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DISRUPTIVE INNOVATION AND COMPETITION POLICY ENFORCEMENT

Note by Alexandre de Streel and Pierre Larouche

-- Session III --

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DISRUPTIVE INNOVATION AND COMPETITION POLICY ENFORCEMENT*

-- Background Note --

1. Disruptive Innovation

1. Nowadays it is very fashionable to talk of 'disruptive innovation'. As with every buzzword, increasing frequency of use adversely affects conceptual sharpness. Accordingly, it is useful to start by going back to how disruptive innovation was defined and described originally.

1.1 Defining disruptive innovation

2. In their seminal paper in the Harvard Business Review, Bower and Christensen (1995) distinguished between two types of technological innovation:

- *Sustaining innovation* takes place within the value network of the established firms and gives customers something more or better in the attributes they already value.
- *Disruptive innovation* takes place outside the value network of the established firms and introduces a different package of attributes from the one mainstream customers historically value.

3. At the outset, it is important to dispel the frequent confusion between the sustaining/disruptive and incremental/breakthrough distinctions. Incremental and breakthrough refer to *technological process*, and qualify the innovation with respect to the prior state of the art: an *incremental innovation* marks a small step forward (typically the improvement of a feature or characteristic of a technological paradigm), whereas a *breakthrough innovation* involves a significant technological jump (akin to a change of technological paradigm). For instance, adding slow motion or stop image capacities to a VCR is an incremental innovation; replacing VCRs with DVDs is a breakthrough innovation.

4. In contrast, sustaining and disruptive refer not to technological progress, but to the relationship between the innovation and the *value network* around it: a sustaining innovation takes place within the value network, whereas a disruptive innovation comes from outside of the value network and displaces it. As Christensen describes it, within the value network, incumbent firms tend to improve products constantly, so as to pull the market upwards towards the high-end. This leaves the door open for other firms to come from a neighbouring market and start offering low-end products that meet the basic requirements of the value network and offer additional value (outside of the value network). If these other firms are successful in gaining a foothold on the low-end of the market, the value network will be

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redefined on their terms, and they will supplant the incumbent firms. This is why, as Christensen explains, even successful firms that invest in innovation and stay nimble can be displaced by disruptive innovation. Disruptive innovation comes from the blind side of incumbent firms.

5. To continue with the example given above, following the introduction of the VCR, its replacement by the DVD and later by Blu-ray are the main events in a long and rich string of sustaining innovations, whereby domestic video recording and viewing devices have become more and more sophisticated along a range of parameters: video and sound quality, ease of use and convenience, recording possibilities, viewing options, etc. This century witnessed the start of another technology, streaming, which at first was not really a competitor to DVDs and Blu-ray. Yet streaming progressively reached the point where – with the help of YouTube and others – it could satisfy the basic needs of the low end of the market, while offering additional values (no need for physical media, ubiquity, etc.). Firms active on the DVD and Blu-ray markets, despite the quality of their products, were unable to stop streaming from eating up their market as it progressed and it became a suitable substitute for a wide range of consumers. It could be argued that the value network has now shifted so that the values of streaming are now central, and physical media systems (DVD, Blu-ray) have become more of a niche market.

6. As explained by Christensen (1997), the deployment of disruptive innovation takes place in two phases: (i) in a first phase, the innovation *performs worse* along some dimensions that are important for traditional customers and with lower prices, hence it targets - and is used - by *new customers* in a new market;¹ (ii) in a second phase when the disruptive innovation is established in its new market, it *progresses quickly* to satisfy the needs of *mainstream customers* and dethrones the leading firms in the mainstream market.

