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Assessment of potential anticompetitive conduct in the field of intellectual property rights and assessment of the interplay between competition policy and IPR protection

November 2011

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COMPETITION REPORTS

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Rights and Assessment of the Interplay Between Competition Policy and IPR
Protection**

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Assessment of Potential Anticompetitive Conduct in the Field of Intellectual Property Rights and Assessment of the Interplay Between Competition Policy and IPR Protection

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Scope of the report

The task that we were set was described as follows:

A. The effects of IPR contracting (including cross licensing, grant-backs and pass-through) on competition

The study will provide an extensive analysis of the effects of IPR contracting (including cross licensing, grant-backs and pass-through) on competition. It will include

- (i) a survey of the relevant theoretical economic literature
- (ii) a survey of the relevant empirical economic literature
- (iii) a discussion of the most important antitrust cases where IPR contracting has been an important issue
- (iv) suggestions for competition policy towards issues related to IPR contracting

B. Licensing arrangements in the context of merger control remedies

The study will provide an extensive analysis of the licensing arrangements in the context of merger control remedies. It will include

- (i) a survey of the relevant theoretical economic literature
- (ii) a survey of the relevant empirical economic literature
- (iii) a discussion of the most important merger cases where IPR licensing arrangements have been important in the context of merger control remedies
- (iv) suggestions for competition policy towards issues related to IPR licensing arrangements in the context of merger control remedies

A few preliminary remarks about how these tasks have been approached in the report are in order. Firstly, this report does not mean to be exhaustive. The goal was not to write a treatise on issues at the interface of IPRs and Competition. Rather we chose to concentrate on a few aspects of the IP/competition relationship where we felt that economic analysis had something to add to current guidelines and/or to the current state of case law. Secondly, we found ourselves somewhat constrained by the scarcity of relevant empirical work on most issues. Similarly, the abundance and diversity of relevant cases varies a lot across topics. As a result, the different sections of the paper are not as balanced as one might have expected or would have been indicated by the task outline, above. For example, there is now an ample theoretical literature on patent pools. However, there is relatively little rigorous empirical work on the topic and – as we argue in the report – this empirical work is of little relevance for competition policy. Finally, even the theoretical literature on some topics was found to be lacking. The situation is especially dire for grant-back clauses: there is

essentially no empirical work and the existing theoretical work is so narrow as to be virtually useless. In such cases we tried to at least present what we believe to be useful first steps toward a rigorous economic analysis of the issues.

Overall, then, the resulting report does not have quite as neat a balance as the original task description might have suggested. Still, we hope that the insights offered on each topic will prove useful for the evaluation and possible re-orientation of current policy at the IPR/competition interface.

Finally, we should emphasise that this report is not a policy document. It is simply an input into the process of revision of the TT Guidelines that DG COMP is embarking into. In other words, we aim to raise questions more than to provide definitive answers. The main purpose of this input is to provide solid *economic* foundations for the policy debates that might ensue. As such, the report does presuppose some familiarity with economic analysis. Although we have steered away from overly technical issues in the body of the text and have tried to emphasise intuition, we do realise that the report is not always an “easy read”. For this reason, readers with little interest in systematic economic analysis might find it profitable to begin with the conclusion of the report which has been written to be accessible to a wider audience. They can then turn back to the corresponding sections in the body of the report if they need further details on a given topic.

Executive Summary

We have been asked to write a report on aspects of the interface between competition law and patent law. Competition authorities have long been aware of the potentially difficult relationship between these two bodies of Law. At the level of the EU, this relationship has already been abundantly discussed in both the *Technology Transfer* Guidelines and the *Horizontal* Guidelines. Indeed, these thoughtful documents already deal with a number of issues in a manner that is largely consistent with both current legal doctrine and the current state of economic analysis. The report is therefore highly selective, concentrating on issues where we feel that recent economic analysis has something to add to the debate.

The first part of the report contains a review of a variety of licensing practices. We begin by describing unilateral and coordinated effects for *cross-licensing*. While the technology transfer guidelines are clearly aware of the potential for cross licensing to facilitate tacit collusion, more attention might be paid to the potentially anti-competitive effect of high royalties in the cross-licensing of complementary IPRs. We also suggest that the TT guidelines could be made even more explicit about how cross licensing might “increase transparency and control certain behaviours.” We also insist on the importance of consistency of treatment of cross licensing and related agreements such as research joint ventures. Given that cross-licensing does not involve the complementarities that a research joint venture might, but could have similar negative effects on innovation incentives, one might wonder whether the current treatment of cross-licensing is not relatively more lenient than the current treatment of RJVs: according to the latest Horizontal Guidelines, a RJV without synergies would be seen as anti-competitive, while it seems that a similar *ex ante* or *ex post* cross-licensing agreement would not for similar levels of market power. Finally, cross-licensing agreements can potentially allow large/dominant firms to leverage their size/dominance to gain a further advantage in the market at the expense of rivals with smaller patent portfolios. Such practices may warrant antitrust scrutiny.

Economic analysis provides some support for the current antitrust treatment of *patent pools*. In particular, current analysis broadly suggests a rather relaxed attitude towards pools that form spontaneously and voluntarily as long as independent licensing clauses are included. Significantly, this conclusion does not hold for pools that are imposed by regulatory activity. One should therefore pay close attention to the governance rules of pools that are set up as remedies to antitrust or merger issues. Moreover, the most recent contributions on the topic suggest that the independent licensing clause might need to be accompanied by specific royalty-sharing schemes and/or restrictive membership rules in order to effectively “screen” welfare-increasing patent pools. One area of discrepancy between current guidelines and the economic literature is the view that pools should be restricted to include only essential intellectual property. The current TT Guidelines restrict the safe harbour on patent pool to just such collections of essential IPRs. While the Guidelines do not imply that other pools would necessarily be objectionable, their exclusion from the safe harbour suggests that defending such pools might be significantly more demanding. This very cautious approach is not supported by the more recent economic literature. Nevertheless, we argue that the economic literature is not yet quite robust enough to consider changing the current approach. Still, additional guidance as to how a pool that is not limited to essential IPRs might get clearance would be helpful. We draw several conclusions in this respect:

1. Keep the safe harbour to essential patents. In practice, this might mean that the safe harbour only covers SSO oriented pools, where essentiality might be more easily assessed.
2. Under a rule of reason: recognise that there might be a need to include non-essential patents in SSO oriented pools in order to achieve a degree of legal certainty. More generally, greater leniency should apply to pools that include IPRs that are mostly complements.
3. Members of the pool should be allowed to keep licensing their IP freely outside of the pool.
4. Pools with selective membership rules can still be pro-competitive. Still, some justification as to why the selective membership rules are needed should be provided.
5. Low levels of royalties are not required for a pool to be pro-competitive. Rather than focus on royalty levels (or impose maximum royalty rules) competition authorities are better off focussing on the type of IPR included in the pool as well as on some simple governance rules that tend to promote socially desirable pools. Still scrutiny of unusual royalty schemes is warranted.

6. There are no general reasons to believe that pools that contain a number of “pure research” members are likely to be less competitive than pools that only include firms that are also involved in the corresponding downstream product market(s). Still, “research only” members are likely to push for higher royalties – and thus less competitive outcomes – when technological competition is intense and is subject to significant network effects.
7. Rules that would trigger the demise of the pool in case of substantial defections are potentially pro-competitive as they help ensure that welfare-improving pools are formed.

Grant-backs, while a common feature of licensing agreements, have not been analysed either comprehensively or compellingly in the economic literature. Still, the basic point made by the legal literature that grant-backs tend to reduce innovation incentives seems compelling from an economic standpoint. A traditional defence of grant-back clauses is that, in their absence, a pro-competitive licensing agreement would simply not be reached in the first place: spooked by the possibility that the licensee might use its intimate knowledge of the technology to improve on it or invent around it, the IP holder would simply prefer not to license its technology. Indeed, the current practice, where agreements that are exclusive and involve severable innovations are subject to more intense scrutiny than agreements that are non-exclusive and involve non-severable innovation, can be seen as an attempt to balance the innovation concerns and the traditional “but for” defence.

Given the dearth of literature on the topic, we develop our own economic analysis of this traditional “but for” defence. We investigate this “but for...” argument from both *ex post* and *ex ante* perspectives. Our *ex post* analysis suggests that, once the initial technology has been licensed, the licensor cannot be hurt by non-severable innovation but may be hurt by severable innovation. Hence, the “but for...” argument appears to be stronger for severable than non-severable innovation. While this suggests that current leniency towards non-severable innovations may be misplaced, we step back from recommendations that grant-backs of severable innovations be looked at more favourably for two reasons. First, from the perspective of the “but for...” argument, the only justification for grant-backs at all is that innovation would be “triggered” by licensing agreements. If the potential licensee would be equally as likely to come up with a severable innovation without a license as with a license, then this innovation capability should be irrelevant for the initial licensing agreement. If licensing does not *trigger* severable innovation, then grant-backs cannot be justified in this case. In practice, determining whether or not a given innovation was triggered by the licensing agreement is likely to be difficult. Second, patent law and policy already both require disclosure as part of the patent document and attempt a balance of innovation

incentives under the possibility of follow-on innovation using “leading breadth”. Revisiting this trade-off via competition policy would not be justified if we assume that intellectual property law already obtains a socially correct balance.

We then turn to an *ex ante* analysis where we ask two related questions. Firstly, would the prohibition of grant-back clauses lead to fewer licensing agreements? Secondly, even if licensing agreements would be signed regardless of the availability of grant-back clauses, would the *terms* of these agreements be more competitive (i.e. involve lower output-related royalties) if grant-back clauses can be used? Although our analysis should be seen as just a first step toward a better understanding of these issues, our results provide further support for the claim that grant-back clauses relating to non-severable innovations are actually efficiency-enhancing. Overall, that is, taking into account both *ex post* and *ex ante* arguments, we believe that there are reasons to query current policy whereby grant-backs of non-severable innovations are essentially exempted. We suggest that this policy be rethought, carefully spelling out the logic of why non-severable innovations receive lenient treatment.

We also note that in situations where the experimental exemption is in force, other methods of transferring information about the innovation may be present, further weakening the “but for...” defence. Finally, rigorous study of the types of innovation that do trigger further innovation by means of licensing as well as the interaction between the competitive relation of the licensor and licensee and innovation “spillover” needs to be studied. At present, little formal work is available in this area on which to base policy.

The treatment of grant-back clauses should be compatible with other innovation-related arrangements, most prominently research joint venture policy. Research joint ventures have been reviewed recently as part of the Horizontal Guidelines, concluding that, like grant-backs, they can actually decrease the innovation rate of an industry. This implies that research joint ventures involving undertakings of significant size should only be tolerated if they involve significant complementarities. We note that a grant-back does not by itself trigger direct complementarities, calling into question a lenient approach. On the other hand, where licensing may facilitate further innovation, an indirect complementarity may be present. Hence, a complementarity based argument justifying grant-backs and consistent with research joint venture treatment is present where grant-backs occur in the presence of a license that significantly increases the licensee’s ability to innovate.

Pass through refers to situations where a license of technology to a manufacturer also guarantees that clients using the manufacturer’s output in their own products are protected from infringement claims by the licensor upstream. These clauses may have real effects on

the market due to both current uncertainty on their antitrust status, and because these clauses can amount to bundling of intellectual property rights in some cases. Further, one could argue that these agreements may amount to price discrimination, which can put some downstream firms at a competitive disadvantage. While our analysis is too brief to be definitive, we recommend that pass through be scrutinised by competition authorities so that they can be reviewed in the future once a portfolio of relevant legal cases have accumulated to serve as a basis for the analysis.

Finally, we turn to merger policy. We find that, while joining complementary assets generally argue in favour of the merger, mergers can raise intellectual property-related issues even if they include complementary intellectual property rights. While consolidating control of the merging parties' complementary intellectual property rights tends to reduce "thicket" issues, it may also decrease the merged entity's incentives to settle infringement issues with third parties. Our reasoning suggests that mergers that make the distribution of intellectual property rights less symmetric should be treated with more attention than those that do not.

We review the recent EU merger remedies study to isolate a variety of issues surrounding the implementation of mergers. We revisit certain remedies, specifically divestment and compulsory licensing, in the cases where intellectual property is involved. We note that adequately defining the set of assets to be divested is likely to be a more challenging task when the merging parties are vertically integrated, as the intellectual property involved will likely include tacit or uncodified know how along with codified intellectual property.

Licensing does not seem to offer any consistent advantages over divestment, as we question both the ability of regulatory authorities to specify the licensing contract fully and the incentives of the licensor to grant access in a way that renders the licensee an effective competitor. Divestment can be a realistic alternative, but we still face incentive problems to obtain divestment of assets complete enough to create competition. In order to implement the divestment and solve this incentive problem, divesting to a profit maximising patent pool in which the divesting firm(s) have a share but no control could be a way forward. On the other hand, divesting to a pool compared to divesting to a vertically integrated entity offers both advantages and disadvantages. The advantage is that the pool maintains full incentives to license the intellectual property on to others. The disadvantage is that a pool would normally license to others for an output-related royalty, which would create a competitive disadvantage compared to a vertically integrated entity that was not subject to output-related royalties. A full analysis of the optimal form of divestiture in a variety of merger situations is beyond the scope of this study, but would be beneficial to generate concrete recommendations to address the issues raised by the merger remedies study.

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1. INTRODUCTION: THE INTERFACE BETWEEN PATENT AND COMPETITION POLICY

Competition law and patent law intersect at three levels. The first level is the actual use of the patent. This would include concerns about the patent-holder's own use of the patent as well as concerns about licensing agreements. Within the first category, one would find the usual issues of abuse of dominant position. The only difference is that the dominant position is based on the control of patents or other forms of intellectual property. As we have argued elsewhere¹ – and is now broadly accepted – there is nothing special about such situations as IP-based dominance should essentially be treated as any other form of dominance. We will therefore ignore this dimension and focus on licensing. Licensing-related issues would normally be considered under Article 101 and are addressed in the Technology Transfer (“TT”) guidelines.

The second point of interaction between competition law and patent law concerns the behaviour of patent applicants and patent-holders within IP's own regulatory process. While infraction of the regulatory rules would normally be punished by IP law itself, such infractions can also have an antitrust dimension that cannot be ignored. Furthermore, as is increasingly recognised, even behaviour that follows the letter of IP regulations can be found to be abusive if a patent-holder essentially “games” the IP system with the intent and/or effect of hampering competition. Moreover, the recent review by the Directorate General for Competition (“DG Comp”) of the pharmaceutical sector has identified a number of IP practices that seem worth scrutinising. Although this dimension of the IP/competition policy interface is likely to become increasingly important, there is currently insufficient case law to usefully apply economic analysis to competition law practice. Abuses of the IP process will therefore be omitted from this report.

The third level of interaction between IP and competition law involves the regulation of mergers, as these transactions can lead to an excessive concentration of IP rights. Following the instructions in the original tender we focus on the types of remedies that might help alleviate such high concentration while preserving other potential benefits from the merger.

¹ See Regibeau and Rockett (2007).

2. CONTRACTUAL AGREEMENTS

a. Licensing - background

Licensing agreements are essentially vertical agreements where one party, the licensor, sells the right to use an IP input to another party, the licensee. The input to which access is granted can be protected by a host of IP rights, ranging from patents to copyrights or trade secrets. As a vertical agreement, the competition law treatment of licensing should be – and is – broadly consistent with the *Vertical Guidelines*. However, the special nature of the input transacted justifies the existence of specific guidelines for technology transfer. Firstly, IP is a public good, meaning that its use by one party does not by itself preclude its use by another party. An immediate consequence of this is that licensing contracts typically authorise the use of the IP by the licensee but not its resale to others. Secondly, the transfer of IP rights involves the transfer of knowledge and therefore affects the parties' ability and incentives to invest in further innovation. As we will see, some licensing clauses such as grant-backs are especially concerned with controlling future developments of the licensed technology. Finally, licensing agreements do generally promote production efficiency (by assigning production and sales to the firm with the lowest local costs and/or highest local expertise) and – as noted above – might also favour the diffusion of knowledge throughout the European Union. Because of these benefits, EU competition law tends to see licensing agreements in a favourable light.

The actual importance of licensing for the economy is difficult to assess, although we know something about its prevalence. Zuniga and Guellec (2009) conduct a survey in the EU and Japan to examine licensing activity, focusing on private firms and individuals. For their sample, 20% of firms in Europe and 27% in Japan declared licensing to non-affiliated entities (35% and 59%, respectively, for all licensing activity), with small and very large companies licensing more heavily in general. Those that do license out tend to license out a large proportion of their patent portfolio, with above 80% being common. Cross licensing tends to involve a relatively small percentage of the patent portfolio, as does licensing abroad. Integrating know-how with patents seems the most prevalent form of integration within licensing contracts of different forms of intellectual property.

Licensing may actually not be widely spread across the economy, so that its importance varies quite significantly across sectors.² Using a random sample of licensing contracts involving at least one US party, Anand and Khanna (2000) obtain a dataset of 1,365 deals over the period from 1990 to 1993. They point out that 79% of these contracts occur within three 2-digit SIC industries: chemicals (45 %), electronics (22 %) and computers (12 %). Moreover, within each of these industries, the bulk of licensing is in a single three digit cluster: 82% in drugs, within “chemicals”, 75% in computer hardware within “computers” and 60 % in non-invasive diagnostic and surgical instruments within “electronics”. Only 18% of licensing contracts are *known to be* non-exclusive, while 37% are *known to be* exclusive. The authors argue, convincingly in our opinion, that at least part of this sectorial pattern can be traced to the relative effectiveness of patent protection across sectors.

Although they only have incomplete information about specific features of these licensing contracts, the authors still provide some interesting statistics. While the authors only have rather partial information on exclusivity, their breakdown into licensing contracts known to be exclusive or non-exclusive suggests that a majority of licensing contracts are in fact exclusive. It is also interesting to note that 13% of the contracts in the sample involve cross-licensing.

b. Patent “Thickets”

Over the last 10 years or so, there has been a growing policy concern about so-called *patent thickets*. The terms “thicket” has been used somewhat indiscriminately in competition law circles to describe various types of concentration of IPRs³. In this report, we use the term in a much more specific and precise sense. Following Shapiro’s definition, patent thickets are “an overlapping set of patent rights requiring that those seeking to commercialise new

² See Anand and Khanna (2000). The Zuniga and Guellec (2009) study of Europe, cited above, does not break down categories in quite the same way but generally finds relatively heavy patenting in these sectors. Hence, while the studies are not directly comparable, the Zuniga and Guellec work does not contradict the Anand and Khanna message that some sectors license relatively heavily compared to others. Chemical, tele-communications, and biotechnology sectors indicate that they are willing to license out a relatively large percentage of their patent portfolio (and also succeed in doing so). See especially table 18 of Zuniga and Guellec (2009) for figures on willingness to license and actual licensing activity per sector.

³ See for example the *Axalto/Gemplus (2006—Comp/M.3998)* case, summarised in appendix 2, where “thicket” is used to describe the concentration of a large number of patents in the hands of a single firm. Specifically, that case refers to a condition post-merger where we have “[a] ‘fog’ of patents filed by the parties that makes it hard to know whether and what patents of the parties are infringed.” (*Axalto/Gemplus* at 49). More generally, a thicket should be distinguished from a patent cluster or concentration, a situation where one entity holds a large number of patents which may make market entry difficult for a competitor.

technology obtain licenses from multiple partners”.⁴ Two conditions must then be fulfilled for a thicket to arise. Firstly, the production and sale of a given product involves the use of a large number of patent rights. Secondly, the ownership of those rights is dispersed. A concentration of IPRs in the hands of a single entity, as we see *post-merger* in the *Axalto/Gemplus* case, does not therefore constitute a “thicket” in the sense used in this report.

It is also important to understand the nature of “overlap” of patent rights that helps define a thicket. Such “overlap” has two main sources. Firstly, different patent rights might cover different aspects of the technology required to produce a new product. In other words, several patents might be technologically essential for the commercialisation of a given product. The second source of overlap comes from the nature of patent rights. These rights can be mutually blocking and are moreover uncertain. In practice this means that a firm with a valid patent covering a given aspect X of a new product might still fear that it might infringe another firm’s patent that relates to the same aspect or at least to a similar underlying innovation. In such a situation, access to the other firm’s patent is not technologically necessary but it is required if the firm wants to proceed under conditions of legal certainty. Indeed, practice in the *Axalto/Gemplus* case *prior* to the merger systematised this process: apparently Axalto and Gemplus regularly reverse engineered their competitors’ products to determine whether they were built on technologies partially or fully covered by the parties’ patent portfolio. If this occurred, then they informed the competitor of the possible infringement and urged licensing in order to spare the legal challenge (*Axalto/Gemplus* at 59). One might therefore settle on the following modification of Shapiro’s definition: patent thickets arise when the IP rights necessary to market a product and do so without significant risk of infringement are held by a large number of different parties.

When thickets arise, each party essentially controls one of several complementary inputs into a production process. As is well-known from economic theory, independent pricing of such complementary goods leads to a total price for the final product that is higher than if all inputs were controlled by a single agent. Intuitively, each independent IP owner prices its own IPR without taking into account that a higher price, by reducing the sales of the final product, also hurts the income of other IPR holders. This problem is also referred to as “royalty stacking”.

The same issue can also be couched in terms of bargaining. In the presence of patent thickets, all parties have an incentive to sit down and negotiate licensing terms. In principle, under ideal conditions, such bargaining should lead to a multilateral agreement that

⁴ Shapiro (2001), p. 119.

maximises the “size of the pie” being shared by all, i.e. an agreement that leads to the same total price as if there was a single owner of all rights. Unfortunately, real world bargaining does not take place under such ideal conditions. For example, each party is likely to hold private information about the value/robustness (or even existence) of its relevant IPRs. Such asymmetric information can result in significant delays in reaching an agreement. In addition, fear of competition law can prevent the relevant parties from engaging in truly multilateral negotiations, especially if these take place outside of a formal “standardisation” process. A set of bilateral negotiations is unlikely to produce the same low price levels as a truly multilateral agreement. Indeed, the difficulties encountered within standard-setting organisations themselves⁵ strongly suggest that real life bargaining is unlikely to reliably produce the most efficient outcome.

While patent thickets have achieved prominence on the agenda of both policy-makers and academic researchers, one can still legitimately wonder about the true extent of the problem. Two questions arise when assessing the importance of patent thickets. The first one is how often such thickets actually arise. The second is what the size of the inefficiency associated with patent thickets is likely to be.

Not all industries are equally susceptible to complementarity problems. Cohen et al. (2000) classify industries according to whether they are “complex” – so that value is derived from complementary components -- or “discrete” – so that there is a stronger link between single patents (or patent families) and commercialised products. For example, based on an extensive survey, they find that telecommunications equipment and electronics are complex industries while chemicals are classified as discrete. Their survey also reveals that the two types of industries are broadly characterised by different patenting strategies. While firms in discrete industries use patents to build a wall around the product or process that they want to exploit, firms in complex industries expand their patent portfolio in order to improve their bargaining positions when it comes to clearing the patent thickets that stand in the way of new products or new processes. Hence, complex industries are those where patents have a large strategic bargaining value whereas discrete industries are those where patents have large stand-alone innovation value.

