).

AlixPartners' economics practice also engages in a range of other competition economics work. Members of the team have acted in relation to the European Commission investigations into credit default swaps and ebooks, the UK Competition and Markets Authority (CMA) investigation into retail banking, and have also acted in relation to the recent market investigations concerning payday lending and private motor insurance. They are also acting in relation to a range of matters involving competition litigation, such as acting for six OEMs in relation to car/truck part cartels, interchange fees for Visa Inc., the polyurethane foam cartel for multiple claimants, and pay-for-delay pharmaceutical litigation.