7. Disruptive innovation is not a new phenomenon: in the past, the advent of the automobile (replacing horse-drawn carriages), of the telegraph (replacing mail) and of the phonograph (replacing live performances) can all be presented as disruptive innovations, with the one proviso that the disruptive innovations started as luxuries and it took some time before their cost of production were reduced such that they could displace existing technologies. In more recent times, disruption ‘on the cheap’ has become possible. Many disruptive innovations now benefit from the characteristics of digital technologies such as: network effects, which may be direct or indirect, leading to market tipping; reduction of costs allowed by the reduction of intermediation; and scalability providing rapid access to a potentially global customer base.²

8. The theories of Christensen were developed against that more contemporary backdrop where entry is less costly and difficult than before. It is easier and quicker to disrupt a market today than it was in the past. That is why we see an acceleration of the number and the rhythm of industry disruptions.³ Recent examples of disruptive innovation would include – next to the Christensen case-study on miniature hard drives – streaming (disrupting the DVD/Blu-ray industry), browser-centric computing (leading to cloud computing, disrupting the PC industry), smartphones and tablets (disrupting the PC and microprocessors industries), digital content and online distribution (disrupting the traditional content industries) or the ‘sharing economy’ (disrupting traditional service industries like taxis and hotels).

¹ Christensen notes that in this first phase, the innovator competes against non-consumption.

² On the characteristics of digital markets: Monopolkommission (2015:15-27), OECD (2012), Shapiro and Varian (1999).

³ To illustrate the acceleration of the rhythm of disruption, see OECD (2015:5).

1.2 *Business strategy and welfare implications*

9. Disruptive innovation is more frequent and, in the wake of the work of Christensen et al, it is better understood. Accordingly, it has become a popular business strategy. From a business perspective, disruptive innovation offers an alternative path to market entry and growth, in addition to the more traditional path of challenging the incumbent firm(s) head on, via sustaining innovation or more statically via cheaper products or superior marketing, for instance. Because it avoids frontal competition, a disruptive innovation strategy can allow the disruptor to grow ‘under the radar’ of incumbent firms and, if successfully executed, can offer more growth potential.⁴ At the same time, the disruptor faces a greater challenge in crafting and offering an innovative product that will at least appeal to the lower-end of the existing value network and offer sufficient added value to draw consumers to it. As its name indicates, disruptive innovation remains innovation: the disruptor must manage both to invent something new *and* to have this invention diffused and adopted by customers. Both invention and diffusion/adoption are affected by uncertainty.

10. The welfare implications of disruptive innovation are generally positive, as long as the innovation does not breach fundamental rights or adversely affect a public policy objective. Disruptive innovation usually also generates the kind of ‘creative destruction’ described by Schumpeter, but it is generally agreed that such process is on balance good for welfare.

11. Combining the business strategies and the welfare implications, against the backdrop of innovation as a combination of invention and diffusion/adoption, the following scenarios can be envisaged:

- i) A firm – typically a start-up – *single-handedly carries out disruptive innovation*, and rides on it to become a large player. Indeed we see many start-ups unseating established firms.⁵ As a starting point, there is no reason for concern in this scenario, save for the risk of anticompetitive exclusionary strategies if and when the disruptor becomes a dominant player.
- ii) In the course of the process of innovation, the *potential disruptor is acquired by another firm* (usually a larger firm), and that acquisition provides the necessary impetus and resources for disruptive innovation to take place. The earlier the acquisition, in the innovation process, the higher the risk taken by the acquirer, but also the lower the price. As a starting point, this scenario should also be of no concern; in some respect, it might even be superior to scenario 1, since the resources of the acquiring firm might increase the chances of successful execution of a disruptive innovation scenario.

12. However, incumbent firms can intervene to affect the outcomes of either scenario:⁶

1. One or more *incumbent firm(s)* can try to prevent disruption from happening by *depriving the disruptor from the ability to create an interface or an overlap* between its innovative product and the existing value network.

⁴ If competition ends up being for the market rather than in the market.

⁵ Founded in 2008, Airbnb is now used by an average of 425,000 people every night. Reportedly valued at about US\$ 20 billion earlier this year, Airbnb is worth about two-thirds of the Hilton hotel chain. Uber now operates in 55 countries, has more than 160,000 active drivers, and is valued at more than US\$ 40 billion, making it more valuable than Delta Airlines and nearly twice as valuable as Viacom: OECD (2015:4).

⁶ Incumbent firms may also try to exclude disruptive innovator through public regulation. This scenario is not examined here as it was already analysed in OECD (2015).