⁵ See the recent Qualcomm and Rambus cases for alleged behaviour hampering the efficiency of negotiations within SSOs. Also a recent analysis by Geradin et al (2007) indicates that even under the presence of RAND commitments, the asymmetries characteristic of industries where standardization is common are likely to deliver socially suboptimal outcomes. See Geradin et al (2007). Farrell, Hayes, Shapiro and Sullivan (2007) are equally sceptical of the effectiveness of FRAND commitments.

This line of reasoning has led to a number of empirical studies that ask whether the explosion in US patent numbers following the strengthening of patent rights in the early 1980s can actually be accounted for by such defensive patenting strategies in complex industries. Focussing on the software industry, which is widely believed to be a “complex” industry, Noel and Schankerman (2006) find some empirical evidence for excessive incentives to patent in order to “hoard”⁶. Related work by Arora et al. (2001), Hall and Ziedonis (2001), and von Graevenitz et al (2011a)) finds that the recent growth in patent applications can be attributed to defensive use⁷ of patents in “complex” industries – those where patent thickets are present.

Directly measuring the prevalence of patent thickets is not a trivial exercise. Until recently, all that was available was an industry classification developed as an afterthought⁸. Obtaining a good measure of patent thickets is difficult. As pointed out by Von Graevenitz et al. (2011a)):

“An ideal measure of complexity should link patents to characteristics of products, showing how many patents are incorporated in each product and how frequently products incorporate patents of rival firms. This measure would yield precise information about overlapping patent portfolios and the potential for hold up. The measure should also cover products that do not reach the market due to hold up.” (p.13)

While Von Graevenitz et al (2011a) cannot provide such an ideal measure, they come significantly closer than most previous attempt by developing a measure based on cross-reference of prior art. Based on this measure, they find that thickets occur frequently in audio-visual technology, telecommunications, semiconductors, optics, and information technology. Thickets occur with moderate frequency in electrical machinery, handling and printing, macromolecular chemistry, engine pumps and turbine and transport. The incidence of thickets in the rest of the 30 technological fields they consider is negligible. Fields without significant thickets include consumer goods, machine tools, environmental technologies, biotechnology and pharmaceuticals.⁹

⁶ They hypothesise that a larger patent “arsenal” also strengthens the bargaining position of an inventor and reduces transaction costs as the number of potential negotiations fall. Dewatripont and Legros (2008), in an analysis of patents’ contributions to standards, appeal to a version of a Shapley value to justify the relation of bargaining strength to the proportion of patents owned.

⁷ This defensive use can include litigation concerns, which will be discussed below.

⁸ Footnote 44 in Cohen et al. (2000).

⁹ The authors use the same conceptual definition of patent thickets as we do throughout this report (see pp. 15-16).

A more detailed discussion of the various measures of “thickets” available in the literature, and of their relative merit in the context of competition policy can be found below, after the sections on cross-licensing and patent pools.

Moving to the question of the effects of patent thickets, there are many anecdotes about the harm done by the dispersion of the ownership of complementary IP rights, but there are very few rigorous studies of their impact. Interestingly, the only rigorous empirical study that we are aware of suggests that the welfare effect of thickets might actually be ambiguous.

Galasso and Schankerman (2008) analyse how the fragmentation of patent rights (‘patent thickets’) affected the duration of patent disputes. Based on a model of patent litigation, they predict that settlement agreements are reached more quickly in the presence of fragmented patent rights. This prediction is confirmed in their empirical work. This means that patent thickets have two opposite effects on the speed with which functional licensing agreements can be reached. On the one hand, the presence of thickets increases the number of required patent negotiations; on the other hand, patent disputes are resolved more quickly.

The belief that patent thickets are one of the most crucial IP issues of the day has naturally reawakened interest in how such thickets might be efficiently cleared. There are two main possible approaches. The first approach consists in reforming if not patent law at least the application of this law at the patent office. The underlying assumption is that the recent (perceived) proliferation of thickets comes largely from an excessive leniency in applying traditional patentability criteria. In particular, it is felt that many patents that are actually granted do not in fact represent a sufficient “inventive step”. If patents are easily obtained on “small bits” of knowledge, then it is more likely that the “bits” that are necessary to produce anything useful will fall in a large variety of hands.

There are several potential problems with this approach, not the least of which is that implementing such a reform would likely take a considerable amount of time. This makes a second approach, based in competition law, especially attractive. The idea is that a more informed antitrust attitude towards some forms of licensing arrangements might help private IP owners get around patent thickets more efficiently. Three types of arrangements seem especially useful in this respect: cross-licensing, patent pools and standard-setting organisations. The antitrust treatment of SSOs has been reviewed recently by the Commission during the process leading to the new *Horizontal Guidelines*. We will therefore not discuss it again and will instead focus our attention on cross-licensing and patent pools. While cross-licensing and pools might then receive more lenient antitrust treatment because of their potential for efficiently handling the thicket issues one should remember that, as

mentioned above, the prevalence of thickets is very uneven across sectors. This suggests an approach where greater leniency towards cross-licensing and patent pools might be the rule in fields – like electronics – where thickets are known, or at least suspected, to be rather widespread. Still, one should remember that we currently know next to nothing about the size of the inefficiencies associated with patent thickets. In other words, while cross-licensing and patent pools might be effective approaches to solving thicket problems, we have no idea of what the corresponding efficiency gains are. This suggests both that it is too early to systematically weaken the traditional “safeguards” that competition law traditionally imposes on cross-licensing and pool agreements and that, even in “thicket-prone” sectors of activity, leniency toward such agreements should require a demonstration that there are actual thickets that would be cleared by the agreement and even possibly some evidence of the benefits involved in clearing these thickets.

The rest of the report is organised as follows. The first part deals with aspects of IP agreements that would seem to benefit from further discussion with a view to refining or changing some aspects of the current guidelines. Two of these aspects, cross-licensing and patent pools, are intimately linked to the issue of patent thickets that we have just evoked. Additional topics -- that are unrelated to thickets -- include grant-backs, settlements and pass-through licenses. The second part of the report discusses licensing and divestment remedies when mergers would create a problematic concentration of IPRS in the hands of the newly merged entity and their likely effectiveness.

c. Cross-licensing

Ex Post Cross licensing, cross licensing where the innovation involved has already been developed (even if protection has not yet been obtained) can give rise to both unilateral and coordinated effects. These effects depend on whether the patents involved are substitutes or complements. Unilateral effects work through two mechanisms. Firstly, as part of the cross-licensing agreement, each party might be charging some form of variable royalty for its licensed property. This raises the rival's cost and can move the firms towards a less competitive outcome. Secondly, each firm will take its royalty income into account when choosing its price or quantity in the product market. Each firm will realise that more aggressive behaviour on its part now reduces its royalty income so that the intensity of product market competition will be reduced accordingly.

Before concluding that cross-licensing raises significant antitrust issues because of the resulting unilateral effects, it is important to consider when such effects are most likely to

arise. In particular, how does the likelihood of unilateral effects depend on whether the patent rights exchanged are substitutes or complements? Perhaps surprisingly, the concern only arises in the presence of complementary rights. This is because, in a static framework, firms would never find it optimal to cross-license substitute IP: any positive sale by one firm based on the other firm's IP would decrease the firms' joint profits. Anticipating this, substitute IP would not be licensed in the first place. By contrast, the licensing of complementary IP rights will usually lead to a situation where each firm uses both its own IP and the licensed IP to produce the good that it sells in the market, triggering the two competition-reducing mechanisms triggered above. However, this does not automatically imply that the cross-licensing agreement raises any particular antitrust concerns in terms of unilateral effects because one must compare the resulting market outcome to the proper counterfactual. This comparison is clearest when the technologies that are exchanged are not only complementary but are each essential for the production of the good. In this case, clearly, cross-licensing increases consumer welfare regardless of the level of contractual royalties. However technologies can be complementary without being essential. This occurs when each firm could produce the good without access to the other firm's property but cross-licensing makes it possible for them to create a better (or cheaper) product. In such a case, the increased consumer surplus imputable to greater quality (or to lower costs that are passed through) must be weighed against the strength of the two mechanisms identified above. Since the strength of these unilateral effects increases with the level of variable royalty charged, it makes sense for competition authorities to require that the level of royalties should be commensurate to the expected quality improvement or cost reduction. The current TT Guidelines are therefore completely in line with economic analysis when they state that "Article 81(1) may be applicable where competitors cross license and impose running royalties that are clearly disproportionate compared to the market value of the licence and where such royalties have a significant impact on market prices". Attention should also be paid to the precise specification of payments in the cross licensing contracts. Only payments that vary with the output of the receiving firms are a concern. In particular the type of royalty free patent exchange that is often observed in some industries does not raise antitrust issues with respect to unilateral effects.

One might also fear that cross-licensing might act as a facilitating practice in the context of tacit collusion. Here, we see no reason to worry about the cross-licensing of complementary rights¹⁰. On the other hand, cross licensing of substitute or even unrelated pieces of IP is likely to make it easier for firms to engage in parallel conduct¹¹. The basic idea is that access to the substitute IP of the rival makes it easier to design effective punishment strategies since the retaliatory price-cut can be focussed on products that are close substitutes to the product of the deviating firm. The mechanism is slightly different if the licensed patents apply to different markets. In this case, cross licensing makes it possible to credibly threaten entry into a product market of the deviator that could not have been easily accessed absent the licensing agreement. The TT Guidelines are clearly aware that cross-licensing might facilitate tacit collusion:

“Agreements can facilitate collusion by increasing transparency in the market, by controlling certain behaviour and by raising barriers to entry. Collusion can also exceptionally be facilitated by licensing agreements that lead to a high degree of commonality of costs, because undertakings that have similar costs are more likely to have similar views on the terms of coordination.” (Para. 54)

Still, one might wish the guidelines to be more explicit on how cross-licensing agreements might in fact “increase transparency and control certain behaviour”. We have seen that cross-licensing might make punishing deviation more efficient. Under what circumstances is this effect likely to be strong? Are there any other mechanisms through which cross-licensing could facilitate tacit collusion? Further clarifications accompanied by examples seem needed, which could be both empirical and theoretical. Work could be solicited as the area seems to have been relatively under-researched.

It is also important to ensure some coherence among antitrust treatments of related agreements. It seems, for example, natural to compare the treatment of cross-licensing agreements with the treatment of research joint ventures. Recall that the type of cross-licensing agreements that we have considered so far are *ex post* agreements where the innovation involved has already been developed. The new horizontal guidelines emphasise that RJVs tend to *decrease* the firm’s incentives to innovate unless they involve significant complementarities in (physical, human or financial) inputs.

¹⁰ The only possible source for concern is that such cross-licensing is likely to lead to both greater uniformity of product characteristics and/or costs of production between the two parties and better information about the other party’s cost conditions. This, in turn could facilitate tacit collusion.

¹¹ For a formal analysis, see Eswaran (1994).

This approach is of no direct relevance to *ex post* cross-licensing since the innovations involved have already been produced.

However, cross-licensing can still affect incentives to innovate in two manners. Firstly, as discussed by Fershtman and Kamien (1992) the prospect of future *ex post* cross licensing can itself change the dynamics of innovation. These authors show that the expectation of *ex post* cross-licensing of complements tends to lead to slower innovation compared to a situation where a single firm always develops both technologies itself. Unfortunately, this is not quite the right benchmark. What one would want to know is how a situation where firms know that cross-licensing will take place if they are each faster in developing one of the two technologies compares to a scenario where firms can only rely on their own technology but still compete to be first to market (or to the Patent and Trademark Office). While we suspect that allowing cross-licensing of complements *ex post* is likely to slow down the pace of innovation, this has not yet been established. If it were, then one might look rather less favourably at these agreements since their apparent *ex post* efficiency would just mask the fact that they in fact harm innovation incentives...and this without being able to claim any of the synergies that make RJVs potentially appealing.

Firms can also sign *ex ante* licensing agreements promising to share all or some future IPRs within some fields of research¹². Such *ex ante* agreements are better treated as patent pools. As such *ex ante* cross licensing agreements have a number of relevant characteristics. Firstly, such agreements are not open to third parties, which is a drawback. On the other hand cross licensing agreements do not usually stipulate a mechanism for the joint sale (or joint setting of royalties) to others and, unless they are exclusive, do not preclude each partner from licensing its own IP independently to third parties. So, if one abstracts from the possible effect on innovation, one would only object to *ex ante* cross-licensing agreements if they are exclusive and the parties have significant joint market power in the relevant technology and product markets. As for incentives to innovate *ex ante* cross licensing does unambiguously reduce total investment in research projects that are substitutes but has an ambiguous effect on investment when the projects pursued by the firms are complementary. Again, *ex ante* cross-licensing agreements do not trigger any of the synergies in the conduct of innovation that the horizontal guidelines see as the main justification for RJVs.

¹² The TTBER only covers licensing agreements *to produce* and not the licensing of research tools for example. What we mean by *ex ante* agreements here is agreements reached before the relevant technologies are fully developed but such that the object of the agreement IS the use of these future technologies for production. In other words, an *ex ante* licensing agreement from A to B does not mean that B will be a co-proprietor of the IP right but only that B will be allowed to use the future IPR *for production*, possibly in a specified territory or field.

One might therefore wonder whether the current treatment of cross-licensing is not relatively more lenient than the current treatment of RJVs: a RJV without synergies would be seen as anti-competitive, while it seems that a similar *ex ante* or *ex post* cross-licensing agreement would not¹³.

Finally, while this section has focussed on bilateral cross licensing, similar concerns might emerge if unilateral licensing does in fact end up building a network of licensing relationships among industry participants. In other words, what matters is the set of mutual dependencies and influences that licensing contracts create within an industry, not whether such links are built through agreements that are explicitly reciprocal.

Cross-licensing might also have some exclusionary effects, especially when it is used to get around potential “thicket” or complementarity issues. If some firms are better able to solve those issues through cross-licensing, or if firms discriminate in the (cross) licensing terms that they offer, some players might be put at a significant competitive disadvantage. In this sense, cross-licensing raises similar issues to SSOs, where competition law worries that some firms might be *de facto* excluded from access to a dominant industry standard. Such concerns arise with special urgency in industries where cross-licensing tends to be via barter arrangements, i.e. where the payment for access to a complementary piece of IP is traditionally made “in kind”. Whatever the underlying economic reason for this preference, the effect is that firms that do not have a sufficiently broad patent portfolio can find themselves unable to solve patent thickets issues as readily as firms with large IP reservoirs. In other words, under such circumstances, cross-licensing agreements can potentially allow large/dominant firms to leverage their size/dominance to gain a further advantage in the market. Such practices may warrant antitrust scrutiny.

d. Patent Pools

The current antitrust treatment of patent pools reflects a preference for pools with open membership and/or pools that allow non-pool members to access pool patents on FRAND terms... Similarly, a preference for arrangements that allow pool members to continue licensing their own patents outside of the pool and for pools that contain mostly *complementary* pieces of intellectual property is supported by economic analysis.

¹³ We will consider *ex ante* reciprocal licensing agreements again when discussing grant backs and their incentives on innovation.

For example, the DOJ/FTC IP Report of April 2007 (“Antitrust Enforcement and Intellectual Property Rights: Promoting Innovation and Competition”) concludes that a patent pool is unlikely to raise antitrust concerns if:

- The pool is limited to essential patents for a standard.
- The pool grants non-exclusive licenses that do not prevent licensees from developing alternative technologies (or contribute to alternative standards).
- Patentees retain the right to license their patents separately outside the pool.

Also, somewhat less formally, the Business Review Letters issued by the DOJ in the mid-1990s when the MPEG and DVD patent pools were approved suggests that the following elements were seen favourably:

- Inclusion of essential patents only
- Individual licensing permitted
- Non-exclusive licensing by the pool
- Freedom to develop and use alternative technologies
- Grant-back clauses for non-exclusive licenses to use patents that are essential to comply with the technology.

However, there is still some controversy on a number of points. In particular, should patent pools only be allowed to contain essential patents or should one also accommodate pools that include less absolute complements? Also, how should internal pool governance on royalty setting, royalty sharing, litigation and licensing of further innovation be constrained by antitrust law? Moreover, while the legal treatment of patent pools might not itself be a popular topic at the moment, understanding the underlying economics of patent pools is important both to understand other types of contractual arrangements and to properly evaluate the remedies available when a merger involves an undesirable concentration of IPRs. A review of the relevant economic literature seems therefore useful¹⁴.

The key reference on patent pools is Lerner and Tirole (2004). In their setting N patent-holders must decide whether or not to form a patent pool. The patent-holders are all “pure research” firms that do not themselves want to use any of the patents in the pool. Therefore,

¹⁴ Throughout, and following most papers in the area, we assume equal treatment within the pool. Therefore, any safe harbour granted to a pool would not extend automatically to any form of unequal treatment within the pool. We do not pursue this point further, as it requires more developed analysis that goes beyond the scope of this work.

the pool can be seen as a “joint marketing” arrangement whereby pool members agree to sell access to their IPRs at jointly determined conditions. Following the practice of nearly 90% of patent pools, Lerner and Tirole further assume that the pool only offers access to the whole bundle of pool patents. This is an assumption that we will retain throughout our discussion of patent pools. Under such conditions, one would of course expect that patent pools that contain only complementary patents would be good for welfare since the profit maximising prices of complements is lower when those prices are set jointly than when they are set independently (the usual Cournot double marginalisation effect). In contrast, pools that contain mostly substitute IPRs would be socially undesirable.

The first contribution of Lerner and Tirole is to point out that this intuition only applies neatly to the extreme cases of perfect substitutes or perfect complements (i.e. “essential” patents). For intermediate cases, the same patents can be substitutes or complements *depending on the level of their price*. Consider the case of two patents that are imperfect substitutes/complements. If their price is low, then buyers will want to acquire both of them so that the patents are effectively complements (decreasing the price of one increases the demand for the other), but if their price is high then buyers will only acquire access to one of the two patents so that the two pieces of IP are now substitutes. This “endogeneity” of the relevant concept of substitutability/complementarity creates a problem for competition policy since the substitutability or complementarity of patents cannot be assessed independently of the pricing of the pool patents. So, unless one wants to only permit pools of strictly essential patents, one faces significant difficulties in drawing a line between “good” and “bad” patent pools. From this perspective, the current EU approach that only grants a safe harbour to pools of essential patents does make sense as criteria for exemption should err on the side of caution.

It should be noted that in the *Syngenta/Monsanto (sunflower seeds)* case included in appendix 2 (2010 COMP/M. 5675) we see a particular difficulty in defining essential versus complementary patents. In that case, the intellectual property at issue is germplasm, where a sufficient variety of germplasm is required to create parentage that will generate marketable varieties in the downstream market. Much of the discussion in the case appears to be centred on “how much is enough” genetic stock to generate adequate parentage for marketable varieties. This is, of course, a question that does not have a “correct” answer but rather is a matter of where one draws the line. In this case, the issue is not only that it is unclear how much genetic stock is necessary to generate a single marketable variety, but that a large set of products is possible based on any given set of germplasm and what is essential to one of those products is not necessarily essential to another. Hence, in the case

of multiple products based on the stock of intellectual property the division between essential and complementary patent rights can be particularly fraught.

The second contribution of Lerner and Tirole is to show that such a dividing line actually exists so that, even if one does not know exactly where the divide lies, one knows at least that the likelihood that patent pools are welfare increasing is indeed increasing in the “degree of complementarity” between the patents included in the pool. One should however be careful when interpreting this result as the definition of substitutability/complementarity is non-standard. Intuitively, the pricing of patents can run into either of two “margins”: the outside margin (called “demand” margin by Lerner and Tirole), where the price is constrained by its effect on the demand for the bundle of patents and the inside margin (called “competitive” margin) where the pricing is constrained by competition from other patents for inclusion into the “bundle” of patents sold by the pool. Loosely, the set of patents is more substitutable in the Lerner and Tirole sense if inside margins are relatively more constraining than outside margins. While this sounds reasonable, one should keep in mind that there is no obvious direct correspondence between this definition and the information on patent substitutability that one might get from a technical expert. This raises the question of how the analysis might be applied in a concrete competition policy context.

The third contribution of the paper is to confirm the intuitive guess that patent pools are socially desirable if and only if the patents included are not too closely substitutable in the sense defined above.

The fourth – and probably most important – contribution of the paper is to study the role of clauses that allow pool members to keep licensing their own individual patents outside of the pool. The authors define a pool as “strongly stable” if the inclusion of such a clause does not affect the profit maximising price level that the pool chooses and show that *all socially desirable pools are strongly stable, while all socially undesirable pools are not*. Glossing over some technical details, this essentially implies that an obligation to include such a clause would mean that only socially desirable pools would be formed. Notice that one would not expect independent licensing to actually *occur* in such pools: the clause just acts as a screening mechanism sorting good pools from bad pools. Taken literally, the implications of this result for competition policy are quite stark. Although complementarity between patents is essential to the underlying mechanism that determines whether a pool is socially desirable, in practice there is no need to look at the type of patents included in a pool. As long as the pool forms voluntarily and competition authorities require the inclusion of an independent licensing clause, then one can relax. In principle then, this result makes the practical difficulty of discerning whether patents are close substitutes in the Lerner and Tirole

sense irrelevant as reliance on one simple governance rule suffices to ensure socially desirable outcomes

For policy purposes, it is important to properly assess the robustness of such an apparently simple and practical policy approach. Following Lerner and Tirole, we now drop the assumption that the patent members are pure research firms, assuming instead that all members of the pool are also active in the corresponding market. This raises two additional antitrust issues.

The first one is the firms' incentives to soften competition downstream by choosing a royalty scheme that "raises rivals' cost". This is very much the same concern as that raised above in the context of cross-licensing. Not surprisingly then, Lerner and Tirole find that *conditional on the existence of the pool*, pool members would tend to charge excessive royalties to each other. Interestingly, Gilbert (2009) has another reading of the effect of vertical integration on pool behaviour. He suggests that vertically integrated players may prioritise the downstream portion of their business so that they would in fact be happy with low or even zero royalties. Formally, one can think that such situations may arise where there are significant network effects downstream so that ensuring a quick diffusion of the new technology (and hence low initial prices) would be profit maximising. This effect would be exacerbated if the technology promoted by the pool were competing downstream with other technologies. The existence of a number of pools that operate on a royalty-free basis suggests that such situations do actually arise in practice. Overall, then, it is not possible to state with any generality whether the presence of pure research firms in patent pools would tend to lead to higher or lower levels of royalties. Still, there is a strong presumption that pure research firms would demand higher royalties in industries where technological competition is intense and technologies generate significant network externalities downstream.

The second antitrust issue that arises when pool members are also active downstream is the traditional problem of foreclosure: how eager will pool members be to grant access to third party downstream rivals? The authors show that their basic results generalise, i.e. pools that form voluntarily under the constraint of continued licensing outside the pool are socially desirable. This is not entirely surprising since firms would also still have some incentives to foreclose downstream entry if they did not form a pool but instead licensed their patents strictly on their own. This means that the formation of a pool can only exacerbate the foreclosure issue if it *increases* these existing individual incentives. Consider the situation where all pool members operate in the same market and where licensing the pool patents to an entrant simply makes it possible for this firm to enter the downstream market. When setting the conditions of access, the pool will consider the loss of profits that such entry

imposes on each member of the pool...but, without a pool, each firm would consider its own loss due to entry when setting its own royalty so that the total royalty would reflect exactly the same total loss from entry as in the presence of a pool.