2. An *incumbent firm can acquire the disruptor* with a view not to accelerate disruption, as in scenario 2, but rather *to thwart it by mothballing* the disruptor and its products after the acquisition. The disruptor usually has a strong incentive to carry out the disruption, since the potential longer-term gains from a successful execution are greater than the short-term losses. In the case of a new entrant, the short-term losses are zero and even for a small incumbent firm, the losses may pale in comparison to the gains. Larger incumbents, however, find themselves in a situation where they are cannibalizing their existing market position, and might prefer to forego long-term gains and mothball the disruptor to protect their existing position.

13. Since disruptive innovation is important for growth and consumer welfare and because it may be threatened by incumbent firms, antitrust agencies have a special responsibility to ensure that the process of disruptive innovation is not affected or prevented through the actions of incumbent firms. However, the threat to disruptive innovation are not easy to identify by antitrust agencies, hence are prone to risks of errors (of type I as of type II). To mitigate those risks, the agencies should rely on appropriate theories of harm based on Scenarios 3 and 4.

2. Competition Policy and Disruptive Innovation

2.1 *The goals of competition policy*

14. There is a growing literature on the relationship between innovation and competition policy.⁷ Often this literature starts with the complex relationship between innovation and the level of competition citing the three main theories: the theory of Schumpeter (1942) which posits a negative relationship between competition and innovation as incentives for innovation are based on the perspective of future monopoly rents; the theory of Arrow (1962) which posits a positive relationship between competition and innovation as the incentives for innovation are based on the need to outperform competitors; and the theory (and empirical analysis) of Aghion et al. (1995) which posits an inverted-U relationship between competition and innovation, i.e. too little or too much competition is negative for innovation.

15. The proponents of Arrow and, to some extent of Aghion et al.,⁸ see an important role for antitrust agencies in supporting innovation because they understand competition as the driver of innovation. On the other hand, some proponents of Schumpeter see no, or very little, role for antitrust because they understand monopoly as necessary for innovation and, in any case, as only temporary as it is rapidly displaced by a new monopoly through the process of creative destruction. However, as explained by Shelanski (2013:1693), the Schumpeter theory does not imply that antitrust has no role in protecting innovation. On the contrary, it should ensure that the process of creative destruction is not impeded by the dominant firms at a risk of being destroyed.

16. Thus, there is no need to choose between the three theories of innovation to agree that antitrust agencies should *protect the process of innovation* by keeping the market open for potential innovators.⁹ As

⁷ For instance: Baker (2007), Katz and Shelanski (2007), Ginsburg and Wright (2012), Monti (2004), Sidak and Teece (2009), Shapiro (2011), Shelanski (2013).

⁸ This is because antitrust intervention usually takes place in markets with little competition, hence in the upward-sloping of the inverted-U curve which matches the Arrow view. The downward-sloping part of the curve (matching the Schumpeter view) is only reached for markets with a CR4 of 50% or less which is unlikely to be the case in practice when there is an antitrust intervention.

⁹ This has always been the view of the European. Already back in 2001, the Competition Commissioner Monti stated that: “*The risk is rather that a position of market power may be temporary in the absence of anti-competitive action – but anti-competitive action by the company with market power would render that temporary strength permanent*”, speech Competition in the New Economy, 21 May 2001. In 2013, the Competition Commissioner Almunia stated

explained by Larouche and Schinkel (2014:173), this conception of the role and the goal of competition policy can be seen as a return to the *ordo-liberal* foundations of competition policy (in Europe at least), which aimed at protecting the competitive process.¹⁰

17. This role of competition policy is even more important for disruptive innovation than for sustaining innovation because its radical nature implies larger effects on consumer welfare but also a larger – if not existential - threat to established firms, hence higher incentives to block such innovation. To be sure, incumbent firms often do not see disruptive innovation, hence cannot stop it. However, given the influence Christensen had on the business community and practices, more and more mainstream firms are able to spot possible disruption. Indeed the most highly-regarded firms in innovative sectors today are actively monitoring a broad range of start-ups and using their capital reserves to carry out strategic acquisitions, implicitly acknowledging Christensen's observation that incumbent firms will rarely retain their leading positions on the strength of their own efforts only, however well they are managed.

2.2 *The theory of harm*

18. The literature on innovation and competition policy also shows that antitrust enforcement should adapt its methodology when it deals and wants to protect the innovation process, and that those adaptations can mostly be done within the existing law. At a very general level, this literature calls for a change of emphasis from static efficiency and price evolution to dynamic efficiency and innovation incentives. The literature also calls for a shift of emphasis from market definition towards market conduct and the theory of harm.