Lerner and Tirole also look at the possibility that inclusion of some patents within a pool could foreclose competing patents outside the pool, i.e. they also look at foreclosure in the technology market. Suppose that a pool contains N patents, some of them essential and that there are two (perfectly substitutable) non-essential (but still useful) patents. Suppose further that these two patents do have their own stand-alone demand. Would the pool choose to include only one of those patents at the detriment of the other? The answer depends again on the overall degree of substitutability of the pool. If this degree is such that the external margin binds, then the pool does not include either patent and there is no foreclosure. If, on the other hand, the inside margin is binding, then the pool includes one of the two patents leading to foreclosure and lower welfare. *However*, this negative welfare effect vanishes if the pools are required to include a clause allowing for continued independent licensing outside the pool. *So, again, the simple requirement of individual licensing saves antitrust authorities from having to delve into the complexities of pool behaviour.*

The results above were established for a set of N *symmetric* firms. Moreover, the analysis only looked at the stability of pools that include all N firms. Are the simple policy rules obtained so far still valid if firms differ in the importance of their IP holdings? Also, could patent pools that only include a subset of the N firms actually emerge and, if such *partial pools* are indeed possible, what is their likely impact on welfare? Let us first look at the case of asymmetric patent portfolios. Assume that each of the N firms contributes one patent to the pool but that some patents are simply more valuable than others. In order for patent pools to form at all *we now need to assume that firms with more valuable patents get a greater share of pool royalties than firms with less valuable patents*. If this were not the case then even socially desirable pools would be “destabilised” by clauses authorising members to keep selling their own technology outside the pool. Under such conditions, Lerner and Tirole show that, provided that the total price of a license without a pool is higher than with a pool for all non-pool equilibria, then the patent pools that actually form are socially desirable *even if the independent sale of patents outside the pool is not allowed*. If on the other hand the total price of the licenses without a pool is smaller than with the pool in all non-pool equilibria, then one needs the additional requirement that *the licensing of individual patents outside the pool is allowed* to ensure that the pools that form are again socially beneficial.¹⁵ While theoretically interesting, the distinction between situations where individual licensing is

¹⁵ Notice however that there is no result for the case where some non-pool equilibria involve higher prices while other non-pool equilibria involve lower prices.

required for the pools to be desirable and situations where such a clause is not necessary is likely to be of little practical use as one cannot see how competition authorities would go about comparing the pool's total royalties to the sum of individual royalties that would prevail in the counterfactual without a pool. Overall, then the basic message is unchanged: freely formed patent pools that allow for licensing outside the pool and have an ownership structure that reflects the variable value of its patents are likely to be socially desirable. However, actual patent pools use a variety of royalty sharing schemes. Not all of these rules are sensitive to the value of the patents held by different pool members. For example, Layne-Farrar and Lerner (2008) find that most pools follow one of three sharing rules: royalty-free licensing (e.g. the Bluetooth pool), numeric rules linking royalty shares to a firm's share in the total *number* of patents own by each firm and value proportional rules. So only the last of the three most commonly used rules actually satisfies the Lerner-Tirole conditions for desirable patent pools to emerge spontaneously when individual licensing outside the pool must be allowed. This raises uncomfortable questions. Firstly, how can the pools that do not have a value-sharing rule be actually stable? Are we supposed to believe that none of these pools allow individual licensing outside the pool? Secondly, whatever the reason why pools without value-based sharing might still emerge, what can we say about their impact on welfare? Is the requirement of individual licensing still sufficient to put our minds at rest? We believe that, until we know the answers to such questions, adopting the laissez-faire attitude that Lerner and Tirole's main results suggest would be imprudent. Sole reliance on simple governance rules is not sufficient to ensure that the broad variety of pools that are actually observed do not raise significant competition policy concerns. Some direct assessment of the complementary links of the patents involved in a given pool might therefore still be necessary. This in turn implies that competition authorities would generally find it easier to approve a patent pool under a rule of reason when the relationships between the patent rights that are included are easier to appraise.

Even if we limit ourselves to a traditional "technological" view of complementarity and substitutability, the relationship between two pieces of IPRs can only be properly defined with respect to a specific product or at least a specific family of products. Two patents that might be complements when developing a smart phone might well prove to be substitutes when applied to another field of application. In the same vein, two patents can easily be seen as both essential for a given product but as simply complementary for another one. This means that the essentiality/complementarity criterion might still be useful for patent pools formed for the purpose of developing a specific product/technology but not for pools with a less narrowly defined purpose. In that sense, the essentiality/complementarity criterion would seem to be most useful for pools arising as part of a standard-setting

process. For less well defined pools – such as pools that might be set up as remedy to a particular merger transaction or to generally relieve potential patent thickets between the parties – the task of determining which subset of patents is complementary might be essentially hopeless. Recent cases such as *Axalto/Gemplus* (2006 – *Comp/M.3998*) and *Syngenta/Monsanto* (2010 – *Comp/M5675*) offer interesting examples of the difficulties involved. The nature of the relationship between patents was in fact never defined in *Axalto/Gemplus*, while the definition of an appropriate set of patents to divest was rather controversial in *Syngenta/Monsanto*. In both cases, one cannot help but feel that the decisions were not based on the kind of careful distinction between substitutes and complements that economic theory appears to suggest.

Gilbert's analysis of 20 US patent pool decisions lends further support to the idea that the distinction between essential/complementary and substitute IPRs might be of little practical relevance outside of the standard-setting context. Dividing the cases into a first set, where it was clear that the patent involved were mutually blocking and a second set, where no strong evidence of blocking relationships was available, Gilbert finds that 38% of the pools in the first group were found to be anticompetitive as opposed to 42% in the second group. In other words, the presence of evidence of blocking relationships between patents does not appear to have had any impact on the decisions. Rather, the most important determinant of the judicial decisions was the presence of price-fixing or market sharing agreements. In other words, the main judicial concern seems to have been whether, because of some internal rules or simply because they provide a cover for collusive agreements, patent pools might support more collusive outcomes.

Lerner, Strojwas and Tirole (2007) test some of the positive implications of the Lerner and Tirole (2004) analysis on a sample of 63 patent pools. In particular they find that pools that contain complementary patents are more likely to allow members to keep licensing their own intellectual property outside of the pool, as would be expected. More interestingly, maybe, such an empirical exercise obviously requires an implementable definition of complementarity and substitutability, so how did the authors proceed? They go back to their distinction between binding margins. For patent pools with “complements”, the outside margin binds, which means that the “purpose” of the pool is to resolve the traditional Cournot double marginalisation issue. By contrast, pools made up of “substitute” patents have a binding inside margin, which means that they are set up to reduce competition between members. Lerner et al. then reason that pools made up of substitutes are more likely to face antitrust litigation than others. They can therefore use litigation as a proxy for the substitute versus complement distinction.

It should unfortunately be clear that this approach is of no use at all from the point of view of competition policy since it uses competition policy itself to identify the two types of patent pools! We are therefore still left only with the option of assessing substitutability in a traditional technical manner (as has been the practice in Courts), hoping that the correspondence between such a ranking and the ranking that underlies Lerner and Tirole's economic analysis is close enough.

Before drawing strong policy conclusions, it is also important to understand what the Lerner and Tirole analysis does *not* say.

Firstly, even for the simple case of symmetric firms, the analysis does not imply that "all patent pools are all right". It says that, provided that the independent licensing clause is imposed then all patent pools that are formed voluntarily by members should be all right. This matters because it means that patent pools *that are imposed through regulatory actions* could be welfare reducing. As we will see later in this report, this is an important consideration when evaluating patent pools as a potential remedy for merger-induced concentration of IPRs. A second limitation of the Lerner and Tirole analysis is that it focuses on pools that only sell third party access to the whole bundle of patents. While this appears to be the case for the majority of pools (around 90%), we should realise that the analysis might not apply to pools that offer different "menus" of patents to outsiders. Thirdly, as we have seen, the analysis does not directly apply to pools that use royalty-sharing rules that do not adequately reflect the relative values of their respective patent holdings. Fourthly, for the case where pool members are also active downstream, Lerner and Tirole do not consider the potential role of patent pools on its members' ability to support tacit collusion downstream. Our previous discussion of cross-licensing suggests that such collusive effects are at least a theoretical possibility.

Most importantly perhaps, the Lerner and Tirole analysis does not address the issue of participation. The number of patents, N , in the pool is given so that the question of whether a given pool is or not "open to all" and on what terms cannot be fully addressed. The importance of relaxing this assumption is underlined by the fact that patent pools typically include only a proportion of the companies that could in principle take part, Studying 9 patent pools that have emerged since the 1990s, Layne-Farrar and Lerner (2008) find that they included between 29% and 58% of all potential members accounting for between 10% and 75% of relevant patents in the field. It seems therefore that the dominant pattern is one where pools that actually emerge on a voluntary basis are *incomplete*, leaving aside a number of potential members.

Brenner (2009) analyses the formation of such incomplete pools in a framework that is very similar to Lerner and Tirole. He shows that requiring that pool members retain the freedom to license individually outside of the pool is no longer an efficient antitrust tool as welfare-decreasing partial patent pools can still emerge (i.e. are “stable”) even in the presence of such an independent licensing clause. On the other hand, Brenner also shows that the independent licensing rule is still an efficient screen for welfare-enhancing pools, provided that it is combined with a particular pool formation rule: membership by unanimous invitation. Essentially this rule means that the patent pool is *not* open to all. On the contrary, only pool memberships that would be approved by all pool members are allowed. The intuition is that, for complementary patents, this exclusive membership rule reduces the incentive for unilateral deviation, as deviation would potentially destroy the entire pool and so leave firms in the lower profit outcome of fragmentation. This result is compatible with the US IP guidelines which do not require pools to be open to all firms to be judged pro-competitive. On the other hand, the EU appears to have a strong preference for open pools. As mentioned in the TT Guidelines, “[w]hen participation in a [...] pool creation process is open to all interested parties representing different interests; it is more likely that technologies for inclusion into the pool are selected on the basis of price/quality considerations than when the pool is set up by a limited group of technology owners”. This position is based on considerations of efficient technology choice which are absent from Brenner’s analysis. In this sense, the current EU position is in fact compatible with Brenner’s conclusions. Still, these conclusions imply that, rather than have a clear-cut preference for open pools, the EU might also consider that openness makes it hard for possible for harmful patent pools to emerge.

So far, we have seen that requiring that pool members be allowed to keep licensing their IP outside the pool is helpful to screen out pools that would be welfare decreasing. If firms have asymmetric IP holdings, then this simple rule must be accompanied by a royalty sharing rule that is sensitive to the value of the patents held by each pool members. Finally, if one allows for the existence of partial pools, then allowing restrictive membership rules can indeed help ensure that observed patent pools are actually good for welfare. We also saw that, in the current state of the economic literature, there are also a number of situations where we do not know whether voluntary formed pools are likely to be harmful or beneficial. In such cases, the best approach remains to check the relationship among the patents included in the pool, with a greater proportion of complementary IPRs leading to greater leniency.

Would further restrictions on the governance rules chosen by patent pools help further ensure that the pools that actually emerge are those that do in fact improve welfare? For example, as the main purpose of pools is to ensure that a new product can be produced

without the handicap of a large stack of individual royalties, would it make sense to impose some ceiling on the royalties that can be charged by the pool? As pointed out by Gilbert (2009) such a restriction is likely to be counterproductive. What an efficient pool ensures is that the royalty imposed by the pool is smaller than what the total royalty payment would have been with individual licensing. This, in itself, tells us nothing as to what an appropriate level of royalty for the pool would be. In fact, by setting too low a ceiling, one would prevent the emergence of patent pools that would actually have increased welfare if they had not been so constrained.

While it seems therefore best to avoid such royalty ceilings, *exit restrictions* might actually be effective. Just like a cartel, a pool can only be stable if individual members do not have an incentive to free ride by remaining outside the pool. Such an incentive does exist: to the extent the pool leads to a lower level of total royalty for the IP owned by its members, a firm that remains outside of the pool can actually charge a higher rate of royalty for its own complementary patent than if it was in the pool or if the pool did not exist at all. Conditions that make the continuing existence of the pool conditional on the continuing membership of all (or a high proportion) of its members can minimise the effect of such free riding as significant defection would leave the defectors without a pool to free ride upon¹⁶.

We do not yet know much at all about the effects of various forms of royalty sharing rules on the social performance of patent pools. We have seen that allowing for sharing rules that are sensitive to the relative value of individual portfolios might be important to ensure that socially desirable patent pools actually emerge but we know very little of the performance of pools under alternative royalty sharing arrangements and even less about which arrangement would be most socially beneficial under given circumstances. At this stage, therefore, antitrust scrutiny of sharing rules should be limited to ensuring that the pool does not use non-standard rules whose only justification would be to undermine the expected social benefits of the pool.

Finally, we have not found any literature dealing with the litigation rules of patent pools. Should any infringement of IPRs belonging to the pool be pursued by the pool itself or should this task fall back to the member who owns the patent? Should pools have the power to re-assign patents between members? In particular, is there a danger that patents would be reassigned to ensure that non-members are subject to litigation that would result in high levels of royalty-stacking? While these are important issues that are likely to emerge in several on-going and future cases, we just do not have a sufficient understanding of the

¹⁶ See Gilbert (2009) for a more extensive discussion of such “poison pills” for patent pools.

economic mechanisms involved to make any responsible policy recommendations at this stage.

We can now try to summarise the main conclusions of this section. We have seen that the economics of patent pool can be complex. This suggests an approach where exemption is limited to few clear-cut cases and where the bulk of patent pools are evaluated under a rule of reason. While still incomplete, the current economic literature offers some guidance as to how such a rule of reason approach might be applied.

1. Keep the safe harbour to essential patents. In practice, this might mean that the safe harbour only covers SSO oriented pools, where essentiality might be more easily assessed.
2. Under a rule of reason: recognise that SSO oriented pools might need to include some non-essential patents in order to achieve a degree of legal certainty. More generally, greater leniency should apply to pools that include IPRs that are mostly complements.
3. Members of the pool should be allowed to keep licensing their IP freely outside of the pool.
4. Pools with selective membership rules can still be pro-competitive. Still, some justification as to why the selective membership rules are needed should be provided.
5. While pools with royalty-free licensing are especially attractive to competition authorities, low levels of royalties are not required for a pool to be pro-competitive. Rather than focus on royalty levels (or impose maximum royalty rules) competition authorities are better off focussing on the type of IPR included in the pool as well as on some simple governance rules that tend to promote socially desirable pools. Still scrutiny of unusual royalty schemes is warranted.
6. There are no general reasons to believe that pools that contain a number of “pure research” members are likely to be less competitive than pools that only include firms that are also involved in the corresponding downstream product market(s). Still, “research only” members are likely to push for higher royalties – and thus less competitive outcomes – when technological competition is intense and is subject to significant network effects.
7. Rules that would trigger the demise of the pool in case of substantial defections are potentially pro-competitive as they help ensure that welfare-improving pools are formed.

e. *Empirical Approaches to the Measurement of Patent Thickets*

If patent thickets are to be used as a basis for more lenient antitrust treatment of cross-licensing, patent pools and other related forms of agreements, then it would seem important to be able to determine when such thickets are indeed present and how severe they are. The economic literature offers a variety of measures that might be used in that manner.

The earliest such measure is Ziedonis' (2004) *fragmentation index*. To compute this index, one must first identify a relevant technological area. Typically, this would be done by choosing a number of patent technological classes. The fragmentation index then tries to give an idea of the dispersion of the ownership of patents that might "read" on the patents held by a given firm in these same classes. Formally, the fragmentation index for firm i is:

$$F_i = 1 - \sum_{j=1}^N \left[\frac{NBCITES_{ij}}{NBCITES_i} \right]^2$$

N is the number of firms owning patents that are cited by firm i 's own patents, $NBCITES_{ij}$ is the number of times patents owned by j are cited in patents owned by i and $NBCITES_i$ is the total number of citations to other firms' patents found in i 's patents. A large value of F indicates that the ownership of the patents to which i 's patents refer is highly fragmented, suggesting that thicket issues might be difficult to resolve. Since the index tries to capture the increasing difficulty to reach agreements as the number of likely complementary patents increases, these counts do not of course include self-citations.

Clearly, fragmentation indices for a given sector of activity can then be obtained by aggregating (e.g. averaging) the indices obtained for all relevant companies. In the context of competition policy, such an index could be used to determine for example how much a given cross-licensing agreement would reduce the fragmentation index of the firms involved. In a patent pool context, one could compute, changes in the individual indices of the firms taking part in the pool. Furthermore, a pool that licenses to third parties at centrally set terms would also reduce the fragmentation index of non-pool members¹⁷. The resulting changes in those indices or in some form of industry-average index could then be a first useful step when trying to evaluate the likely thicket-related benefits of patent pools. Interestingly, the overall effect of a patent pool on the fragmentation index would depend on how the pool treat outside members, i.e. there is a direct link between the effect of a patent pool on the fragmentation index and some aspects of the pool's governance.

¹⁷ A pool with a centralised system for dealing with third parties should be treated as a single entity when looking at the possible resolution of patent thickets. This reduces the number of parties to which a given firm's patents can refer, thereby decreasing F .

Ziedonis' fragmentation index has two main limitations. The first one, which is common to some other indices, is that it relies exclusively on the pattern of patent citations. Its value therefore depends on the strength of the link between such patterns and the likely complementarity (both technical and legal) of the underlying patents. To be convinced of the usefulness of citation-based indices one must believe that a patent is more likely to cite another patent that it might infringe or a patent covering a complementary technology than a randomly selected patent. The first of these two associations should not be controversial. In our opinion, there are also reasons to believe in the second association - between cites and technological complements -: technologies that are technological complements are those that can be combined into one new product that serves a particular need. This likely commonality in the goal toward which both technologies are applied seems likely to give rise to more cross-citations than between two random patents. Still, overall, we believe that citation-based measures capture legal complementarity better than technological complementarity. As such they would be best used in combination with some expert-based analysis of the patent portfolios involved.

The second weakness of the fragmentation index is that it evaluates the likelihood that a *given thicket* would be hard to resolve but it is not itself a direct measure of the presence of patent thickets in the first place. In other words, the fragmentation index gives a picture of how dispersed the ownership of patents within some technology classes is but it does not provide a measure of the intensity of the overlap between these patents. To see this, considers the following two examples.

There are three firms, A,B,C, with patents in a given technological area. In the first example, there is very little overlap. Each firm has 10 patents but firm A only has one patent that cites both one of B's patents and one of C's patents. A's other patents do not cite any other patents. The corresponding fragmentation index is $1-(0.25 + 0.25) = 0.5$. Now consider a second example where each one of A's ten patents cites one patent from B and one patent from C. It seems clear that this second example corresponds to a situation where patent thickets are more likely to arise than in the first example. Still, the corresponding fragmentation index would still be equal to 0.5.

Siebert and Von Graevenitz (2008) offer an interesting variation on Ziedonis's approach developing a measure of likely *mutual blocking* between patent holders. This measure is defined as:

$$B \equiv (C^A + C^B)S$$

C^{ij} is the share of citations made by firm i 's patents to j 's patents in the total number of cites made by firm i 's patents. It is therefore the same as the terms $NBCITES_{ij}/NBCITES_i$ found in Ziedonis' concentration index. Notice that here, the blocking index counts both cites going from i to j and cites going from j to i . S is a standard technological proximity index defined as

$$S \equiv \frac{\sum_c A_i^c A_j^c}{\sqrt{\sum_c A_i^c} \sqrt{\sum_c A_j^c}}$$

Where A^{xc} is the number of patent owned (and/or patent applications) by x in technology class c . While Siebert and Von Graevenitz rely on 9 three digit technology classes that seem relevant for the industry (semi-conductors) that they analyse, this index can of course be adapted to any level of aggregation within the existing technology classifications. In fact, one advantage of the B index is precisely that one could start with a fairly large number of potentially relevant technology classes and just let the S component of the index determine how much overlap there actually is between the structures of the two firms' portfolios. Interestingly, for semi-conductors at least, this B measure is not highly correlated with Ziedonis's fragmentation index.

Von Graevenitz, Wagner and Harhoff (2011a and 2011b) exploit a specific feature of the EPO review process to develop a measure that is linked more directly to the idea of "mutually blocking" patents that is at the core of the economic concept of "patent thickets". When EPO examiners review a patent applications they chose the patents and patent applications that they believe ought to be cited. In doing so, they distinguish between "normal" citations and so-called "X and Y citations" which, in the examiner's mind, indicate the possibility of a blocking relationship between the patent application and the patent (or application) cited. The authors then proceed to create an index of patent thickets *for given technology areas* in the following manner:

- Step 1: Select the relevant technology area(s)
- Step 2: Consider an area and a firm A in this area. Identify all firms whose patents are referenced by A 's patents. Identified are the cases where such citations are "X or Y types".
- Step 3: Do this for all firms active in the technological area and identify pairs in which each party can block at least one patent belonging to the other.
- Step 4: Identify all groups of *three* firms which are part of mutually blocking firm pairs.
- Step 5: Count the number of such "triples".

Sector of activities with a high rate of such triples are then identified as those where patent thickets are most likely to arise. Again, this measure can easily be adapted for use in a competition policy context as one can determine how various types of agreements would change the number of triple within a given technology area or even how it would change the number of “triples” in which competitors are involved.

This measure has several attractive features. Firstly, as it incorporates the classification of cites made by the EPO examiners, it does combine a statistical approach with some form of “expert analysis”. We have argued above that such a combination is desirable. Secondly, this is much more than a simple measure of fragmentation of patent ownership. One difference is particularly telling. If two firms were to put their IP portfolio under common ownership, then a traditional fragmentation measure like Ziedonis’ could only decrease, as ownership is now more concentrated¹⁸. By contrast, the number of “triples” computed by Von Graevenitz and al. could actually increase. To see this, imagine that there are three firms, A, B, and C. As shown on the graph below, A has patents that are blocking for some of B’s patents and C has patents that are blocking for A’s patents. Between these three firms one cannot find a single pair of companies with *mutually* blocking patents. Let us now assume that B and C combine their IP assets into a single entity P. Now A and P do form a pair with mutually blocking patents and this pair is now a candidate for inclusion in one of the “triples” that the authors actually count¹⁹.

Before the Merger: No Mutual Blocking Relationship

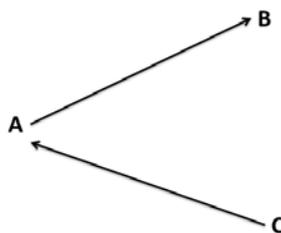


Figure 1: No Mutual Blocking

¹⁸ As a contrast to the “thicket as patent concentration” interpretation adopted in *Axalto/Gemplus*: when these firms combine, Ziedonis’s index would indicate that the thicket is being “solved”, not created, as the case alleges.

¹⁹ Referring to the thicket interpretation in *Axalto/Gemplus*, the von Graevenitz et al index could – but would not necessarily – increase in that case incident to the merger. Indeed, it is not clear at all from the case decision that the concern involves mutually blocking patents, so it is not clear that the index would be high in any case for the industry in the *Axalto/Gemplus* case. This would require information on the *relation* among the patents, which is not an explicit focus of the decision.