19. This applies in particular to disruptive innovations which cannot be properly factored in within an analytical framework that relies on static tools such as market definition and market power. Indeed relevant markets are defined at the outset of the analysis, and they are presumed to remain constant through the analysis. Market power is ascertained, the implications of firm conduct are assessed, and even remedies are crafted against the backdrop of the relevant market, as it was defined.

20. With disruptive innovation, competition takes place at the level of market definition: the aim of the disruptor is, by starting from a product which would normally be on another relevant market, to create sufficient overlap with the value network of the existing market in order to attract customers away from the existing market. In so doing, the value network is shifted, and the disruptive innovation takes centre stage. To the extent the incumbent firms remain on the 'redefined' post-disruption market, they play a reduced role. Alternatively, the traditional market can remain, but its overall significance is diminished. For instance, once browser-centric computing came to disrupt the traditional PC software markets, the market for operating systems did not vanish away – nor did Microsoft's position on that market – but it faded in significance, and the focus of competition policy turned to firms such as Google.

21. Thus with disruptive innovation, firms compete to displace one another from a central position in the broader ecosystem, by shifting and creating relevant market(s) so as to occupy a central stage overall. This calls for innovative theories of harm.

- i) First, the established firms should have *market power* on its market in order to have sufficient incentives to protect such power against disruptive innovation. Non-dominant incumbents would

that: “*One of the priorities of competition control is to ensure that dominant firms and gatekeepers do not abuse their positions; especially that they do not prevent other firms from entering the market with new and innovative products and services*”, speech Competition in the online world, 11 November 2013.

¹⁰ For an analysis of the *ordo-liberal* foundations of the German and EU competition policy, see Ahlborn and Grave (2006), Gerber (1998).

presumably have less incentive to prevent disruption, since they have less to lose, and would rather seek to appropriate it.¹¹ A dominant incumbent is more likely to try to prevent disruption in order to protect its current position.

- ii) Second, the target should be a *potential disruptor*, and not merely a firm engaged in sustaining innovation (in the case of sustaining innovation, the traditional tools of competition policy should be used). By way of proxy, the limitations of relevant market definition could be beneficial: if the target is *not* on the same relevant market as the established firm, according to standard relevant market analysis, then the target could be a potential disruptor. This is actually the main difference between the theories of harm around disruptive innovation and other theories of harm: here the target is on a separate relevant market, so the aim is not to undermine its market position, raise its costs or foreclose it on its market, but rather to prevent it from engaging into a redefinition of the relevant market by shifting the value network.
- iii) Third, the established firms should adopt *conduct* making the deployment of disruptive innovation more difficult or even impossible. One indicia may be the important financial or otherwise resources used by mainstream firms to stop the development of small firms. The essence of disruptive innovation is that the disruptor gains a foothold by entering the lower-end of the value network through overlap between traditional products and its innovative product, using this foothold as a lever to bring customers over to a new value network where the disruptor stands at the centre. The incumbent can thwart disruption by preventing the disruptor from ever gaining that foothold. On the basis of the scenarios sketched out above, two courses of conduct can be distinguished: conduct designed to raise costs for potential disruptors to execute their strategy (section 3) and strategic acquisition of potential disruptor, followed by mothballing (section 4).

2.3 *The procedural and institutional context of enforcement*

22. Current innovation, and in particular disruptive innovation, is very often based on Internet which means that they are often rapid as Internet allows for massive network effects and global as Internet is easily scalable.

23. That implies that, to be effective, antitrust enforcement needs to be quick and rely on legal tools and procedures having the right balance between rapid intervention and due process. Enforcement needs also to be well coordinated between the different authorities involved when several countries are impacted.

3. **Anti-competitive conduct denying a foothold to the disruptor**

24. Established firms can use different practices to impede the process of innovation. Most of the cases analysed by antitrust agencies and discussed in the literature relate to sustaining innovation. That may be due to the fact that such type of innovation is more frequent than disruptive innovation. That may also be due to the fact that parties bringing cases to agencies are more concerned with sustaining innovation.

3.1. *The anti-competitive conduct*

25. However, few cases relate to disruptive innovation. As outlined above, in those cases, established firms try to make the access to the lower-end of the consumers more difficult and/or render the interface

¹¹ We leave aside the possibility of collusion amongst incumbents to prevent disruption.

between its value network and another value network more difficult. Those impediments may be done with vertical agreements, predatory practices or abuses of intellectual property rights.

26. One of the best examples of an antitrust action protecting disruptive innovation is the *Microsoft Explorer* case. The established position of Microsoft on the operating systems for PC was threatened by an innovation on a very different market, the Internet browsers. In reaction, Microsoft bundled its operating system Windows with its own browser Explorer, thereby making access to consumers more difficult for competitors and preventing Netscape from executing a strategy of disruptive innovation.¹² The DoJ¹³ and then the European Commission with a commitment decision¹⁴ intervened to guarantee customer access.

27. Another case is luxury brands prohibiting their distributors from selling over Internet (for an extensive analysis of vertical restraints for online sales, see OECD (2013)). Here again, firms with established distribution networks impede access to lower-end customers and innovative distribution channels which may - with time - disrupt existing channels. To alleviate such practices, EU antitrust guidelines limit the possibilities of such prohibitions.¹⁵

28. Also, some established companies try to get very extensive IPR – in particular patents - to make the interface with their value networks more difficult, hence making the second phase of disruption more difficult or even impossible. For instance, if some of the main features of smartphones, including the gestures made on the touchscreen, are covered by patents, then any disruptor needs to innovate around these features. The disruptor will find it harder to establish a foothold and convince existing customers to migrate to an innovative product offering if it has so little overlap with the elements of the existing value network.

29. Those cases show that established firms, when they are able to spot the threat of a disruptive innovation, may render the first and/or the second phases of disruption more difficult. Antitrust agencies should then maintain open access to low-end consumers and interface between value networks, thereby making the process of innovation possible. However, to reduce error risks, agencies should give a precise theory of harm explaining how the conducts of the established firms impede the disruption.

3.2. Procedural options for effective enforcement

30. Because disruptive innovation can be quickly killed, antitrust agencies should rapidly condemn anti-competitive conduct, otherwise their actions are useless. Antitrust enforcement is based on different instruments whose velocity varies:

- i) *Antitrust guidelines* describe prohibited behaviour. Their effect can be rapid because of their deterrence power but they can only be used against conduct where the theory of harm has been tried and tested in a series of previous cases.
- ii) *Interim measures* can be adopted quickly when there is, first, prima facie finding of antitrust infringement and, second, urgency due to the risk of serious and irreparable damage to competition.¹⁶ As the condition of urgency is not easily met, interim measures are rarely used.

¹² Note that a modified version of this strategy was later on successfully executed by Google, which managed to make the browser the central stage in the ecosystem, as opposed to the operating system.

¹³ 253 F.3d 34 (D.C. Cir. 2001).

¹⁴ Commission Decision of 16 December 2009, Case 39.530, *Microsoft (tying)*.

¹⁵ Commission Guidelines on Vertical Restraints, OJ C 230 of 19.5.2010, p. 1.

¹⁶ In the EU, see Article 8 of Regulation 1/2003.

However, such condition may be more easily met when disruptive innovation is at stake as the anti-competitive conduct is often aiming at small firms that may easily disappear.

- iii) *Commitments decisions* where the antitrust agency agrees with the investigated firms to end some practices. Those decisions can be adopted relatively quickly as seen in the EU Microsoft Explorer case. However, in the EU, they are based on often opaque bargaining between the agency and the firms, and they are not tested in Court, hence cannot provide a high level of legal certainty for the industry.
- iv) *Infringement decisions* where the antitrust agency condemns firms on the basis of a well proved theory of harm. Those decisions can take time to be adopted and are often appealed in Courts. In case of disruptive innovation, they often take too much time to be effective in the case at hand. However, the precedent value may have deterrent effects for future similar anti-competitive practices against disruptive innovation.