After the Merger: Mutual Blocking Relationship

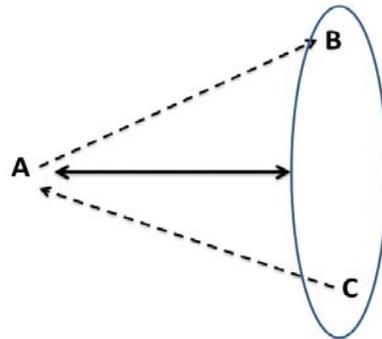


Figure 2: Mutual Blocking

One weakness of the measure is its exclusive reliance on “triples”. In principle, one would want to count any kind of blocking relationships, from pairs to triples, quadruples and so on. One would of course want to assign a greater weight to larger “clusters” as the difficulty of reaching a negotiated settlement is likely to increase with the number of parties involved. Of course the precise value of such weight would be fairly arbitrary but the ability to distinguish between industries with “big” and “small” thickets might make such an exercise worth it anyway²⁰.

Finally, the economic literature on “network” also offers a number of statistics that might be useful when evaluating the presence of thickets and the effect of various agreements on their resolution. An example of this approach can be found in Clarkson (2007). In a “patent network”, patents are the nodes and citations are the “ties” that link those nodes together. Starting from a given technology field, the author identifies all relevant patents and classifies them by age. Each patent is then characterised by a measure of the volume of linkages – called the “density” – that is obtained by dividing the number of citations received by the maximum number of citations that a patent could have received (which increases as the population of relevant patents increases over time). Once this is done, one can then compare the average density of a subset of patents to the average density of the relevant “universe” of patents – most easily defined as a set of technology classes or subclasses. If

²⁰ The lack of clarity that results from a large number of potentially blocking relations is not a focus of these indices, as the “character” of the index does not change as the volume of patents (i.e., the volume of triples in the von Graevenitz et al measure) grows.

the subset exhibits a density that is statistically larger than the relevant universe, then one can conclude that the subset of patents does constitute a patent thicket. The technique can therefore not only identify patent thickets but can also give us some estimate of how severe a given thicket is compared to the relevant average.

While the application of the theory of network to patent networks is in its infancy, it does have significant potential as it offers a fairly large number of readily available statistics measuring not only the density of citations but also their dispersion and the underlying shape of the network (e.g. identifying the main and secondary “centres” of networks). In other words, the specific architecture of the patent thicket could impact on how the thicket should be resolved, and social network theory does offer a number of measures of architecture that have not yet been exploited. For example, a patent may have very few linkages in the sense of the von Graevenitz et al measure, but may nonetheless play a pivotal role in linking several technologies into a whole that can be used as the basis for an entirely new product. The role of such a patent in creating a larger thicket out of several smaller thickets could be key, but a measure that does not identify this pivotal role based on relatively few linkages would not necessarily even pick up such a patent. Rather, it could pick up the two densely connected sub-thickets without recognition that these two networks actually are subsets of a larger and far more complex whole²¹.

f. Grant-backs

We define a grant-back as a clause in a licensing contract whereby at least one of the two parties agrees to give the other party access to future innovations relating to the object of the license. Notice therefore that, for us, grant-backs are *prospective* clauses in the sense that they relate to intellectual property that has not yet been produced. Somewhat confusingly, some authors also refer to *retroactive* grant-back clauses. Such clauses stipulate that at least one party must give the other party access to all of its existing IP (including possibly some patent applications) relating to the technology being licensed. We believe that such retroactive clauses are better classified as defining the object of the licensing agreement or, if they are reciprocal, as cross-licensing agreements. Beyond this, the only interesting aspect of such clauses is that they provide each party with some protection against moral hazard on the part of the other party. The clause ensures that the licensee is reassured that some other piece of IP held – or applied for – by the licensor will not make the licensed technology

²¹ See the discussion of cutpoints, for example, in Wasserman and Faust (1994), for example, and other architectural features described in that volume.

immediately obsolete and the licensor is protected against the possibility that the licensee might already hold knowledge that would allow him to immediately outperform the licensor.

In this sense such clauses might be necessary to ensure that the parties can reach a licensing agreement at all. Once this aspect is considered, the agreement should be treated like any other (cross-) licensing contract.

Grant-backs are very common in licensing agreements, with 43% of all licenses encompassing such clauses (Cockburn (2007)). A recent empirical study of 113 licensing contracts by Laursen et al (2010) also finds that grant-back clauses are more likely to be included in the licensing contract when the firms are both in the same market and familiar with the technology. In other words, grant-back clauses tend to arise more often when the licensing contract is between actual or at least potential competitors in both products and technology markets. This is worth keeping in mind when proceeding through the following analysis.

Before we turn to an analysis of the competitive effects of grant-backs, it is important to lay down some terminology. There is a wide variety of grant-back clauses. Such clauses can differ according to the following dimensions:

Reciprocity: Are both parties obliged to give access to their future developments of the licensed technology or does this obligation only apply to one of the parties (usually the licensee)?

Ownership: Suppose that the licensee commits to “grant back” to the licensor any improvement that she makes on the licensed technology, does this mean that she simply grants the original licensor a license on the improvement or does she actually have to *assign* (read “give”) property rights on the innovation?

Exclusivity: If the other party gets a license on further developments of the technology, is this license exclusive? Does the innovating party still have the right to use the innovation herself? Who has the right to decide whether the further development should also be made available to third parties, including other licensees of the original technology?

Quid pro quo: Are the further developments of the original technology transferred for free or is there some compensation either in kind or as royalty payments? If there is a *quid pro quo*, how are the nature and the size of this *quid pro quo* determined?

Duration: Does the grant-back clause only apply for the length of the original licensing agreement or does it extend beyond that period?

Coverage: what does “further improvements on the original licensed technology” mean? How does one determine whether one of the parties’ new know-how or even one of the parties’ new patents is simply an improvement linked to the licensed technology as opposed to an independent, unrelated innovation?

Severability: A severable “improvement” is one that can be exploited independently of the original licensed technology or, following the TT guidelines’ definition, “An improvement is severable if it can be exploited without infringing upon the licensed technology”. Note that the term “improvement” does not imply that the innovation involved is not significant. In particular such an “improvement” might well be patentable itself even though it does infringe the initial patent.

So grant-backs relate to *future* innovation. As such, they raise two kinds of issues. The first issue is the likely impact of the clauses on the innovative behaviour of the two parties. Are grant-backs likely to increase or decrease future innovation? The second issue is whether grant-back clauses are likely to limit the access of third parties to the future innovations of the licensee and/or licensor? In particular, can grant-back clauses be used as a way to “leverage” the market power of the licensor into other markets or as a way to extend patent protection beyond the term of the patents that are covered by the initial agreement? These two concerns form the backbone of the legal treatment of grant-back clauses on both sides of the Atlantic.

i. A Brief History of the Antitrust Treatment of Grant-back Clauses in Europe and the US

In the 1970s, licensing practices in the US were governed by the so called “nine no-no’s”. One of these included exclusive grant backs that require the licensee to *assign* to the licensor patents that may be issued to the licensee after the licensing arrangement. The grant backs were criticized on the grounds that they reduce innovation incentives, especially if they are exclusive. From 1988, a rule of reason approach to evaluate patent licensing agreements was adopted and used for grant back clauses. The 1995 antitrust guidelines for the licensing of intellectual property rights suggest that the grant back provision in technology licensing is not illegal *per se*:

Grant backs can have pro-competitive effects, especially if they are nonexclusive. Such arrangements provide a means for the licensee and the licensor to share risks and reward the licensor for making possible further innovation based on or informed by the licensed technology, and both promote innovation in the first place and promote the subsequent licensing of the results of the innovation. Grant backs may adversely affect competition, however, if they substantially reduce the licensee's incentives to engage in research and development and thereby limit rivalry in innovation markets.

In practice, the relevant agencies make a first determination of whether the grant back clause significantly reduces the licensees' incentive to improve the licensed technology. If so, then they balance these against any offsetting pro-competitive effects in the innovation or in the product markets. The US Guidelines clearly favour non-exclusive rather than exclusive grant back clauses²². This idea goes back to much earlier literature, including Chevigny (1966). Chevigny also discusses the differences between grant-backs on severable ("extraordinary") and non-severable inventions. He proposes that access to the initial technology be the main justification for grant-back agreements, with all types of agreement that go beyond the minimum required for access to be viewed as potentially illegal extensions of the patent monopoly. He further proposes that considerations in any evaluation should include (1) whether the parties are competitors, (2) whether there are multiple licensees, (3) whether the original patent generates a large or small amount of market power, (4) whether severable or non-severable improvements are covered, (5) whether the grant-back is exclusive or non-exclusive, (6) whether the grant back is a license back or an assignment back, (7) whether invention is discouraged. This list has changed somewhat over time, although it has remained similar in many respects. According to Gilbert and Shapiro (1997), the US lower courts have developed a list of factors to consider in evaluating grant backs including the exclusivity of the grant back, but also a set of other considerations: (1) the licensee's right to retain use of the improvements, (2) the licensor's right to grant any sublicenses; (3) the duration of the grant backs; (4) the royalty applied to the grant back, (5) the market power of the parties, (6) the relationship among the parties, (7) the coverage of the grant backs, and (8) the effect of the grant back clause on the incentive to innovate (for the licensor or the licensee).

²² Indeed, the view that grant-backs are more desirable when they are not exclusive can be found much earlier in Austern's (1965) discussion of *FTC v. Consolidated Food Corp.* (380 US 592 (1965)). Stedman (1965) notes that even non-exclusive grant-backs can be found to reduce innovation incentives and competitiveness, however, citing *United States v. Aluminium Co. of America* 91 F. Supp. 333 (S.D.N.Y 1950).

EC competition policy has attempted to limit the types of restraints that can be incorporated into grant-back clauses. Before going into the specific restrictions on the clauses themselves, it is important to note that Article 101(1) (b) of the EC treaty contains a prohibition to “limit or control production, markets, technical development, or investment”. Hence, any clause that potentially limits innovation incentives, as has been argued for grant-backs, potentially falls afoul of EC competition policy under this article. More specifically, grant-backs were governed by the EC Technology Transfer Block Exemption Regulation EC No. 240/96 (“old TTBER”) that regulated licensing activities between 1996 and 2004. It specified that feedback of severable improvements be non-exclusive, that the licensee retain the right to sub-license and favoured mutual exchange of information and rights to improvements on the basic technology. In other words, the old TTBER also favoured grant-back clauses that were *reciprocal*²³.

The TTBER was updated in 2004 so that currently “The Treaty to Categories of Technology Transfer Agreements” no. 772/2004 (“New TTBER”) which is valid for 10 years from 1 May 2004 is applied in the EU. Besides shifting from a “formal” approach to a more “effect based” approach, the most significant differences between the old and new TTBER are the following:

1. The 2004 TTBER and accompanying Guidelines no longer favour grant-back causes that are reciprocal.
2. Exclusive grant back clauses are the greatest concern. The new TTBER exempts non-exclusive grant back obligations, whereas under the old TTBER, some of them could have been blacklisted. For example, under the old TTBER non-exclusive grant back clauses are excluded from the block exemption if the improvement is severable.
3. In a sense, then, severability has become a less important aspect of grant-back contrasts since it is only the combination of severability and exclusivity that leads to exclusion from new TTBER.
4. The new TTBER also excludes no challenge clauses from the block exemption (article 5.1(4) of New TTBER). A no challenge clause prohibits the licensee from challenging the validity of the intellectual property rights which the licensor holds in the Common Market. This is relevant to the issue of grant-backs because, if the licensee cannot challenge the validity or breadth of the existing patent, it is difficult to prove whether an improvement is severable or non-severable.

²³ See Anderman (1998).

Case History -- EU

Like in the US, the EU policy has vacillated somewhat on the treatment of licensing agreements in general since the early sixties, building up through modifications to the block exemption starting in the 1980s and culminating in the current TTBER and current *Guidelines for Technology Transfer*²⁴. Indeed, older cases must be treated with caution, as the guidelines supplant earlier treatments.

Following *Anderman*, 1998, the principle that non-exclusive grant-backs do not constitute restraints on competition was supported in the *Raymond/Nagoya* case, where nonexclusive licenses for improvements within the field, even if unrelated to the basic technology, were required within the grant-back clause. The *Delta Chimie* decision by the Commission suggested that, in order not to be restrictive of competition, the licensee should retain the right to license its severable improvements freely outside of the application to the original licensed product or process as long as the originally licensed technology remained protected (also supported by discussion in *Kabel/Luchaire*, where licensor retained right to sub-license technology granted back non-exclusively). Indeed, upon expiration of the original license, the Commission suggested in this case that the licensee should retain full decision rights over how to use its own severable improvements, including on what basis the licensor could continue to use them. This view was supported in the subsequent decision, *Rich Products/Jus Rol*. The Commission appears particularly keen to ensure that the licensee not be cut off from unseverable know-how at the end of the original license and thereby be unable to exploit its own severable know-how. Continuing reciprocal exchange agreements, such as those cleared in *Boussois/Interpane*, ensure continuing access to the parties and the ability to exploit all own improvements that have ensued from the original license.

It should be noted that an original exclusive license could potentially be prolonged indefinitely by post-term agreements on exchange of improvements (even those that are unpatented). This was permitted under TTBER as long as the parties had a right of refusal of improvements and right to terminate the agreement. Indeed, the licensor could continue to use the non-severable improvements of the licensee after the expiration of the contract by

²⁴ For this and other relevant case references, see 72/237 *Davidson Rubber*, EuC; 72/238 *Raymond/Nagoya* EuC; 75/494 *Kabel- und Metallwerke Neumeyer and Etablissements Luchaire*, EuC; 85/410 *Velcrol Aplix* sections B.II.1, B.III.2, B. III.2(f), EuC; 85/561 *Royon/Meilland*, EuC (concerning mutant plant varieties; Regulation 2349/84 Art 3(8); *Neilson-Hordell/Richmark*, EuC. Also see Turner's (2010) text summary, pp. 128-130. Additional references are *Raymond/Nagoya*, 1972 CMLR D45, *Rich Products/Jus Rol* (1988) 4 CMLR 527, *Boussois/Interpane* (1988) 4 CMLR 124.

continuing royalty payments²⁵. Otherwise, any obligation to license the severable improvements of the licensee back to the licensor would generally be frowned upon, whereas both licensor and licensee would normally be expected to face restrictions in their licensing behaviour of non-severable improvements during and after the term of the license. In other words, under the old TTBER, if a licensor wished to sub-license non-severable improvements of the licensee, he should request the licensee's consent and similarly if the licensee wished to sub-license non-severable improvements of the licensor, consent should be requested as well.

A reciprocal and non-exclusive grant of non-severable improvements by licensee and licensor was viewed as compatible with Article 85(1) in *Bousois/Interpane*, where the reciprocal and non-exclusive nature was the reason for the clearance.

The 2004 guidelines permit exclusive grant-back of non-severable improvements to the licensor. The philosophy underlying this is that the non-severable improvements could not be used without the acquiescence of the licensor in any case, so they are not restrictive of competition²⁶. Furthermore, there has been some reversal of previous restrictions on the use of grant-backs to "evergreen" the licensor's patents by effectively prolonging the licensor's control of the underlying technology beyond the patent term²⁷.

²⁵ See Anderman, 1998, for more discussion.

²⁶ See 75/494 *Kabel- und Metallwerke Neumeyer and Etablissements Luchaire* Section IV.15, EuC, *Spitzer/Van Hool*, EuC; *Neilson-Hordell/Richmark*, EuC for discussion and Guidelines on technology transfer, section 109.

²⁷ For example, in the earlier *Delta Chemie/DDD* and *Rich Products/Jus Rol* cases (88/563 *Delta Chemie/DDD* Sections I.E(11), II.A(B)(33), EuC and 88/143 *Rich Products/Jus Rol* Section II.A(b) (36), EuC), the licensor's right to use the licensee's improvements was required to terminate upon the termination of the original license; however, it might be that these cases would be decided differently now (see Turner 2010).

Case History – US

Prior to 1946 grant-backs did arise in legal cases, but they were never found to be “illegal”²⁸. In 1945, the Supreme Court imposed a limited prohibition on grant-backs in *Hartford-Empire Co. v. United States*²⁹ but felt that a more general prohibition would undesirably reduce the incentives to invent for the licensor (which was primarily a licensing company rather than a manufacturer). Criteria for determining whether grant-backs violate anti-trust laws were considered for the first time in the 1946/1947 case *Transparent-Wrap Machine Corp v. Stokes & Smith Co.* (“*Transwrap* case”). Closely following Schmalbeck’s 1975 summary and discussion of the case, Transwrap Corporation held patents on a machine that made filled and sealed cellophane packages. Transwrap granted Stokes & Smith Co. an exclusive North American license to its patented process including an assignment back of rights to patents that improved on the machine or were for use in connection with the machine. The contract included a clause specifying that the licensee submit any patentable ideas to the licensor so that the licensor could apply for any patents arising from these ideas. The licensee then had access to use these patents on any non-competing product with no additional charge. Stokes & Smith developed improvements that fell within the agreement, but refused to assign them to Transwrap. Transwrap terminated the license. The licensee sued, stating that the grant-back was contrary to competition law and hence unenforceable.

The appeals court felt that the grant-back in this case was being used to force others to buy what was outside “the four walls of the patent”. It argued that the licensor would have control over the improvements after the basic patent had expired, suggesting misuse of the original patent by means of extending the patent’s scope. Indeed, in the course of the arguments on the case an analogy between grant-backs and tie-ins was made³⁰. The Supreme Court disagreed, saying that patent statutes allow for assignment for any consideration, including in exchange for rights to continue using the basic patent. Furthermore, they did not find the agreement’s terms to be illegal in themselves. In other words, it does not constitute misuse of a patent’s “lawful monopoly” to use it to acquire other lawful monopolies. Indeed, grant-backs and tie-ins were different, the court suggested, since tie-ins involved extending a monopoly to non-patented products and could then be seen as using a “legal monopoly” to

²⁸ *Allbright-Nell Co. v. Stanley Hiller Co.*, (7th Cir. 1934) 72 F. (2d) 392; *Gasoline Products Co. v. Champlin Refining Co.*, (D.C. Me. 1931) 46 F. (2d) 511; *Bunker v. Stevens* (C.C. N.J. 1885) 26 F. 245; *American Refining Co. v. Gasoline Products Co.*, (Tex. Civ. App. 1927) 294 S.W. 967; *Allbright-Nell Co. v. Stanley Hiller Co.* 72 F.2d 392 (17th Cir. 1934). These cases broadly supported the legality of grant back clauses under the Sherman Act.

²⁹ 323 U.S. 386 (1945).

³⁰ For a related case, see *International Salt Co. v. United States* 332 US 392 (1947).

create an “illegal monopoly”. Furthermore, it could only be illegal to combine these two legal monopolies if the effect were to substantially lessen competition or create a monopoly that was not there already³¹. In the absence of misuse and in the presence of the ability to demand any type of consideration in exchange for the patent, this grant-back was not illegal *per se*. In the decision, a test of reasonableness of the restraint was suggested whereby if there is no showing that the grant-back enhances the position of the patent-holder or that others desiring a license would be excluded, there is no reason to call the agreement into question³². On the other hand, if grant-backs are found to be part of a larger, monopolistic scheme or result in funnelling all technology to a single owner resulting in unlawful control of a market, then antitrust condemnation could be justified. Judge Hand, dealing with the case on remand, specifically addressed both control of the patents during the period of the original patent’s term and the extension of the monopoly due to the unexpired terms of the improvement patents. He concluded no abuse in the first case and that, with respect to an increase in term, *someone* was entitled to a monopoly during this period and he saw no problem with having ownership by the original patent holder rather than the licensee.

Bergsten (1957) in his comments argues that this particular grant-back reduces the incentive of the licensee to innovate, even though he acknowledges that it improves the licensor’s incentive to invent basic innovations. Bergsten suggests, however, that this objective would be better achieved by lengthening the term of protection under patent law rather than allow grant-backs of this type. He also notes that the particular grant-back clause at issue was not the only type that would maintain the incentives to invent basic innovations: a grant-back clause that allowed the licensee to retain the patent to improvements on a non-exclusive basis would have allowed the licensor to maintain its competitiveness. Chevigny (1966) emphasises that the circumstances of the case were quite special: there was a single licensee, the licensee and licensor were not competitors, and the improvement was non-severable.

³¹ For cases where the underlying legal theory is that each legal monopoly must succeed or fail in the market on its own merits – a monopoly cannot justify tying itself to another monopoly by asserting that both monopolies are legal, see *United States v. Paramount Pictures Inc.*, 334 US 131, 157-58 (1948) or *Ethyl Gasoline Corp. v. United States* 309 US 436, 459 (1940), for example.

³² “The defendant’s control over the industry will be no greater by virtue of the improvement patents; all it will gain during the joint period is a freedom to add the improvements...not every restraint of competition is ‘unreasonable’ and ...only ‘unreasonable’ restraints are unlawful.” 161 F.2d at 567. Chevigny (1966) notes that the grant-back only ensures access to technology, which is distinct from tying conceptually.

He cautions that the reasoning of the case may be valid only with these particular circumstances³³.

The *Transwrap* case seems to have settled the legal debate about grant-backs rather effectively as there was little systematic treatment of grant-backs in later cases³⁴, even though the decision received considerable criticism³⁵. Instead, later cases tend to dismiss the grant-back as a “sole consideration”, citing *Transwrap*, and then go on to discuss other anti-competitive behaviour. The cases are then decided based upon an overall appraisal of this general anti-competitive pattern rather than on the basis of the grant-back itself³⁶. In other words, grant-backs have only been found illegal when used with other clauses or along other types of behaviour as part of an overall monopolistic scheme.

*United States v. General Electric Co.*³⁷ appears to suggest that exclusive licenses are potentially more worrying from an anti-trust standpoint than non-exclusive licenses³⁸. Furthermore, the scope of the grant-back has at times been at issue, with grant-backs involving all future patents in a field obtained by the licensee. Indeed, in a later *United States*

³³ An example of a case where grant-backs are not found per se illegal in the presence of multiple licensees is *United States v. Huck Mfg. Co.*, 277 F. Supp. 791, 795 (E.D. Mich. 1964). See Chevigny (1966) footnote 34 for more examples.

³⁴ Grant backs are treated in the *Cellophane* case (*United States v. E.I. DuPont de Nemours & Co.* 118 F. Supp. 41 (D.Del. 1953) aff'd 351 U.S. 377 (1956)) where the validity of the grant back was found given that (1) there was no showing that anyone had been refused a license, (2) no one could do anything without the basic DuPont patents in any case, so it mattered little whether DuPont also held the improvement patents, (3) the agreement only covered moisture proof cellophane, and (4) DuPont charged an additional royalty for its improvements that were eventually added to the license. In *United States v. Birdsboro Steel Foundry & Machine Co* (139 F. Supp. 244 (W.D. Penn. 1956)), an exclusive cross license of blocking and complementary patents (current and future) between firms competing in different markets, where there was no showing of either the power or the intent to exclude competitors. *United States v. Line Material Co.*, 333 U.S. 287 (1948) made clear that the license violated the Sherman act because there were additional elements (such as price fixing) in the license which rendered the agreement illegal when combined with the provision for inclusion of future patents. See Simmons (1959) for discussion.

³⁵ See Donnem (1969), Chevigny (1965-66) including cases cited in notes 33 and 34.

³⁶ See *United States v. Switzer Bors., Inc.*, 1953 Trade Cas. Para 67,598 (N.D.Cal. 1953) where grant-back is one of several offensive items); *United States V. Imperial Chemical Industries, Ltd.*, 105 F. Supp. 215 (S.D.N.Y. 1952); *United States v. Besser Mfg., Co.*, 96 F. Supp. 304 (E.D. Mich. 1951); *United States v. Aluminium Co. of America*, 91 F. Supp. 333 (S.D.N.Y. 1950); *United States v. General Electric Co.*, 82 F.Supp. 753 (D.N.J. 1949) (Lamps); *United States v. General Electric Co.*, 80 F. Supp. 989 (S.D.N.Y. 1948) (carbology). Violations were not found in: *United States v. Huck Mfg. Co.*, 227 F. Supp. 791 (E.D. Mich. 1964) and *United States v. E.I. du Pont de Nemours & Co.*, 118 F. Supp. 41 (D. Del. 1953).

³⁷ (S.D. N.Y. 1948) 80 F. Supp. 989.

³⁸ Report of Attorney General's Committee on the Anti-trust Laws 228-29 (March 31, 1955): “If the grant back is a license, its reasonableness may depend in some circumstances on whether the license is exclusive or non-exclusive. A grant back by assignment or an exclusive license, which is in effect any assignment, should be subject to close scrutiny as a factor which may dull the grant back licensor's incentive to invent. On the other hand, grant back of a non-exclusive license, especially with authority to sub-license, may diffuse the benefits to all licensees and thus tend to encourage competitive use of the innovations.”

*v. General Electric Co.*³⁹ licensees granted back nonexclusive licenses with a right to sublicense not only their present patents but also all future patents that they acquired on the relevant technology (incandescent bulbs). In this case, General Electric was found to have used its basic patents to funnel all industry patents to itself. Similarly, *United States v. National Lead*⁴⁰ finds against the grant-backs in question, but the court does not condemn broad grant-backs *per se*. On the other side of the coin, *United States v. E.I. du Pont de Nemours & Co.* affirms that the grant-back in question, while it covers improvements to the basic moisture-proof cellophane patent, only resulted in nine patents' being granted back. On that basis, Du Pont was not found to have used its patent position to monopolise the industry via the grant-backs. In the case *United States v. Imperial Chemical Industries* the term of the grant-back is in question in the sense that it was found that the grant-back "perpetuate[d] control of the product, after expiration of the basic patent, for an unlawful use...". As Bergsten notes, in his review of the cases above, the courts used an overall evaluation of the way patent-holders were conducting strategy in the industry as a means of deciding whether grant-backs were in violation of anti-trust, rather than looking narrowly at grant-backs. For example, in the *National Lead* case, licensees were under production, territorial and price restrictions as well as exclusive grant-backs. This gave a broad picture of anti-trust concern, which influenced the court. The 1948 *General Electric* decision makes this explicit, by condemning use "on a scale such as is found in this suit"⁴¹ suggesting that dominance tends to be found in more than just the narrow confines of the grant back provisions⁴².

ii. *Economic Analysis: Grant-backs and Innovation*

Under a grant-back clause, at least one of the two parties to the licensing contract knows that she will have to share any future innovation (including improved know-how) that falls within the scope of the clause. If this sharing is not associated with any payment from the receiving party and the future innovations of the two parties are not complementary⁴³, then grant-back clauses tend⁴⁴ to reduce the total investment of the two parties into acquiring

³⁹ (D.C. N.Y. 1953) 115 F. Supp. 835.

⁴⁰ 332 U.S. 319 (1947).

⁴¹ Citations of the cases in this paragraph in footnote 23. ICI case quote is from *United States V. Imperial Chemical Industries, Ltd.*, 105 F. Supp. 215 (S.D.N.Y. 1952 at 232). 1948 General Electric Case citation is at (S.D. N.Y. 1958) 80 F. Supp. 989 at 1006).

⁴² Bergsten (1957) also notes that grant backs on assignments and on licenses are treated somewhat differently by the courts, with assignments treated more leniently in general.

⁴³ For the purpose of this discussion two innovations are complementary if their joint value – in terms of quality improvements and/or cost savings – is higher than the sum of their stand-alone values.

⁴⁴ While this has been the presumption of much of the discussion on grant-backs, Choi (2002) shows that one way grant-back clauses might in fact lead to higher total investment in innovation (i.e. the positive effect on

further know-how and/or developing further improvements of the technology. From this point of view, the old regulatory preference for reciprocal agreements is somewhat puzzling. The only thing that reciprocity achieves is to ensure that the grant-back clause reduces the innovation incentives of both parties rather than one. For the rest of this analysis, indeed, we will effectively disregard the issue of reciprocity and focus on clauses that require the licensee to license (or assign) further related innovations to the licensor.

The effects of exclusivity on innovation are also clear. Unless exclusive licensing would be the profit maximising strategy of the innovator anyway then imposing exclusivity *ex ante* must decrease incentives to innovate.

Competition authorities tend to be better disposed toward grant-back clauses if they involve some form of *quid pro quo*, i.e. if the transfer of each piece of new technological knowledge leads to some form of payment from the recipients to the innovator. This makes sense since such payments restore some of the innovation incentives dissipated by the sharing agreement. In fact, as we will see below when we discuss the possible efficiency gains stemming from a grant-back clause, a promise of substantial payment *might* increase the R&D effort of a party that is either financially strapped or does not have the necessary wherewithal to commercialise its own innovations. Unfortunately, the specification of such a *quid pro quo* runs into practical difficulties. In order to be most effective, the *quid pro quo* should be committed to in advance and be conditional on the delivery of further know-how or innovations: it is only if a party knows for sure that it will be rewarded and can properly gauge the level of this reward that innovation incentives are increased. Unfortunately it is in practice nearly impossible to agree in advance an appropriate level of remuneration for innovations that are as yet unknown.⁴⁵

The issue of *severability* also impinges on innovation incentives because it helps to determine what the proper counterfactual is likely to be. Consider first the situation where a new development by the licensee could not be used without infringing some of the patents that are the object of the licensing agreement. In other words, the innovation is not severable. Notice that this lack of severability is independent of the issue of patentability: an infringing innovation can very well be patentable itself. What would be the options of the licensee in the absence of any grant-back agreement? Suppose that we are in a situation where the parties cannot specify *ex ante* a proper payment schedule for further technological improvements. In the absence of a grant-back clause, then, the licensor and licensee find

the licensee can outweigh the negative effect on the licensee) in the presence of incomplete licensing contracts; however, see our critique, below, of Choi's argument.

⁴⁵ In some special cases, royalties could be expressed *ex ante* in terms of an objective measure of realised cost saving or improved product quality but this is likely to be the exception, not the rule.

themselves in an *ex post* bilateral monopoly situation. We would expect bargaining to ensue and to lead to an agreement that splits the total surplus to be gained from using the new knowledge between licensee and licensor. This means that, even for non-severable innovation, we would expect the licensee to be able to appropriate some return in the absence of grant-back. Hence a grant-back clause without a properly specified – and enforceable – *quid pro quo* would decrease the licensee’s incentives to innovate even in this case. This calls into question the common reasoning according to which the licensor “controls the use of non-severable improvements anyway” so that there is nothing to worry about in such a case.

Now consider the case of severable⁴⁶ innovation by the licensee. In the absence of any grant-back clause, the licensee is free to use this innovation in a manner that maximises its profitability. A commitment to grant this innovation back to the licensor must then generally reduce the reward associated with the licensee’s innovation and hence reduce the licensee’s incentives to innovate. This disincentive effect is clearly likely to be higher the more restrictive the grant-back clause is. In particular, grant-back clauses that require assignment of the new IP right, that are exclusive and/or do not involving a sizeable conditional payment, will have a more negative impact on innovation.

Not everyone agrees with this. It is interesting to understand why. For example, as we have seen in the US guidelines, it has been argued that, by providing the licensee with a guaranteed outlet for its new technology, a grant-back agreement can actually be seen as a form of risk-sharing between the licensor and the licensee. Alternatively, grant-back to the licensor could ensure that all the relevant technology be available (and priced) for third parties in a “one stop shop”, saving transaction costs and (in case of complementarity) getting around the issue of royalty stacking. The common feature of such arguments is that – except for the aspect of complementary pricing -- they essentially involve the bundling of some *other* service with the grant-back clause: insurance in the first case and “retailing” in the second case. Following the doctrine of indispensability, one should then ask why these alleged benefits cannot be obtained without also imposing a grant-back clause. We do not have a good answer to this question.

⁴⁶ The distinction between severable and non-severable improvements, albeit not in name, has been a staple of the literature on cumulative innovation (Scotchmer and Green 1990, Green and Scotchmer 1995, Scotchmer 2004, and O’Donoghue 1998, who focuses on scope implications in the presence of “imperfect” licensing), but the direction of the literature has tended to focus on the implications for patent design – in particular the scope of patents – rather than on grant-backs *per se*. Still, it will be worth checking whether some of the results of this literature might be usefully re-interpreted in terms of grant-back.

Interestingly, while the effect of grant-back clauses has been an important theme in both legal texts and legal cases, the only direct reference to any *evidence* of an associated decrease in the research incentives of licensees is *United States v. Aluminium Company of America*⁴⁷, where evidence of a low proportion of research employees was found at Kaiser and Reynolds, the two competitors of Alcoa, and this was interpreted as a measure of decreased innovation incentives resulting from their mutual grant-back agreements. Still, as this evidence goes in the same direction as the rather unambiguous predictions of economic theory, we conclude that the negative effect of a grant-back clause on innovation incentives is potentially an important issue. Moreover, as already briefly discussed above, we believe that some of the traditional arguments in favour of grant-backs are not logically strong, suggesting that the current antitrust treatment of grant back clauses might be too lenient. This tentative conclusion is reinforced when we look further into some of the efficiency arguments that are used to justify the current approach.

iii. Efficiency Arguments in Favour of Grant-back Clauses

The recent academic literature on grant-backs has largely focussed on finding efficiency justifications for such clauses. Van Dijk (2000) argues that grant-back clauses can be socially desirable precisely *because* they are likely to slow down the rate of innovation. This is rather uninteresting as a practical matter. It is of course true that, as a matter of economic theory, private incentives to innovate can either exceed or fall short of the corresponding social incentives. However, the absence of policies explicitly aimed at slowing down innovation strongly suggests that the policy makers' dominant opinion is that, as actually stipulated in Article 101, competition policy should try to encourage innovation and the diffusion of technological knowledge, not the contrary.

Choi (2002) proposes a more elaborate efficiency argument in favour of grant-back clauses. His point of departure is similar to the setting of Gallini and Wright (1990). The licensor and licensee do not operate in the same market. The licensor can license either its frontier technology or a lower quality technology. There is imperfect contracting in the sense that which of the two technologies is actually delivered is not verifiable. At the same time, the licensor faces the risk that the licensee might use the transferred technology to forge ahead in its own research and make the original technology obsolete. This is only possible if the licensee has access to the cutting-edge technology of the licensor. In the absence of a grant-back clause, the optimal contract includes variable royalty payments. This is the

⁴⁷ *United States v. Aluminium Company of America* ((S.D. N.Y. 1950) 91 F. Supp. 333 at 409, 411).

mechanism through which the licensor gets incentives to actually deliver the best technology: the better the technology delivered, the larger the licensee's sales and hence the larger the licensor's revenues. Those royalties of course involve a loss of allocative efficiency. Choi then shows that the inclusion of a grant-back clause helps ensure that the licensor still has the incentive to deliver the best technology but at a lower level of royalty. From a static point of view, then, the grant-back clause helps improve welfare. Overall, this positive effect of grant-back clauses must be weighed against their possible negative effect on innovation incentives.⁴⁸ Choi does not offer any result as to which effect is likely to dominate. Our main problem with this argument is that we find the underlying assumptions somewhat inconsistent. The basic issue to be solved is that the quality of the technology licensed by the licensor is not verifiable. Supposedly, the resulting inefficiency is limited if grant-back clauses can be used....but such clauses can only be effective if the parties can actually verify that the licensee does indeed license its own "best technology" to the licensor. Why should this be easier than the other way round?

As a result, we do not find any of the arguments presented above very convincing. Overall then, the main efficiency gain from grant-back clauses seems to be their possible ancillary character: grant-back clauses might facilitate technology transfer from the licensor to the licensee in the first place by reducing the threat that the licensee can use the technology to leapfrog the licensor's technology. Since the grant-back would allow the licensor to remain current with the licensee's advances, it will not need to fear that its own technology will become obsolete as a result of the licensing agreement. Hence, they can facilitate the development and diffusion of technology by enabling licensing agreements that otherwise would not take place. Such an agreement can also facilitate compatibility in industries where standards are important, to the extent that it allows the licensor to coordinate improvements by collecting and disseminating to all licensees any improvement that has been made to the technology. The problem with such efficiency arguments is that, in the absence of a practical approach for evaluating the strength of such effects, they can be used as a blanket excuse for grant-back clauses. In particular, it is always possible for a licensor to argue that, were it not for the presence of grant-back clauses, there would not have been any licensing agreement in the first place. We are not aware that the Commission has developed any practical approach to deal with this issue. It seems therefore important to investigate the economic foundations of this "but for" argument and try to understand under what conditions it should be given credence. We will now turn to this investigation.

⁴⁸ Although, as stated above, Choi (2002) also shows that this effect is not necessarily negative under certain assumptions.

iv. An Economic Analysis of the “but for...” Defence of Grant-back Clauses

The most common justification for the inclusion of grant-back clauses is that the licensor would otherwise fear that the licensee would use its intimate knowledge of the licensed technology to further its own innovation efforts. In other words, the fear is that licensing of the initial technology would lead to higher rates of related innovation by the licensee than in the absence of a licensing agreement

An important point of logic should be made at the outset. Showing that the inclusion of a grant-back clause makes an otherwise doomed licensing agreement possible is not sufficient to prove that the grant-back clause actually increases welfare. As we have seen above, in practice, grant-back clauses likely reduce innovation incentives. In a sense, then, they limit the intensity of future R&D competition. Such a decrease in the intensity of rivalry has a value for the firms but a cost to society. Grant-back clauses might therefore lead to licensing agreements with a main purpose to reap this “collusive” value and not to effect greater production efficiency or faster diffusion of knowledge. Assuming that “whatever makes licensing agreements easier to reach is socially desirable” would therefore be logically incorrect. This caveat should be kept in mind below as we examine more closely the “but for...” argument, which is a widespread and potent defence of grant-back clauses.

To assess this argument, we must first determine what the effect of innovation by a licensee on the licensor’s income is likely to be. In doing so, we must further distinguish between an *ex post* analysis, where we take the existing licensing contracts as given and an *ex ante* analysis, where we also determine how the prospect of future innovation by licensees might affect the terms – or even the existence – of the initial licensing contract. Since grant-back clauses likely decrease the incentives to innovate, the traditional argument in their favour can only hold if more innovation by the licensee(s) actually makes licensing less profitable for the licensor.

PART I: EX POST ANALYSIS

A. Single Licensee

We begin our discussion with the simple case where a licensor, L , licenses its technology to a single licensee I_1 . We assume that I_1 is the sole licensee and that the license is exclusive. In terms of sales, we will need to distinguish between situations where L and I_1 were potential or actual competitors before the licensing contract and situations where they were not. In the absence of pre-licensing competition between L and I_1 , EU law accepts territorial restrictions preventing L and I_1 from selling in each other's market. If the two firms were already (potential) competitors, then such reciprocal exclusion is limited in time. We will assume that territorial restrictions are part of the original licensing agreement whenever they are legal. M_1 is I_1 's market while M_L is the licensor's own market. Hence, schematically we have the following arrangement: L sells to its own market, M_L , and licenses to I_1 , which in turn sells to its own market, M_1 .

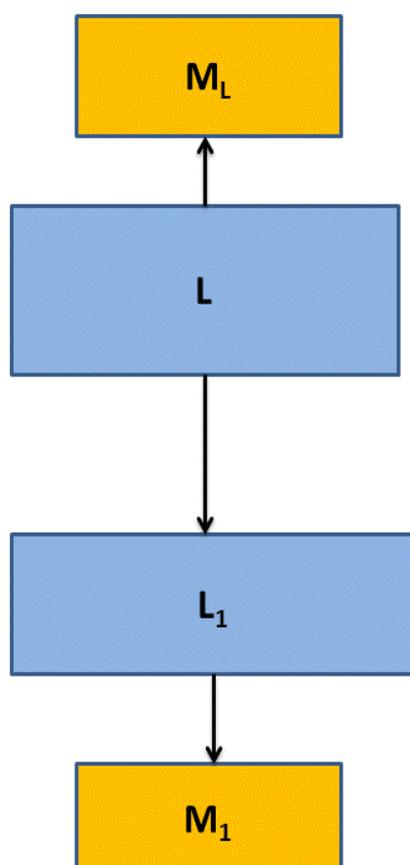


Figure 3: Licensing Framework with Single Licensee

1. *Non Competitors*

Suppose first that the licensee's innovation is non-severable, i.e. that it cannot be used without infringing the licensor's original IPR. Unless the original licensing agreement includes a specific restrictive clause, then I_1 should be able to use its innovation in its own market M_1 since it already is authorised to use the initial innovation in that market. If the original licensing contract includes any royalty payment that increases with output or sales, then the licensor's income increases as a result of the licensee's innovation. Because the licensee cannot use the original licensed technology in market M_L , the licensor suffers absolutely no harm in its own market. Overall then, *even in the absence of a grant-back*, the licensor unambiguously benefits from the licensee's innovation. Hence, the possibility of innovation induced by licensing should not limit the parties' ability to reach an agreement that helps them to exploit other efficiencies, such as productive efficiencies. On the contrary, the possibility of greater innovation without a grant-back clause should facilitate the emergence of an efficiency-enhancing agreement.

Assume now that the licensee's research generates a *severable* innovation. As severable innovations have been defined as those that do not infringe the initial IPR, the "severable" headline can in principle cover two rather different situations. In the first situation, the severable innovation is an *add-on* to the product that is made under license. For example, the initial license may involve IPRs relating to a mobile phone and the new severable innovation might involve additional equipment or an application that can be used with the phone. Such a situation should not create any concern for the original licensee: the appearance of the add-on simply add value to the product that is made and sold under the initial license. As such it should increase the original licensor's revenues *ex post*. Furthermore, the prospect of being able to commercialise such add-ons unhampered by a grant-back clause should make the licensor willing to pay more for the initial license. In the second situation, the licensee's severable innovation improves on the original licensed technology and is a (*perfect*) *substitute* for this technology. In such a context, the licensor seem to have a legitimate concern that licensing will simply make its own technology obsolete. We concentrate on this case since it is the scenario that is most favourable to an efficient-defence of grant-back clauses.

Without a grant-back, the licensee would be free to use this innovation in whichever way it wants. If this innovation represents an improvement on the technology originally obtained from L , then I_1 would switch to its own technology and stop paying output or sales-related royalties to L . Moreover, I_1 would also be free to sell its product in the licensor's own territory

since its output should no longer fall within the scope of the original licensing agreement and its territorial restrictions. In that case the licensor is definitely hurt by the licensee's innovation. Hence, if the licensing agreement does indeed increase the likelihood that the licensee will come up with a severable innovation, then this possibility might prevent the parties from reaching an agreement that would otherwise enhance static efficiency.

2. Competitors

The analysis of a severable innovation is the same as in the case of non-competitors. For a non-severable innovation, the only difference is that competition law might be somewhat less tolerant of the protection of the licensor's and licensee's respective territories. This means that in principle the licensee might eventually be able to use its improved technology to compete against the licensor in market M_L . If output or sales related royalties apply to the total sales of the licensees that rely on the initial technology, then the licensor's revenue from market M_1 increases. In market M_L , the licensor gains royalty revenues but loses some of its own market share and the corresponding profit margin on its own sales. Overall then, the licensor might now conceivably be made worse off overall by the licensee's innovation if the original royalty rate is lower than the licensor's own profit margin in market M_L .

Summary: *If there is a single licensor-licensee relationship between non-competitors then non-severable innovation by the licensee cannot hurt the licensor and cannot therefore be the basis of an efficiency argument in favour of grant-backs. If the licensor and licensee are potential competitors, non-severable innovation could hurt the licensor but this is easily remedied by setting a royalty based on the licensee's total sales. Hence, again, there seems to be little justification for grant-back clauses. On the other hand, severable innovation by the licensee does hurt the licensor. Hence, the fear that the licensing contract might facilitate the emergence of severable innovations might justify the inclusion of a grant-back clause. In other words, the "but for..." argument has a stronger basis where severable innovation is the concern.*

It is interesting to note that our conclusions so far are rather at odds with the current practice, where grant-back clauses that apply to severable innovations are treated more harshly than grant-back clauses that extend to non-severable innovations. Does this basic conclusion survive the introduction of multiple licensees?

B. Multiple Licensees

Let us now turn to the more complex situation where the licensor has multiple licensees. We will base our discussion on the stylised situation represented in figure 2. A licensor L licenses its technology to N licensees, labelled I_1 to I_N . Each of these firms is the sole and exclusive licensee in a territory determined in the initial licensing contract.

1. Non Competitors

Let us assume that the licensees and L were not potential competitors before licensing occurs. This means that, following the current EU guidelines, the sole and exclusive character of the licensing agreements is not problematic and is not subject to any time limit. We focus our attention on the contract between L and I_1 . Suppose that the licensor and licensee have reached a licensing agreement with no grant-back clause. The agreement involves some royalty payment from the licensee to the licensor and this payment includes an output or sales-related component. Let us then assume that I_1 comes up with an innovation which improves on the licensed invention. Let us further assume that this innovation is *non-severable*, i.e. that it cannot be used without infringing the original licensed IPR. What would happen?