31. Thus the antitrust agency should choose the best procedural options depending of the characteristics of the case and find the right balance between, on the one hand, velocity and effectiveness and, on the other hand, respect of due process and reduction of errors' risks. If the conduct impeding disruptive innovation is based on a behaviour already described in some guidelines, the agency should point to those guidelines. If the conduct risks damaging seriously and irreparably competition by destroying a disruptive innovator, the agency should adopt interim measures.¹⁷ If the agency wants to establish a precedent with a new theory of harm, it should adopt an infringement decision that can be tested in Courts.

4. Preventing disruption through acquisitions

32. Next to exclusionary conduct, established firms may also acquire potential disruptors to avoid that innovation comes to the market and destroys their business. The antitrust agency should prohibit such mergers, which are welfare detrimental. There are however two difficulties. First, the acquisition often takes place when the potential disruptor is still small, hence the merger is not notified to the antitrust agency. For that, the law might need to be amended to provide for an additional threshold for merger notification (section 4.1). Second, it is not easy to determine whether the acquisition of a potential disruptor will decrease consumer welfare. For that, a precise test for the theory of harm needs to be applied (section 4.2).

4.1. Merger notification threshold

33. In the EU, the threshold to notify a merger for approval by the antitrust agency is based on the turnover of the firms involved. When an incumbent firm buys a potential disruptor, it often does so – for business reasons – at a time when the disruptive threat is apparent, yet the disruptor still has a low turnover. Hence the merger might not be subject to a notification obligation. However, because disruption can be very costly, the incumbent firm will be ready to pay a high acquisition price that is a premium for market stability. To be sure, the high price may also reflect important future revenues expected from the innovation, hence does not indicate in itself that the merger is welfare detrimental. The point here is that a high price to buy a firm with a low turnover may indicate an impediment to the innovation process which requires antitrust analysis.

¹⁷ Interestingly, Monopolkommission (2015, paras 509-513) calls for more frequent use of interim measures when enforcing antitrust in digital markets which are prone to disruptive innovations.

34. Therefore, as the German Monopolkommission (2015: para 471-479) suggests, the legal notification threshold currently based on turnover could be complemented by another threshold based on the value of the transaction. In most of the cases, the value of the transaction is aligned with the current turnover, hence such legal change does not have practical consequences. But in the cases where the value of the transaction is not aligned - and much higher – than the turnover, the legal change imposes additional notifications. That is appropriate as those cases may hide a welfare-detrimental acquisition of a potential disruptor.

4.2. *Merger approval test*

35. Once a merger is notified, the antitrust agency should determine whether it would increase or decrease consumer welfare. In the context of disruptive innovation, the agency should determine first whether the acquired firm is a potential disruptor and, then, whether the acquisition will slow down or stop the innovation.

36. On the first question, the Merger Guidelines in the US and in the EU instruct the agencies to be particularly cautious in authorising the acquisition of a maverick firm. None of those guidelines give a precise definition of a maverick, but they give examples which are similar.

37. The US 2010 Horizontal Merger Guidelines states at para 2.1.5 that:

A “maverick” firm (is) a firm that plays a disruptive role in the market to the benefit of customers. For example, if one of the merging firms has a strong incumbency position and the other merging firm threatens to disrupt market conditions with a new technology or business model, their merger can involve the loss of actual or potential competition. Likewise, one of the merging firms may have the incentive to take the lead in price cutting or other competitive conduct or to resist increases in industry prices. A firm that may discipline prices based on its ability and incentive to expand production rapidly using available capacity also can be a maverick, as can a firm that has often resisted otherwise prevailing industry norms to cooperate on price setting or other terms of competition.

38. The EU 2004 Horizontal Merger Guidelines states at para 42 that:

A ‘maverick’ firm (...) has a history of preventing or disrupting coordination, for example by failing to follow price increases by its competitors, or has characteristics that gives it an incentive to favour different strategic choices than its coordinating competitors would prefer.

39. Owings (2013) rightly observes that those definitions of a maverick are broader than disruptive innovator. He suggests to distinguish better between firms that requires independence to constrain coordination and firms that aggressively compete. The first category should be defined according to the criteria of Christensen, i.e. (1) *the firm offers a product or service that is worse in some way than the traditional offerings*, (2) *the lower quality is accompanied by a lower price (or some other innovative benefit)*, and (3) *the product or service only works well for a niche segment of consumers who substitute away from the traditional competitors*. The definition is important because, according to Owings, the presumption of anti-competitive harm enshrined in the US Guidelines should be limited to the acquisition of disruptive innovator.