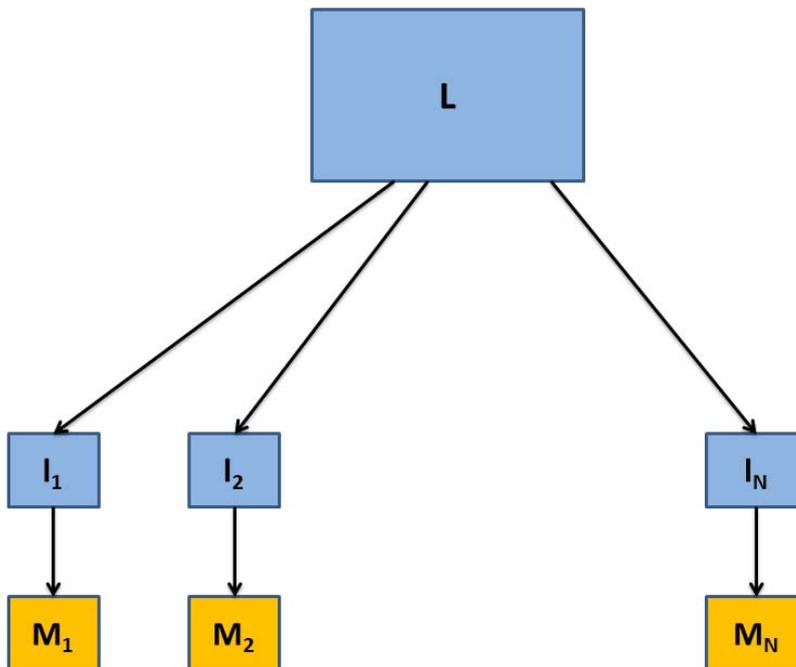


Figure 4: Licensing Framework with Multiple Licensees

a. *Non-Severable Improvements*

Since I_1 is a licensee of L it could in principle use both the initial technology and its own improvement without further approval from L . For the same reason, all other licensees, I_2 to I_N , could also use the new improvement without infringing on L 's original right. On the other hand, other third parties could not use I_1 's technology, even if it were licensed to them, without also getting a license from the original licensor L . What I_1 would optimally choose to do depends on its efficiency in serving other markets compared to the efficiency of the licensor or of the other licensee that already operates in the market.

Since the licensor presumably chose the most efficient possible set of licensees, it seems natural to assume that each licensee has some cost advantage in serving its local market. Let us first take this assumption to the extreme and suppose that I_1 would be unable to serve the other markets itself. It would then license its improvement to all other licensees as well as to L , if L also operates in some reserved market M_L . In bargaining with each of these potential licensees, I_1 would appropriate a portion of the extra value that it has created. Notice that, under this scenario, the original licensor L not only gets improved profits from its own direct exploitation of the technologies but, as the further improvement should increase sales in all territories, it also collects extra-revenues through the royalties specified in the initial licensing agreements. Notice as well that licensees I_2 through I_N are strictly better off after I_1 innovates and licenses to them. Indeed, as we will discuss later in this note, the prospect of this extra surplus would make these licensees more eager to sign the initial licensing contract, and that in turn means that L should be able to extract better terms for these initial contracts than if there was no prospect for future innovation by I_1 .

Let us now turn to the case where I_1 could profitably operate in other licensees' markets. Indeed, let us consider the extreme assumption where it can do so at no cost disadvantage whatsoever. In this situation, then, I_1 would decide to exploit its innovation itself if it is legally feasible. Under current guidelines, I_1 would not be allowed to sell into the licensor's own market but would be allowed to sell in the territories of other licensees, provided that enough time has elapsed since the start of the licensing agreement. In such a case, it would seem that other licensees would always suffer significant losses and might even be driven out of business. However, such a conclusion would be incorrect. Under our assumption that licensees are able to make both passive and active sales in each other's territories after some period of time has elapsed, the profit that each licensee would be able to extract in its own market after this critical period of time is itself solely determined by the cost advantage of each local licensee. In other words, after the period of time during which active/passive

sales across territories can legally be banned, the profits of each licensee would go down fairly dramatically anyway. Indeed, in the case where there is no cost advantage to the local licensee, and assuming price competition, profits would be driven to zero anyway, so innovation by another licensee cannot in fact make other licensees worse off.

To see whether this “no harm” result generalises to less extreme cases, we must present a more formal analysis. Assume that each local licensee has a cost advantage of c and that innovation by I_1 increases the quality of the product by a . Market demand in each market is completely inelastic: there is a mass one of consumers willing to pay up to V for the original product and $V + a$ for the improved product. Finally there is no product differentiation and competition is in prices. If I_1 does not innovate, then each licensee’s profit is equal to V during the period of time where licensees cannot sell into each other’s territories and is equal to c after the territorial restrictions are no longer valid. Now assume that I_1 has innovated and that territorial restrictions can no longer be applied. Suppose that there is only one other licensee, I_2 . There are no barriers to trade between the two markets, so prices must be identical for identical products and the prices of products of different quality should exactly reflect the quality difference. If I_1 decides not to license I_2 then it makes a profit of $c + a$ in its own market and a profit of $a - c$ (or 0 if $a < c$) in I_2 ’s market. If on the other hand I_1 decides to license I_2 (and assuming that there cannot be any territorial restrictions this licensing agreement), then the royalty rate r in the licensing agreement will be determined through bargaining. The solution to this model can be found in appendix I. The main conclusion is that other licensees (such as I_2) only make positive sales in equilibrium if $a < c$ and that, even in this case, I_2 makes lower profits than before after I_1 innovates. This conclusion would change if we assumed that the licensing agreement between I_1 and I_2 can itself guarantee that I_1 and I_2 cannot operate in each other’s market. In such a case, licensee I_2 can actually be better off due to innovation by I_1 .

Whether or not the licensor is hurt would depend on the terms of the licensing contract. If royalties are owed on all sales that use (i.e. infringe) the initial technology, then the licensor’s total royalty income will go up since the product sold in each market is now superior to the one based on the old technology. If on the other hand I_1 only owes royalties on sales in its own territory, then the licensor’s income could go down quite significantly. Our understanding is that the first type of agreement is standard. Moreover, even if it is not standard, contracts could certainly be written in such a manner to protect the licensor against the *ex post* effects of licensee innovation without resorting to grant-backs. This then means that, while other licensees are hurt by I_1 ’s innovation, the licensor is not. This is true *ex post*, i.e. given the existing licensing agreements.

On the other hand, the prospect of expropriation by another innovative licensee might decrease the licensees' willingness to pay for the original technology in the first place, an issue to which we will soon return.

b. Severable Improvements

The main difference is that now the innovating licensee, I_1 is not limited in terms of the firms that it can license to since a previous licensing agreement with L is no longer required to use I_1 's technology. The relevant issue now is not whether or not I_1 could serve the other licensee's territories itself but rather how efficient other firms might be in serving the other licensees' territories with respect to the existing licensees. It is clearly in I_1 's interest to license its own technology to the most efficient firm in each market. If this is an old licensee, I_i , then that licensee retains some positive profits which can in principle be higher or lower than the profits that it obtained before the new innovation. Otherwise, an old licensee's profits are curtailed by the introduction of a rival with a superior technology. Interestingly, the licensor is in fact better off if the old licensees are not chosen as recipients of the new technology. If they are, they simply abandon the old technology in favour of the new one and no longer owe any royalties to L . If they are not, they keep using L 's technology and pay royalties albeit on a reduce level of sales. In either case, the original licensor L is unambiguously worse off after I_1 obtains its severable improvement.

2. Competitors

If L and I_1 were potential competitors before the initial licensing agreement was reached, then, under current practice, I_1 might be allowed to eventually make sales in the licensor's on market. Except for this additional effect in market M_L , the analysis is exactly the same as in the case of non-competitors.

Summary: *Whether or not the licensor and licensees are potential competitors, the licensing contract can be written to ensure that the licensor is not hurt ex post by the prospect of non-severable innovation by one of its licensees. For non-severable innovations, whether other licensees are hurt by the innovation or benefit from it depends on the size of the licensee's innovation as well as on the territorial restrictions that can legally be written into the new licensing contract between the innovating licensee and other licensees.*

The licensor may be hurt by the prospect of severable innovation. Other licensees are more likely to be hurt by severable innovation than by non-severable innovation. Hence, the “but for...” argument is stronger where severable innovation is the concern.

Overall, then, irrespective of the number of licensees, the licensor cannot be hurt *ex post* by non-severable innovation but is hurt by severable innovation. While this conclusion seems to question the current leniency toward grant-backs of non-severable innovations it also suggests that the “but for” argument in defence of grant-back might be strong when it comes to severable innovations. Should we then recommend a regime under which grant-backs of severable innovation are looked at quite favourably? We would answer this question negatively for two main reasons. The first one is practical. It is crucial that the range of innovations to which grant-back clauses apply be defined quite precisely and narrowly. Let us remember that there is no possible justification for grant-back clauses that would cover innovations that have not been in any way “triggered” by the licensing agreement (see part III below). The problem is that defining such innovations in practice seems hard. The distinction between severable and non-severable innovations is at least one manner to enforce some distinction between smaller innovations that seem more likely to arise from the use of the technology and larger ones (i.e. patentable ones) that seem more likely to originate from the licensee’s own R&D efforts. The second reason is that the patent system does already take into account the fact that today’s technologies are likely to be supplanted by future generations and that the very knowledge imparted by a patent might help others to obtain their own patents that might make the original invention obsolete. In economic terms, the patent system deals with this issue through the concept of “leading breadth”⁴⁹. This leading breadth is determined to balance the benefits of providing a reward to today’s innovator with the benefits of providing incentives for rapid improvements of today’s technology. It is hard to see why one should assume that this trade-off has not been struck more or less correctly by IP law. There are therefore no reasons to modify *ex post* by the inclusion of grant-back clauses in licensing contracts.

PART II: EX ANTE ANALYSIS

The previous analysis took the terms of the licensing contracts as given. However, the possibility of including a grant-back clause might also affect the other terms of the contract. We consider two issues. The first one is whether the licensor is better off *ex ante* if a grant-back clause is introduced into the licensing agreements. For example, we have seen that,

⁴⁹ See Scotchmer (2005), Regibeau and Rockett (2007).

with non-severable improvements the licensor could be better off even though it non-innovating licensees might be worse off. This means that *ex ante* the licensees might not be willing to accept to pay as high a level of royalties without a grant-back clause, which might make the licensor worse off overall. In a sense then, a grant-back clause could conceivably help the licensor credibly protect its licensees against future expropriation. So the first issue concerns the level of royalties that the licensor would be able to extract from its licensees and hence the *ex ante* profitability of the license agreement for the licensor. The second issue relates to the *structure* of royalty payments. Would the availability of a grant-back clause modify the relative weight of fixed and output related royalties in the licensing contracts? Since output-related royalties lead to higher downstream prices and hence lower consumer surplus, there might be an efficiency argument for grant-back clauses if their exclusion also raises the output related component of royalty payments.

The following two tables summarise the results from the formal analysis conducted in the appendix. The first table assumes that a given firm can only profitably serve its home market. This means both that licensing is very valuable and that an innovating licensee cannot use its own innovation to compete with the original licensors or other licensees in their respective home market. The second table considers the case where the costs of serving a foreign market is low enough that the licensor and all of its licensees are (ex post) potential competitors in all markets. Please note that a “No” in the last column of each table means that grant-back clauses do not lead to lower royalties *for all parties*. In some cases, a grant-back clause does lead to lower royalties for the licensor but to higher royalties for its licensees. A “No” therefore means that there is no clearly identifiable welfare increasing effect of grant-back clauses on the level of royalty payments.

Effect of Grant-Back Clause: Prohibitive Cost of Serving Foreign Markets

	More Licensing?	Lower Royalties
1 licensee non-severable	No	Yes
1 licensee severable	No	No
2 licensees non-severable	No	Yes
2 licensees severable	Yes for very valuable innovation	No

Effect of Grant-Back Clause: Foreign Markets Can Be Served Profitably

	More Licensing?	Lower Royalties
1 licensee non-severable	No	Yes
1 licensee severable	Yes	No
2 licensees non-severable	No	No
2 licensees severable	Yes	No

Table 1: Grant-Back Clause Model – Summary of Findings

A. Ex Ante Profitability of the Licensing Agreement for the Licensor

The effect of grant back clauses on the licensor’s incentives to license its original technology is shown in the middle column of each of the two tables. The contrast is, once again, stark between the case of non-severable improvements, where grant-backs do not lead to more licensing and the case of severable improvements, where grant-backs usually do lead to a greater occurrence of licensing. This raises further doubts as to the wisdom of a policy that looks at grant-back clauses more leniently when it involves non-severable improvements.

B. The Structure of Royalty Payments

We saw above that Choi (2002) presented an efficiency defence of grant-back clauses that relies on the structure of licensing fees. In a nutshell, sales-related royalties were needed in order to limit the adverse consequences of a moral hazard problem between licensor and licensee. Further, because it partially alleviates the moral hazard problem, a grant-back clause made it possible to reduce the sales-related component of royalty payments thereby leading to lower prices in the corresponding downstream product markets. As we discussed above, we do not feel that Choi’s specific argument is convincing enough to serve as a reliable guide to policy-making. On the other hand, we cannot reject out of hand the idea that grant-back clauses might make it possible to reduce the level of output-related royalties. Indeed, the *TT Guidelines* do consider that besides the “but for” defence, a licensing clause might be justified if it allows for lower levels of price-increasing payments. However, given the existing economic literature, it seems hard to identify a sufficiently robust mechanism to support such an argument in favour of grant-backs. However, this conclusion does receive some support from our own modelling efforts. As shown in the last column of the two tables presented above, grant-back clauses sometimes lower equilibrium royalties when the licensee’s innovation is non-severable. Still, the effect of grant-back clauses on the effective

level of royalties paid by the various actors is overall rather ambiguous. We would therefore suggest that this line of defence remain open and be considered on a case by case basis. On the other hand, we do not feel that such a claim is strong enough to justify any *presumption* that grant-back clauses are associated with lower output-related royalties.

PART III: DOES LICENSING INCREASE THE LIKELIHOOD OF LICENSEE INNOVATION?

All of our discussion so far has taken as given the claim that the ability to actually use the license technology significantly increases the likelihood that a firm will come up with a related innovation. One should of course ask whether this is so as well as whether this *should be so*.

We are not aware of any rigorous study showing that licensees systematically come up with more innovations related to the licensed technology than non-licensees with similar characteristics. When assessing the possible link between utilisation of the licensed technology and further innovation, it is worth remembering that intellectual property law requires that, in exchange for obtaining a patent, the innovation be described with sufficient clarity to be reproducible by “one versed in the arts”. In principle, then, the relevant information for the pursuit of further innovation should already be available to all. We understand that, in practice, this requirement is not always fully met but it would seem strange to allow in licensing agreements any clause that is justified by a presumption that disclosure is actually full and complete in the first place.

There are of course different types of knowledge than can trigger further innovation. The knowledge transmitted through patent documents does not relate to the details that are often important to get a given invention to actually “work on the ground”. In fact, as many patents are filed when the innovation is only at the prototype stage the full implementation often has not been worked out at the time the patent disclosure is written. Indeed, numerous patents would prove to be fairly useless or at least uneconomical if they were actually put into high level production practice. One might therefore believe that the information found in patent documents is more likely to lead to further innovation that is somewhat more drastic than the innovations that would come from the day to day use of the new technology.

If this is true then the inclusion of a grant-back clause would be more justified for non-severable innovation, the rate of which would indeed increase significantly because of

licensing, than for severable innovation which might be more likely to rely on information that should be available via the patent disclosure.

Another indication of whether the licensing agreement is itself instrumental in promoting further innovation might come from the distinction between competitors and non-competitors. However the distinction is significant if it refers to potential overlap in product markets, regardless of their geographical boundaries. The reasoning is that, if firms already operated in similar fields before the licensing agreement, they are also likely to have had their own capacity to pursue research in the area of the licensed technology. One might then surmise that the marginal contribution that access to the licensed technology makes to the likelihood of further innovation by the licensee might be smaller than if the licensee initially had little expertise of its own. If this conjecture is correct, then it would suggest a more tolerant attitude towards grant-back clauses in agreements between non-competitors, albeit for a rather different reason than those that motivate the current legal practice. Moreover, the concept of (potential) competitors would be best defined in terms of technology markets or, at the very least, in terms of product markets, regardless of geographic boundaries.

A further aspect of IP law that has some bearing on the link between licensing and further innovation is the so called *experimental exemption*. Although patent documents are supposed to convey the knowledge required to understand and reproduce the new innovation a patent still gives its owner the right to exclude the others from *use*. This right does not extend to the use of the underlying *idea/knowledge* but it does in principle include the use of the technology itself as part of another firm's research process. In that sense, by allowing the licensee to actually use the technology the licensing agreement might trigger further innovation of both the severable and the non-severable types. However, the IP laws of several countries establish an *experimental exemption* that allows other firms to actually use the patented technology for research purposes. Where such an exemption exists, the case in favour of grant-back clauses is correspondingly weaker.

Overall, then, the very link between licensing and further innovation, which is crucial to the usual justification for grant-back clauses, is rather less evident than one might think. It seems particularly weak when firms are rivals in technology markets before the licensing agreement, when the innovations covered by the clause are severable, and in jurisdictions that allow for an experimental exemption. The table below summarises our arguments on grant-backs so far:

	Non-Severable	Severable
Grant-back decreases Licensee’s Incentives to Innovate?	Yes	Yes
Licensee’s innovation sparked by licensing agreement?	More Likely	Less likely
Licensee innovation hurts licensor’s ex post profits?	No	Maybe
Grant-back required for efficient licensing to take place?	No	Maybe
Grant-back leads to lower marginal costs (inclusive of royalties)?	Ambiguous	Ambiguous

Table 2: Summary of Grant-Back Arguments

Other things equal, grant-back clauses hurt the licensee’s incentives to innovate. The main efficiency defence is the “but for” defence. This takes two forms: either the licensing would simply not occur without grant-back or it would lead to higher output-related royalties. For this efficiency argument to have any weight it must first be true that licensee innovation is actually triggered by the licensing agreement. Given the IP rules on revelation of information in patent documents and the possible existence of “experimental exemptions), we concluded that this link was a priori more likely for non-severable innovations than for severable innovations. On the other hand, non-severable innovation could never decrease the licensor’s ex post profits, while severable innovation could. In a similar vein, a grant-back clause would not increase the likelihood that the original technology is licensed if the subsequent innovations are non-severable but it could under the threat of severable innovation. Finally, the effect of grant-back clauses on the level of royalties borne by the different players was shown to be ambiguous.

v. Consistency

As grant-back clauses affect innovation, it is necessary to ensure that their antitrust treatment is compatible with the treatment of other innovation-related arrangements. Most prominent among these are *research joint ventures* (RJV), whereby two parties pool some of their research assets in order to pursue innovations that will in principle be available to each of them.

RJV agreements have been reviewed recently as part of the new *Horizontal Guidelines*. The main point of the guidelines is that, other things equal, RJVs are actually likely to *decrease* the rate of innovation in a given industry, just like grant-back clauses. Therefore, RJVs involving undertakings of significant size are only tolerated if they involve significant complementarities, be it at the level of scientific expertise or at the level of financing ability. While a grant-back clause tends to decrease innovation it does not by itself trigger *any* complementarity between the parties involved. A lenient view of grant-back clauses would therefore seem to contradict the economic reasoning that underlies the Commission's current view of RJVs.

One could argue that there is actually a further similarity between RJVs and grant-back clauses. While grant-backs do not themselves involve any direct complementarities between licensor and licensees, the licensing agreement to which the grant-back clause applies does involve indirect complementarities precisely because, as we have discussed above, the licensing agreement itself might facilitate further innovation. As a result, if one believes that the link between licensing and further innovation is strong and that further innovation hurts the licensor, then a grant-back clause might be required in order to take advantage of the innovation complementarities stemming from the licensing agreement. In other words, if the "but for..." argument holds, so that licensing increases the propensity for the licensee to innovate *and* the relevant counterfactual is no licensing at all, then a licensing agreement with a grant-back clause might be justified by its positive effect on the overall innovation rate.

vi. Economic Analysis: Grant-backs and Exclusion

To focus on possible exclusionary effects of grant-back clauses, we now abstract completely from any innovation-related consideration. In other words, we take the level of innovative activity of both the licensor and its licensees as given and ask how the presence of grant-back clauses is likely to affect who gets access to the product of this innovative activity and on what terms.

Some of our previous discussion remains useful. In particular, the discussion of how a licensee would decide to use its own innovation in the absence of grant-back clauses is still the correct counterfactual. Hence we know that, for a non-severable innovation, the innovative licensee would be limited to using its technology itself and licensing it to other parties that already have access to the original technology, namely the original licensor and its set of licensees. On the other hand, severable innovations could be licensed freely to maximise the profits of the innovative licensee.

Let us now assume that the original licensing contract contains a grant-back clause. The precise nature of this clause matters. It might require that the licensee actually assign the property right on the new innovation to the original licensor or simply that the licensor be able to use the technology. If the rights to the innovation are assigned to the licensor then it is the licensor who determines how the new technology gets used and/or licensed. If there is no assignment, the grant-back clause can still specify whether the licensor gets the right to sublicense the new technology and whether or not this right is exclusive (i.e. whether or not it is shared with the innovative licensee).

Let us first focus on who gets to control the further licensing of the new technology and let us assume that this technology is non-severable. This means that, absent grant-back, we would expect the technology to be made available to all existing licensees. On economic grounds, we would not expect a different outcome if licensing decisions were in the hands of the original licensor. The new technology creates the opportunity to obtain more surplus in each of the markets, and rational parties should find an agreement that allows them to share this surplus. In particular, we would expect the original licensor to make the new technology available (for a price) to its existing licensees⁵⁰. In fact one might even argue that the number of firms given access to the technology might be greater in this case since the original licensor can license both the new technology and the original technology without which the new technology cannot legally be used. Of course, the innovative licensee could also conceivably license its technology outside of the set of original licensees but that would require a separate agreement between the new licensee and the original licensor. Following the logic explained in the section on patent thickets, such an arrangement is likely to be harder to strike – and likely to involve higher total royalties.

In a similar vein, the fact that the original licensor would also be expected to license the improvement to its original licensees does not mean that these licensees would get the technology on the same terms as if it were licensed directly by the innovative licensee. Assume that at least part of any licensing payment takes the form of an output or sales related royalty. When licensing the improvement, the original licensor realises that even a royalty-free license would increase its revenues: the new technology will increase sales and hence will increase its revenues under the original licensing contract. On the other hand, the innovative licensee could not expect any such indirect reward if it licenses the improvement itself. This means that the royalty rate charged by the licensor to its initial licensees for the improvement would be lower than the rate charged by the innovative licensee.

⁵⁰ Interestingly, there are examples in case law where the Court felt it necessary to specify that a failure to license the new technology back to the existing set of licensees might constitute abusive behaviour on the part of the original licensor.

In our opinion, this type of argument – which, to our knowledge has not been articulated clearly before – is the only substantial defence for the inclusion of grant-back clauses that apply to non-severable innovation. Notice that, at its core, this argument is again a version of the “Cournot-complement” issue first discussed in the section on patent thickets.

Let us now consider the situation where the grant-back clause applies to severable innovations. Since the use of the technology does not require the use of the original technology the innovative licensee could license the technology to whichever firm it pleases, including possibly the set of original licensees. There is therefore no longer any difference between the set of potential licensees available to the innovative licensee and those that would be available to the original licensor. The only relevant question then is whether there is a reason for the profit-maximising licensing policy to differ depending on which of the two firms controls the new rights. The answer is positive and harks back to a very traditional argument in the theory of industrial organisation.⁵¹ By licensing the new technology, the original licensor essentially can make its own original technology – and the revenues that it generates – obsolete. In other words, the sale of the new technology “cannibalises” the revenues from the original technology. If the innovative licensee was in charge of licensing its own innovation, it would face no such loss. It is therefore reasonable to expect that the extent of licensing would be less (and the licensing conditions worse) if the licensor was in charge. This argues against tolerating grant-back clauses that apply to severable innovations.