40. This link between definition and competitive harm test leads us to the second, and more important, issue: the assessment of the effects of the merger on the innovation. Authors have proposed different tests for such assessment. Shelanski (2013:1703) proposes a *downward innovation pressure* (DIP) test consisting in analysing how the probabilities of introducing innovation will evolve post-merger. This analysis is linked to the cannibalisation effects of the innovation on the acquirer’s products or services. If

possible, the analysis should be done on the basis of quantitative economic data, and if not, on the basis of documentary evidence.

41. Shapiro (2012) proposes to base the merger analysis on the examination of three factors: (i) *contestability* which relates to the nature of ex post product market competition; (ii) *appropriability* which relates to the possibilities for the successful inventor to capture the social benefits of its invention; and (iii) *synergies* which relate to the capabilities of enhancing innovation by combining complementary assets. The factors of contestability and appropriability relate to the incentive to innovate while the factor of synergies relates to the ability to innovate. The antitrust agencies should determine: (i) first, whether the merger significantly reduces contestability, i.e. the future rivalry between the merging parties which is based on the calculation of an *innovation diversion ratio* and (ii) second, whether the merger nonetheless enhances innovation by increasing appropriability or enabling merger specific synergies.

42. Those tests, which have been proposed for all types of innovation, are applicable for the specific type of disruptive innovation. In particular, the agency should assess whether the mainstream firms will bring the disruptive innovation to the market at the risk of cannibalising its own business or whether it will stop the innovation. Unfortunately, it is not always possible to ascertain clearly the plans of the acquiring firm at the *ex-ante* stage of merger control. Any evidence that the acquiring firm plans to close the target and send its invention to the dustbin of history should therefore be decisive against the merger.

43. Should the mothballing strategy only be apparent once the merger has been approved and carried out, however, an intervention could be envisaged along the lines of either (i) revoking the approval on grounds of misrepresentation in the notification phase or (ii) treating the actions of the acquiring firm as anti-competitive unilateral conduct and using Article 102 TFEU, section 2 of the Sherman Act or the equivalent provision. Both options are rife with difficulties; accordingly, in cases where there is a suspicion that the merger could affect disruptive innovation, merger control assessment should go at greater depth than usual into the strategic reasons for the acquisition.

5. Conclusion

44. Disruptive innovation, according to business literature, occurs when an innovative product is brought to a market, such as meets the basic requirements of the lower-end of an established value network and also offers added value outside of that value network. That product wins over consumers and progressively takes over the established market, displacing the existing value network in so doing. By now, disruptive innovation is a frequent entry strategy, and it is usually beneficial for welfare.

45. Despite an ever growing literature on innovation and competition policy, the latter is not well placed to deal with disruptive innovation. Methodologically, disruptive innovation can hardly be captured with the tools of market definition and market power analysis, which do not account for the competition for the definition of the relevant market that is characteristic of disruptive innovation. In addition, competition authorities experience difficulties in acting quickly enough to deal effectively with attempt to prevent disruptive innovation.

46. However, incumbent firms on the established market can hinder disruptive innovation. The theory of harm is that an incumbent firm with market power seeks to prevent a potential disruptor from another market from executing its strategy, using either (i) anti-competitive practices designed to prevent the creation of an overlap between its innovative product and the established market or (ii) an acquisition with a view to mothball the disruptor and its invention. Against the former, competition authorities should seek to keep markets open and act quickly to prevent practices such as defensive leveraging (as in the *Microsoft Explorer* case) or the use of IP protection to lock away features of the value network. Against the

latter, additional merger thresholds (based on a discrepancy between transaction value and turnover) and an expanded concept of the maverick firm could be effective.

47. Ultimately, disruptive innovation is by its very nature difficult to discern, even for the firms themselves; yet competition policy can evolve in order not so much to protect disruptive innovation, let alone foster it, but rather to ensure that it can happen and will not be thwarted by incumbent firms. This can be achieved under existing competition law by relying on an appropriate theory of harm.

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