The difference between grant-back clauses that assign the new IP rights to the licensor (“assignment back”) and those that simply let the licensor control further licensing (“license back”) is mostly one of timing. Assigning is forever, licensing is not. If the rights were actually assigned to the licensor, the licensor would keep controlling the rights even after the expiry of its own patent and/or the expiry of the current licensing agreements. On the other hand, a license back could – and likely should – be made for a period of time that is no longer than the period of validity of the initial patent or initial licensing agreement.

g. A Remark on Open Source

Open source agreements involve the pooling of intellectual property with the goal of developing and promoting a technology that is available to all, often on a royalty-free basis. Grant-back clauses are also a typical part of the contractual arrangements that govern many open source ventures. The patent pool aspect of open source programmes does not seem

⁵¹ See for example Gilbert and Newbery (1982).

to be especially troubling. Firstly, and most importantly, open sources projects that are open to all and make their final product available to all without payment should not be a concern since the main issues with patent pools are exclusion and excessive levels of royalties. What if the open source association actually charges a royalty for access? Although such pools are likely to include IPRs that are substitutes as well as IPRs that are complements, the parties typically retain the right to use and license their own IP outside of the open source project. Since firms and individuals are free to participate in the project, one would think that the basic result of Lerner and Tirole applies: pools that actually form are likely to be welfare improving. The only caveat is that, in the case of an open project, pools form sequentially, with continuous addition of new IP. Since this case was not analysed formally by Lerner and Tirole, one cannot be absolutely sure that their main conclusion would still apply.

Participants in open source projects often must promise to return the ownership of their further development efforts to the project itself. The declared purpose of such clauses is to prevent the open source product from being hijacked by parties who would use the shared output and who “appropriate” it by tying it to their own proprietary improvements. A related concern is that, in the absence of grant-back, the open source project can “fork”, i.e. yield different incompatible versions of its product, essentially defeating the initial purpose of openness. Do such clauses deserve antitrust scrutiny? Clearly, such clauses do decrease the incentives to innovate of individual participants but this occurs within an organisation whose very purpose is to encourage sharing and compatibility. Such goals are hard to pursue without a cost in terms of innovation incentives. On the other hand, if the open source organisation is open to all and licenses its research output for free, no possible exclusion concern can arise.

Overall then, we feel that antitrust authorities can be tolerant of the typical open source agreement without being inconsistent with the principles discussed above for the assessment of both patent pools and grant-back agreements.

h. Pass-through

Pass through refers to situations where the licensing of a technology to a manufacturer also guarantees that clients who use the corresponding output of the manufacturer as part of their own product are protected from infringement claims by the licensor of the upstream technology. This is illustrated on the following figure:

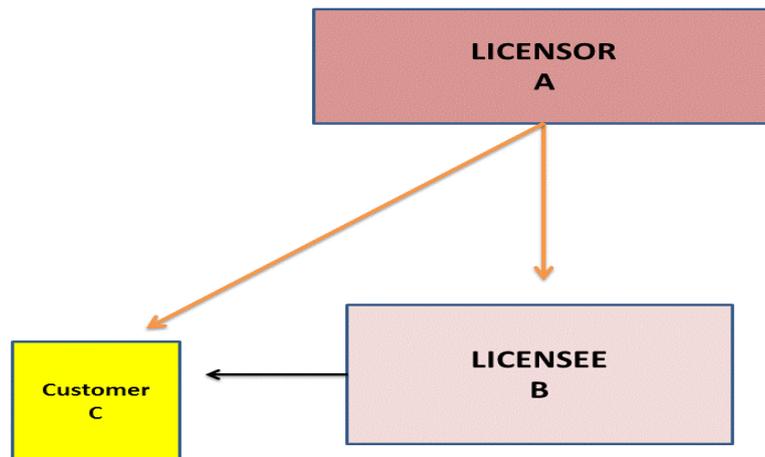


Figure 5: Licensing and No Pass-Through Protection for Customer

The licensee needs access to the IP of the licensor to produce a good that is itself an input into the product of its customer. As an example, we may think of the licensee as selling a microchip that the customer then uses in building its own electronic device – say a 3G mobile phone. In this example, the licensee has obtained access to some of the licensor’s IP relating to an aspect of the design or programming of its chip. Crucially, the licensor claims that its IP applies both to the product of the licensee and to the product of its customer. In the absence of pass-through, a licensing agreement between licensor and licensee would allegedly not protect the customer against claims for royalties from the upstream licensor. The figure below represents a situation where the agreement between licensor and licensee does include a pass-through clause. In this case, the very fact that the customer purchases from a licensee who benefits from such a clause means that the licensor can no longer enforce a separate claim for royalties against the licensee’s customer.

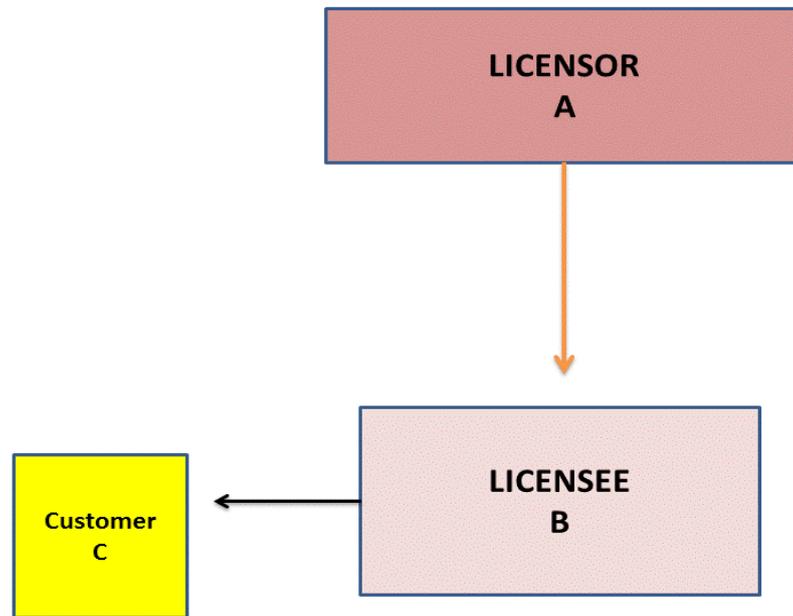


Figure 6: Licensing and Pass-Through Protection for Customer

Pass-through rights are fairly strange creatures from the point of view of IP rights and there seems to be a lot of confusion currently as to their status, both among IP lawyers and – especially – in industries (like electronics) where such clauses are becoming more widespread. Unfortunately, our understanding is that the validity of pass-through clauses has not been challenged in IP Courts. The reason for this seems clear: if there is a pass-through clause, then neither the licensee nor its customer has any reason to complain. Hence the validity of existing clauses is unlikely to be challenged from a pure IP perspective. What has been challenged is the need for such explicit clauses. Customers being sued by the licensor because they bought a product (the “chip”) from a supplier who had a license from the IP holder but a license that did not contain an explicit pass-through clause have argued that no such clause was needed under the traditional doctrine of the first-sale exhaustion of IP rights⁵². We understand that, in the UK at least, the few such decisions that exist have gone against the upstream licensor.

The doctrine of exhaustion lies at the core of the pass-through issue. In a nutshell, this doctrine says that if firm *A* licenses its technology to firm *B* to make ball bearings and firm *B*

⁵² See Layne-Farrar et al. (2010) for an economic analysis of first sale exhaustion of rights.

sells its ball bearings to a firm *C* that makes machine tools, *B* owes royalties to *A* but *C* does not. If this doctrine applies broadly under national IP laws, then pass-through clauses would seem to be at most redundant and could not be the source of any substantial concern under competition law. However, the relevant IP law (which of course varies across national jurisdictions) is not straightforward, for two reasons. Firstly, regardless of the doctrine of exhaustion, which applies as a default, licensing contracts between *A* and *B* can be written so as to exclude explicitly the licensee's ability to sublicense *A*'s IP to its own customers. Where licensors have such a freedom, then whether firm *C* might be liable to pay royalties to *A* is a result of the type of agreement reached between *A* and *B*. Secondly, IP rights are not monolithic. Most patents contain a number of claims relating to the same invention. For example, a given patent might include one claim on an aspect of chip design and a second about the inclusion of a chip with this design in a specific type of electronic device. If both types of claims have been granted then, effectively, the same patent "reads" both on the chip that *B* makes and on the device in which *C* incorporates this chip. In such a case, the doctrine of exhaustion would not necessarily apply.

There are therefore good reasons to believe that pass-through clauses are likely to have real effects in the market. Firstly, the very ambiguity that surrounds their status creates significant uncertainty for firms like *C*: if they buy their chip from a firm that does not have an explicit pass-through clause in their original licensing contract with *A*, might *A* eventually claim royalties against them? This concern implies that, other things equal, *C* would prefer to purchase a chip from a firm that has an explicit pass-through clause in its license with *A*.⁵³ This also means that *A*'s decision to grant pass-through to some licensees but not others is liable to distort competition in the relevant downstream markets. Secondly, in the "multi-claims" scenario discussed above, Firm *A* does have a legitimate claim over both *B* and *C*. A pass-through is then a particular manner of enforcing those claims jointly rather than individually. It therefore amounts to a form of "bundling" that might also have anti-competitive effects, as we discuss below.

Still, given the absence of competition law case history and the uncertainty that still surrounds pass-through clauses as a matter of IP law, it would be overly ambitious for us to suggest any precise guidelines about the possible antitrust aspects of such clauses. This is clearly an issue on which DG Comp will have to wait until a number of cases have been assessed before seriously considering the lessons that can be drawn from this case experience and economic analysis. The goal of the rest of this section is therefore much

⁵³ Related to this, typing "pass-through license" in a search engine yields a number of enquiries and declarations as to whether specific licenses do or do not include a pass-through clause. The volume of such enquiries suggests the breadth of this concern.

more modest: we only want to point out a number of angles from which competition law cases relating to pass-through seem worth investigating before we can really decide how much antitrust attention this issue actually warrants.

A. Discrimination

The figure below considers a situation where B_1 gets a license with a pass-through clause while the license between A and B_2 does not include such a clause. We further assume that, in the absence of such a clause, it is the industry's belief that C is also liable to pay royalties to A . Royalties paid by each party are indicated as r_i in the figure.

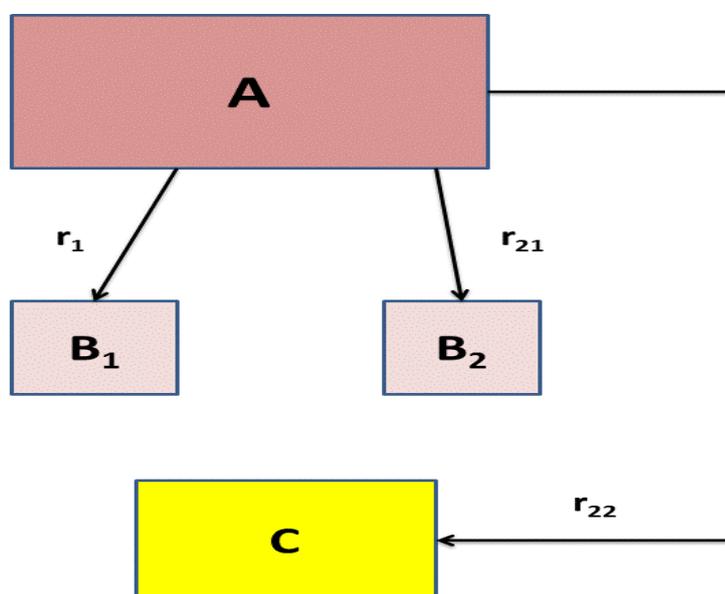


Figure 7: Discrimination in Inclusion of Pass-Through Clauses

In the situation described above, B_2 is effectively placed at a disadvantage with respect to B_1 as long as $r_{21} + r_{22} > r_1$, i.e. if the sum of the (unit) royalties paid by B_2 and C under the no pass-through regime is higher than the single royalty paid by B_1 under the pass-through regime. There is little that can be said in general about this relationship as one would expect a license without pass-through to be less costly than one that includes the clause (i.e. $r_1 > r_{21}$). Still, an interesting special case arises in the situation where $r_1 = r_{21} = 0$. This is actually a frequent situation in several industries. In such a case, firms (A and B) are involved in rather broad reciprocal IP agreements where IP is traded for IP, and where no or rather small royalties are applied to the whole IP portfolios involved in the exchange. Whether one wants to describe this situation as one of price discrimination is unclear since B_1 might well have had to “pay” more to A in terms of IP exchanged than B_2 . Nonetheless, B_2 finds itself at

a competitive disadvantage *ex post* with respect to B_1 when selling to C . Whether such a disadvantage would be a source of concern for competition authorities is something that would, at this stage, need to be assessed on a case-by-case basis.

B. Bundling

Let us now refer to the “multiple claims” scenario evoked above, where A 's IP reads on both B and C 's products. In such a context, it would seem natural for A to offer a license covering the potentially infringed claims to both B and C . In this view, then, a pass-through license to B amounts to bundling two normally separate contracts. While, as usual, such bundling might be a source of efficiencies (see below), it might also be a source for concern. Consider, for example, a situation where C much prefers to include (or even needs) B 's chip in its electronic device. On the other hand, it has a choice of design between an approach that might infringe the claims that A has effectively bundled into its pass-through license to B and another approach for which it would need a license from some other firm, D . Without even looking into possible dynamic theories of foreclosure, it seems that one could argue that the pass-through license has an exclusionary effect on D , as explained in Whinston (1990). Whether this is true and whether other, maybe dynamic, theories of harm may prove justified would have to be considered in the context of specific cases.

The “bundling” view of pass-through rights is put in particularly sharp focus in the “degenerate” when A and B are the same firm, i.e. when B produces a microchip but also holds IPR that might read on the design of firm C 's electronic device. The equivalent of a pass-through license then amounts to only selling the chip to C if C also purchases a licensing agreement on the possibly relevant IP.

Not only might this – as in our previous example – exclude another firm from the technology markets relevant to the electronic device's design but it might also disadvantage a horizontal rival of B in the market for microchips. This situation is shown in the figure below:

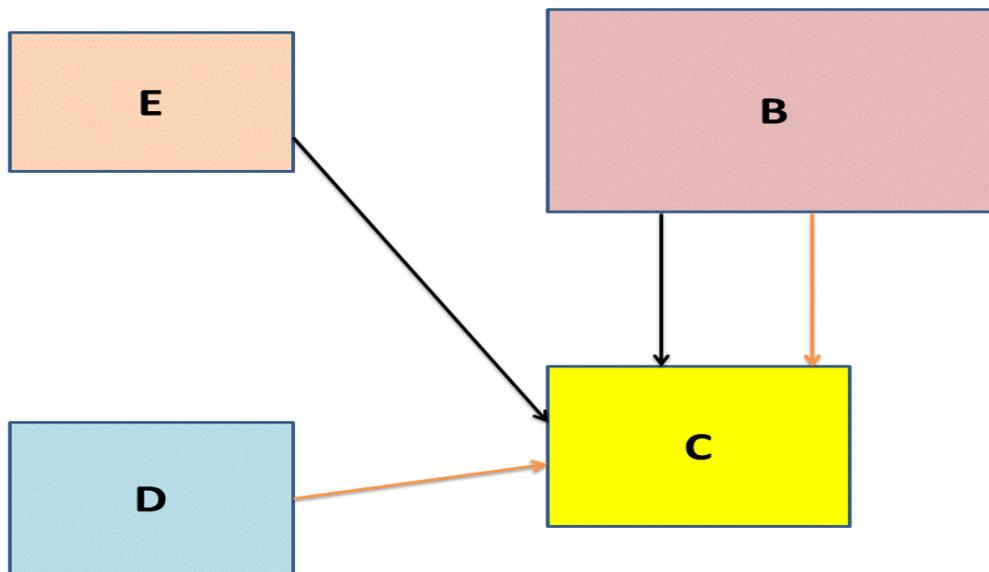


Figure 8: Bundling of IP rights and product

If B adopts a strict bundling approach for its microchips and its device-related IP, then C has the choice between this bundle and purchasing the chip and relevant device-related IP separately from E and D. We then find ourselves in a situation where bundling is likely to have significant anti-competitive effects⁵⁴. While rather “generic”, this type of argument seems at least to justify some investigation of the potential anti-competitive effects of pass-through. We are at this stage agnostic as to whether such investigations will or will not conclude that pass-through clauses are worthy of continued antitrust attention. It would be best investigated in the context of case experience.

⁵⁴ Nalebuff analyses bundling in a series of essays investigating different anticompetitive aspects (2003, 2004, 2005). For a critique, see also Brennan’s discussion at: www.ftc.gov/be/seminardocs/BrennanBundlingIalkFTC150606.ppt.

C. Efficiencies

Pass-through clauses allow firms in the downstream market to enjoy the benefits from one-stop shopping and legal certainty. While the first efficiency would likely not be very significant for firms that are used to dealing in IPRs, it might well be important for smaller, less experienced firms, especially start-ups.

3. MERGER CONTROL

a. Complementary IP rights

It is well understood that mergers can give rise to undesirable levels of concentration not only in product markets but also in technology and innovation markets. Clearly a merger between two firms that control a set of patents on substitute technologies can have an effect that is very similar to a merger between two firms producing substitute goods. What is sometimes less well understood is that a merger between firms that control complementary pieces of intellectual property can also have anti-competitive effects. One reason for this, as recognised by the TT Guidelines, is that the joining of complementary patents might facilitate the emergence of an industry standard that the merged entity might then be reluctant to license to others. There are, however, other less obvious situations in which concerns might arise. For example, even in the absence of any standard-setting considerations, a merger can affect the relative bargaining positions of market participants in the licensing “game” through which situations of dispersed ownership of complementary assets usually get resolved. Indeed, bargaining and foreclosure is the concern in the *Axalto/Gemplus* case incident to the merger even in the absence of standard setting: the combined entity “the parties can use their portfolio of IP rights to worsen the bargaining position of their competitors...the new entity would switch from the current...strategies that fetch royalties to aggressive strategies by refusing the licensing of its patents...” (*Axalto/Gemplus* at 60, 63)

Let us now consider an example where the “complementarity” between patents comes from the possibility of infringement and the resulting threat of litigation. Let us suppose that there are four firms, *A*, *B*, *C*, and *D*, competing in the same product market. Each firm holds some patents relevant to the type of product sold in the industry.

As underlined in the *Axalto/Gemplus* case, the infringement situation is far from clear. Some of the patents that *C* uses to for its own product very likely infringe some of *A*'s patents, however *C*'s lawyers also believe that some of *A*'s patents might also infringe *C*'s own IP. They are therefore hopeful that some form of settlement could be reached, allowing both *A* and *C* to introduce their product into the market without any fear of litigation. Firm *B* and *D* also believe that their patents might be mutually infringing but they have already signed a cross-licensing agreement clearing the way for each of them to introduce their product in the market. Overall, absent any merger activity there are good reasons to believe that all four firms would eventually be able to introduce their own product and compete independently in the product market. The situation is depicted in figure 7:

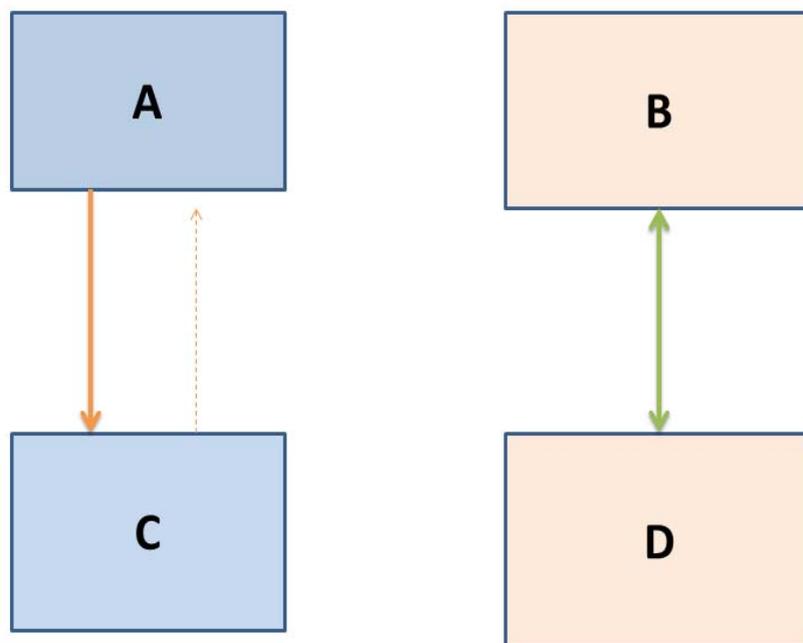


Figure 9: Complementary IP Rights

Now assume that *A* and *B* merge. This reduces the likelihood that *C* will make it to market for two reasons. Firstly *A* now has less to lose if it cannot introduce its own product (as it considers the resulting cannibalisation of the sales of product *B*). Secondly, *A* also faces a higher cost of allowing *C* into the market (since this would increase competition for both *A* and *B*'s product) than before the merger. Overall then two scenarios are now more likely. In

the first one, *A* will take the chance of losing an infringement case with *C*, introduces its product, but hopes to prevent *C* from entering the market. This leaves us with three (or two if *A* eventually loses the litigation with *C*) products in the market, only two of which are sold by independent entity. In the second scenario, *A* simply abstains from introducing its own version and also blocks *C*'s entry by not granting it a license to the IP that its own technology infringes. This leaves us with only two independently produced versions of the good in the market. In this case, what might have looked like a 4 to 3 merger is in fact a 4 to 2 merger. Clearly, similar issues would arise if *B* had a piece of IP that would help *A* produce its version of the good without infringing on *C*'s patents. In that case the merger would ensure that *A* would get access to this piece of IP, eliminating *A*'s incentives to settle with *C*.

The main lesson from this example is that mergers – or other agreements resulting in increased horizontal concentration of IPRs - might raise IP-related issues even if they include complementary IPRs. The root of such issues is that, while the joint control of the merging parties' complementary IP rights does eliminate any possible "thicket" issues between the two parties, it might also decrease the merged entity's incentives to settle potential infringement/complementarity issues with third parties. While the identification of possible antitrust concerns will of course depend on the specifics of each individual transaction, at least one general guiding principle seems to be useful. In industries, such as electronics, where patent thickets appear to be an on-going concern, firms "arm" themselves for the threat of litigation – or more simply the difficulties of negotiation – by amassing significant patent portfolios. Such patent portfolios help improve the firm's bargaining position but also facilitate the resolution of conflict by ensuring that various parties come to the table with enough "bargaining chips" of mutual interest. This latter "facilitating" function of patent portfolios works best when interested parties have relevant patent portfolios of broadly similar size.⁵⁵ This suggests that mergers or other transaction that make the distribution of relevant IPRs significantly less symmetric should attract increased attention. Indeed, this issue is also underlined in *Axalto/Gemplus*.

Still, while the merging of entities with complementary IPRs does deserve some scrutiny, it seems reasonable to assume that, in most cases, the joining of complementary assets should be counted as a benefit of the merger not a cost for two main reasons. Firstly the merger helps resolve any outstanding patent litigation and/or patent thicket issues between the two merging parties, making it more likely that new products will make it to market both quickly and cheaply (since infringements or thicket issues are resolved without any royalties)

⁵⁵ Ideally, a more thorough assessment of the blocking value of various patents in the portfolios would be used but, given the difficulty of such a task, IP lawyers routinely use portfolio size as a useful approximation of the true strength of the portfolios.

Secondly, if it licenses at all, then the merged entity is likely to license its complementary IP assets at lower levels of royalties than those that would be charged by two independent IP owners. This is a direct implication of the “Cournot complement” principle discussed earlier in this report. Hence, if one enforces some divestment or compulsory licensing of IP portfolios as part of a merger remedy, one would ideally try to separate complementary (especially essential) from substitute IPRs since the type of remedy called for might be rather different.

In the case of complementary rights, then, one should try to preserve the efficiency benefits of the merger by ensuring that the merged entity still has access to these rights. This can be achieved by leaving the relevant IPRs in the hands of the merged entity but requiring that it issues licenses on reasonable terms to other firms in the industry. Alternatively, the IPRs could be divested to a patent pool that would grant a (possibly royalty-free) license to the merged entity and would then license the rights to others in order to maximise the patent pool’s profits. This reasoning could be applied to the *Syngenta/Monsanto (sunflower seeds)* (2010 COMP/M5675) case, summarised in Appendix 2, where there is a concern that the merged entity would not allow access to its larger stock of germplasm, which is complementary within itself but also with the germplasm held by competitors. Surely, there are significant efficiency gains in this case, but maintaining access via licensing on reasonable terms to others could conceivably assuage the concerns in that case about foreclosure and reduction in final variety for consumers.

b. Substitute IP Rights and Other Issues Raised by Cases

We have reviewed some recent merger cases where IP plays a role in the decision, some of which have been mentioned in the text, above. Indeed, the specific relation among the patents in the portfolios is not treated systematically or completely explicitly, so the cases may have substitute patents at their heart, complementary patents, or a combination of the two. While the relation among the patents is not completely clear, one can often infer that there is a significant substitute component to the portfolios from the strategic behaviour of the firms.

In the *Axalto/Gemplus* case, there is no concern about innovation incentives with the combination because there still appears to be sufficient incentive to “escape the competition” despite the combination. Indeed, there appear to be some economies of combining the R&D that may increase rather than reduce innovation in this industry. This is a clear benefit to the merger and would probably occur more readily with a substitute portfolio. In the

Axalto/Gemplus case, the gain seems to come from rationalisation of R&D efforts, in fact, which would be more likely with substitutes. In the *Syngenta/Monsanto* case, there are more classic concerns about a reduction in innovative activity by the merging firms, as there is little remaining competition on the scale that could maintain innovation incentives.

Second, there are “second sourcing” issues in that it appears that Axalto and Gemplus separately were capable of “inventing around” patents owned by the other firm. Hence, the merger eliminates the “second source” for any potential patent in this industry⁵⁶. This intuition also is behind the concern that post-merger there will be no redress for delay in certification or reduction in interoperability in the area of OTA card administration. That being said, the case argues that the current incentive is to license freely to any firm wishing a license because this “second source” is, in fact, available for technology. This harks back to the intuition offered by Gallini (1984) that licensing incentives are high where the alternative to licensing is for invention around the patented technology. In this case, the ability to invent around is seated in one of the two potentially merging firms rather than in the other firms in the industry. Hence, the merger potentially eliminates this incentive to license. (*Axalto/Gemplus* at 58).

Third, there is a feeling that the combined entity will refuse to license its patents to small competitors with no or few patents to offer. The idea underlying the basic concern appears to be a combination of a feeling that increased asymmetry in patent portfolio sizes tends to be associated with lower licensing activity as an empirical issue, and second that the incentive to license for trade may exist even where the incentive to license for royalties is absent. The first finds some support in the work of Schankerman and Lanjouw (2004). For the second argument, it is not clear why firms would prefer a trade to a royalty that captures the value of the trade unless the trade’s value is large precisely due to complementarity between the traded patent and the firm’s remaining portfolio. If, by combining the new patent into a large portfolio, the larger entity can obtain economies in licensing (perhaps by removing barriers to licensing caused by a Cournot complements problem), then the royalty negotiations might not adequately capture this value.

The *Syngenta/Monsanto* case raises a related concern about foreclosure of inputs available via licensing post-merger, but appears to be a more straightforward foreclosure argument. The concern is heightened in this case for small firms not because they lack the possibility of trading for germplasm rights, but because they might lack a sufficiently large germplasm portfolio themselves to “step into the gap” if the combined *Syngenta/Monsanto* restricted licensing.

⁵⁶ See Shepard (1987) for a discussion of strategic second sourcing.

A similar concern leads the case to conclude that Greenfield entry might be restricted by the combination. This comes on top of concerns that the combined entity might withdraw varieties from the market that compete too directly, citing evidence from the Hungarian market that this would actually occur, resulting in price rises.

c. Remedies

The focus of this section of the report is not on discussing the variety of situations or mergers that can trigger IP-related concerns. Rather the main issue is how such concerns might be alleviated through some form of remedy. Broadly speaking, there seem to be two types of remedies. The first type involves divesting the ownership of some of the patents of the merged entity. The second approach merely sets some more or less precise and coercive guidelines as to how some pieces of IP should be licensed to others.

d. The EU Experience

IP is only a significant issue in a relatively small number of merger cases. Moreover, such cases cannot be readily identified from the websites of either DG Comp or the US Competition Law authorities. Gathering exhaustive evidence on the type of remedies imposed in the past and – even more – on the difficulties eventually encountered when applying such remedies is therefore a Herculean task that goes well beyond the scope of this report. We will instead rely on the report on remedies recently commissioned by DG Comp (2005), from which the following section is drawn.

The merger remedies document looks at 40 decisions over a five year period 1996-2000. This represents 40% of the 91 decisions with remedies during that time period. They also constitute about a fifth of all the decisions with remedies under the old and new European Merger Regulation (ECMR) from its inception in 1990 until end 2004. The remedies analysed include granting access (only 40% of remedies considered “effective”), exit from a JV (77% considered effective), transfer of a market position including long term exclusive license, package of assets, extensive carve out, and stand-alone business (56% considered effective). The sectors represented cover a wide variety from NACE industrial sectors C, D, E, G, I and J. IPR transfers fell into both the “granting access” and the “transfer of market position” categories. It should be kept in mind that the sample size, once one narrows it down to those remedies where IPRs were an important element, is very small. A few of these cases are briefly presented in Appendix 2.

The study covers “reported” outcomes, but did not have the resources to conduct market evaluations to get an independent assessment of the opinions reported in the interviews. Further, the study constructs counterfactuals of what would have happened in the absence of the remedy, which is a dicey exercise. Still the study identifies a number of serious issues with remedies that involve divestment.

A. Failure to Divest All Relevant IPRs

The main issue seems to be the failure to include in the divestment all of the related IPRs. If a technology is divested but is technically tied to components that are not divested, then the buyer of the divested business ends up entirely dependent on the supply of complementary products for several years after the divestiture. In this case, the buyer is an ineffective competitor for some time. In one related case, the design rights were not divested to the purchaser so that he had to incur substantial costs to develop new designs with a new supplier. The business suffered substantial market share loss during this time. Indeed, problems with tied or complementary products, such as where the complementary product remains with the merged firm and the purchaser must pay a high price for it, appear frequently in the complaints.

In some cases, in order to find a buyer the seller had to expand the scope of assets divested (because presumably buyers recognized that the scope of the divestiture was insufficient to create a viable business). Indeed, some buyers insisted on (and got) additional concessions before buying the divested entity. This suggests that putting the divested IPRs up for sale might have some advantage over divesting into an empty shell such as a made-for-purpose patent pool. In this case, the expertise of the buyer will help determine which IPRs and complementary assets need to be divested to maintain an effective competitive entity. The study notes that issues involving the scope of the divestiture were those that generated the largest number of unresolved issues in divestiture remedies.

B. Degradation of Assets During Interim/Implementation Period

Another major issue is the loss of know-how during the transfer, making the business after transfer less competitive than it was before. A particularly sore point involves the transfer of critical personnel. When the transfer of personnel is left to the negotiations process of the buyer and seller, it often results in bad faith (insufficient) transfer. Often few key personnel

were responsible for the success (the effective know-how) of the business whereas the seller used the divestiture to try to off-load unproductive employees instead of transferring these key people. Accusations involving a variety of personnel practices (including poaching) are common in the study.

C. Third Party Restrictions and Delays in Implementation Creating Loss of Competitive Advantage

Third party restrictions can lead to a loss of competitive advantage for a large set of reasons. In cases where third parties were involved (often JV partners) so that their consent was required to implement the remedy, the third party often created a variety of problems including: (1) delay (which can put off product launch, for example), including delay in resolving third party IPR disputes -- indeed the one case where the remedy took 17 months to implement was delay in a third party IPR dispute, (2) demands for large concessions to get their agreement to deals, (3) third party restrictions on IPRs and know how so that these could not be transferred, (4) lack of disclosure of third party commitments to the Commission at the time of the remedy design, (5) where the JV partner was the only likely buyer for the business and did not agree with the remedy – perhaps because they were not consulted when the remedy was designed – and so refused to buy on the terms envisaged.

D. Know How Transfer Difficulties Resulting in Narrow Field of Purchasers (of Divestitures)

Know how often is not sufficiently defined in the Commission remedy, so that incomplete transfer often occurs. For example, transferred personnel should be allowed to take supporting documentation when they transfer. Alternatively, adequate documentation needs to be provided for new personnel to undertake their duties efficiently after transfer. Disputes involving making know how transfers precise were reported to delay the transfer of the business. In some industries, such as those in innovation-driven markets, expertise is very hard to come by and often is a requirement for the purchaser to have in order to make a viable business. Since transfer of expertise does not always happen, this reduces the field of potential purchasers. All these problems were not so bad when the divested business had been operating as a separate entity, of course. This issue of providing adequately specified remedies dogs the decisions included in appendix 2 of this report. In particular, we see the volume of discussion attempting to render the precise meaning of disclosure of information precise at the end of the *Intel/McAfee* case (COMP/M.5984 especially at 313-320).

E. Inadequate Trustees

In theory the trustee's role is to sort out all the difficulties mentioned above. However, in practice, and in particular in IPR transfer cases, there are often problems with defining the trustee's role, remuneration, relationship with the businesses and so on that make the trustee ineffective to some degree. We will investigate this more fully below.

F. Particular Issues Raised by Licensing as a Remedy

Access often is granted via licenses rather than divestiture. The Commission guidance on when a licensing arrangement is acceptable rather than divestiture reads as follows⁵⁷:

“Where the competition problem is created by control over key technology, a divestiture of such technology⁵⁸ is the preferable remedy as it eliminates a lasting relationship between the merged entity and its competitors. However, the Commission may accept licensing arrangements (preferably exclusive licenses without any field-of-use restrictions on the licensee) as an alternative to divestiture where, for instance, a divestiture would have impeded efficient, on-going research. The Commission has pursued this approach in mergers involving, for example, the pharmaceutical industry.”⁵⁹

The merger remedies study found that the general implementation issues of licensing were shared with those of divestiture.

Determining the optimal scope for the license and its terms, especially price, were the main problems with licensing remedies. In particular, certain pricing schemes (such as high per unit royalties) can create disincentives to compete or can convey sensitive information (such as payments conditional on executed sales). The license had to have sufficient scope to give a sound basis for the licensee to compete. In one of the cited cases, the IPRs did not appear

⁵⁷ Paragraph 29 of the Commission Notice on Remedies (2001), acceptable under Council Regulation (EEC) No. 4064/89 and under Commission Regulation (EC) No. 447/98, OJ C68/3 available at [http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52001XC0302\(01\):EN:NOT](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52001XC0302(01):EN:NOT) and quoted p. 119 of Kopke, Alexander, K. Kraak, D. Levie, J. Menezes, S. Plas, W. Tretton (2005) *Merger Remedies Study (Public Version)* European Commission, October. 2005 available at: http://ec.europa.eu/competition/mergers/studies_reports/remedies_study.pdf. The Remedies Notice was revised in 2008 to add more detail, but did not change the basic “message” of the earlier notice. See Remedies Notice [2008] OJ C267/01 and discussion in de Valois Turk (2009).

⁵⁸ “Commission Decision of 1 December 1999 (Comp/M.1601 *Allied Signal/Honeywell*), Commission Decision of 3 May 2000 (COMP/M.1671 *Dow Chemical/Union Carbide*)”

⁵⁹ “Commission Decision of 28 February 1995 (IV/M.555 *Glaxo/Wellcome*; OJ C 65, 16.3.1995, p.3)”

complete in the license and, while this was being resolved, the *de facto* industry standard remained controlled by the merged parties and continued to be developed, leaving the licensee struggling to catch up. Still, onerous financial terms were the single most important determinant of the success of granting access. The Commission has sometimes insisted on free licenses or licenses on a cost-plus (or cost) basis, agreements at “fair market value” and non-discrimination clauses; however, the study recognizes that it may not be easy to determine what these mean in particular circumstances. Interviewees suggested that since these terms really were not very clear, including dispute resolution mechanisms in the remedy would have been helpful.

Licensors usually were found to have many means to restrict effective access to technology via technical requirements in the license. A trustee would normally ensure that the IPR access value was preserved during and after transfer, including know-how that could be devalued by breaches of confidentiality. However, as we have seen, trustees were sometimes inadequate to this task

The study sums up by suggesting that licenses used in remedies should:

1. Be offered and granted to a sufficient number of potential licensees;
2. Have field of use and duration defined sufficiently broadly for potential licensees;
3. Have correct territorial scope for potential licensees;
4. Be granted under terms to make access commercially attractive (in particular without too high a cost)
5. Not be encumbered by third party rights or restrictions;
6. Not convey new competitive advantages to the licensor, such as the dissemination of commercially sensitive information on sales volumes of the licensee;
7. Not facilitate coordination between the licensor and licensee.
8. Be reviewed so that if the market develops unexpectedly, unnecessary remedies can be cancelled (so that they don't continue to create costs) or modified.

In what follows, we revisit the issue of IP-related remedies, starting from first principles. Like the report on remedies, we consider the relative merits of divestment and compulsory licensing; however we further distinguish between divestment to an existing competitor and divestment to either an existing or a newly created patent pool. We also distinguish between situations where the merging firms are vertically integrated into product markets where they exploit their own technologies and situations where the merging parties (or at least one of them) is only involved in the relevant technology markets.

e. Divestment

The divestment of IPRs by merging parties raises three Issues: What should be divested? To whom? And how does one make sure that the required divestment actually takes place in a manner that helps restore competition?

A. What to divest?

The overarching principle is of course that the remedy should try to approximate as closely as possible what the IP situation might have been in the absence of the merger. In particular, one should resist the temptation of making the relevant technology markets more competitive than they otherwise would have been. Since the merger involves the joining of two IP portfolios, the simplest approach is to divest the entire portfolio of one of the merging parties. Provided that a suitable acquirer can be found, this would restore the distribution of IP ownership that prevailed before the merger. This, however, is too blunt an approach as it might involve the divestment of both substitute and complementary IPRs. To preserve the efficiency benefits from joining complementary assets, it would be more appropriate to divest the portions of one of the two portfolios that overlap with substitute IPRs in the portfolio of the other merging party. One should however realise that, in practice, the determination of which assets are complements and which ones are substitutes is likely to be significantly harder than in non-IP related mergers where remedies involve the divestment of product lines or productive capacity.

The scope of the divestment required also depends on whether the merger occurs between two research specialists or between two firms that are present both in the relevant technology markets and in some of the corresponding product markets. If the merging parties are indeed research/IP specialists, then it seems less important to ensure that the divested package of IPRs “makes sense” commercially. The independent merging party to

be replaced was not itself involved in producing any product, so ensuring that the acquirer of IPRs gets a bundle of rights that allows for such production is not required to restore the status quo. Moreover, since research specialists are not, by definition, involved in production, their IP is more likely to be of the formal type and to be protected by explicit property rights, such as patents, rather than by trade secrets. This means that one does not have to worry excessively about the transfer of the uncodified “know-how” or of the essential “personnel” that might be required for the transferred IPR to have an appropriate commercial value and represent effective competition in the relevant technology markets.

Defining the scope of divestment is trickier when the merging parties are vertically-integrated into some of the product markets that correspond to the IPRs to be divested. When the IPR holder has been involved in production, it is likely to have developed a significant amount of informal, uncodified know-how which is hard to identify. Moreover, some of this know-how might be embedded in key members of personnel that might be hard both to identify and to transfer effectively. As we will see in the next section, this difficulty has some implications as to whom/how the divestment should take place. For now, we simply conclude that adequately defining the set of assets to be transferred is likely to be significantly more difficult when the merging parties are vertically integrated. As remedies are likely to be less effective, such mergers should be vetted somewhat more severely than a merger between research specialists that involves a similar amount of overlap between substitute IPRs.

Whether the remedy relies on full divestment or on licensing rules, one must also determine whether the remedy applies solely to existing patents or patent applications or whether some future innovations should also be covered. There are several reasons why extending the remedy to some future innovations might make sense. For example, this could be a remedy against a (temporary) increased concentration in innovation markets. Alternatively, including future IPRs in the remedy could be justified on some of the same efficiency grounds as grant-back clauses.

B. To Whom to Divest?

Clearly, the first principle, as in any divestment, is to avoid transferring the relevant IPRs to a party that already controls a significant mass of substitute IP. Such a transfer would result in a larger concentration of relevant IPRs than before the merger and decrease the competitiveness of the relevant technology markets. A second issue is whether the IP should be transferred to another research specialist, a vertically integrated participant, or a patent pool. Here again, the solution appears simple at first blush. Since the goal of a remedy is to

restore the pre-merger situation, it would seem easier to transfer the relevant IPR of a merging research specialist to either another research specialist or a patent pool, while the intellectual assets of a vertically integrated merging party are best transferred to another vertically integrated firm. To discuss the role of patent pools, one must first specify what the governance of such a pool would look like. It is clear that the pool should not be in any way under the control of the merging parties. One also needs rules of conduct. Such rules should be simple and easy to implement. One such set of rules is that the patent pool managers must maximise the pool's profits under the constraint that the IPRs cannot be licensed back to the merged entity. Under such a set of rule, a patent pool would essentially have the same incentives to license the technology as a research specialist. For most of the discussion, then, we will treat the two these two types of potential recipients as one.

In practice, however, the two principles stated above often can conflict. For example, the merging party might be vertically integrated but all vertically integrated acquisition candidates already hold significant substitute IP. Alternatively, the merger might be between research specialists but existing pools or specialists might hold similar IP. Further, setting up a *de novo* patent pool might be prohibitively costly. It is therefore useful to compare the incentives of the two possible types of recipients.

Transferring the relevant IPRs to an integrated firm has one main advantage and one main (potential) disadvantage. The main advantage is that provided that the IPR is transferred from the merging parties for a fixed fee, further use of the IP by the recipient itself is not discouraged by any output-related payments. This contrasts with research specialists and patent pools, which would have to license the IPRs to others to get any benefit from the acquired rights. Typically, such licensing does involve some output-related royalty. Imagine then that, in both cases, only one firm eventually gets to use the IPR. With transfer to an integrated firm, the disappearance of one merging party that could use the IP "for free" is counteracted by the emergence of another party that also can use the same IPR "for free". On the other hand, with an initial transfer to a research specialist or to a patent pool, the firm that eventually gets to use the divested IPRs does so at greater cost – and therefore exercises a lesser competitive constraint – than the previous owner of the IP.

The potential disadvantage of transferring the rights to another vertically integrated firm is that it might have lower incentives to license to other firms than a research specialist or a patent pool. Let us start from a situation where a pool has licensed to one firm and compare it to a situation where the vertically integrated recipient has not yet licensed any other company. When considering whether or not to add a licensee, the vertically integrated recipient will consider the fact that access to a better technology will allow the licensee to

steal some of the vertically integrated firm's downstream business. This is a standard foreclosure argument. A pool or research specialist does not face such an additional cost of further licensing. On the other hand, it would consider that the extra licensee, by competing with the first one, will reduce the revenues from output-related royalties that it gets from its first licensee. As a result, each type of IPR recipient faces some form of "business stealing" cost from further licensing. It is not *a priori* possible to determine which of these two costs is greater so we cannot tell *a priori* which of the two types of recipients would have an incentive to license the IPRs more broadly. On balance then, when we consider both the advantages and disadvantages, there does not seem to be a compelling economic reason to favour research specialists or patent pools over integrated firms as recipients of the divested IPRs

Vertically-integrated recipients offer another, more subtle, advantage. Since such recipients will likely end up using the IPRs mostly themselves⁶⁰, competition authorities can in effect choose the final user of the divested IP by vetting acceptable bidders at the time of divestment. In particular, the competition authority can ensure that the IP does not end up in the hands of a firm that already has a large portfolio of similar assets. If on the other hand, the relevant IP is divested to a research specialist or patent pool, such a recipient will itself license it to a firm involved in the relevant downstream markets. Unless the competition authority wants to exercise continuous control over the licensing activities of the pool or research specialist, this means that the IPRs will likely end up with the highest bidder...which might well be an integrated firm that already controls a portfolio of similar rights. In other words, divesting to a patent pool deprives the regulator from the opportunity to select an acceptable final recipient of the patent portfolio.

The *Syngenta/Monsanto (sunflower seeds)* case offers an example of a case where divestiture was required and concerns ensued that the divested property did not constitute a stand-alone business with longevity. This restricted the potential purchasers, in fact, to existing firms with significant business already in the area so that the "carve out" could be fit in with other complementary assets. This was viewed as acceptable as a remedy in this case, as a number of firms indicated interest in purchasing the divested business, without going further to require sufficient assets to be divested to form an independent and long-lived entity. Linking development of new lines outside the European Union to those developed for the Union was viewed as sufficient in that case to remove any incentive problems faced by the entity acquiring the divested business in commercialising new lines within the Union, although details were not plentiful on this point.

⁶⁰ Remember that self-use is by far the dominant mode of exploitation of IPRs.

Licensing incentives compared to the incentives for an independent entity were not really compared in the case document. Indeed, in this case, divesting sufficiently to make an independent research firm viable would have been infeasible.

The *IPIC/Man Ferrostaal AG* 2009 decision (COMP/M. 5406), summarised in appendix 2, also raises concerns in this respect. In that case, the concern was that IPIC had control over AMI, a producer, while Man Ferrostaal has control over the single source of technology on which relevant production is based. Furthermore, the licensing contracts for Eurotecnica's technology could potentially involve sensitive information on cost and planned capacity increases of competitors to AMI. There was a concern in the case that AMI, as a competitor in production, might use its power at Eurotecnica to delay capacity additions by competitors which would have a negative effect on competition (*IPIC/Man Ferrostaal* at 47-53). Coordinated effects between AMI and another main competitor, DSM, were also feared as a competitive constraint is removed by the merger (*IPIC/Man Ferrostaal* at 54-64). The solution in the case to this difficulty is divestment which, as pointed out in the case (*IPIC/Man Ferrostaal* at 67), eliminates the concern that AMI will use Eurotecnica's technology to negative effect. Still, while the Commission retained the right to approve of the purchasing party, little direct restrictions on who this party could be were included in the case, as long as competition concerns should not be raised by the purchase (*IPIC/Man Ferrostaal* Commitments at Section D 14(c)). In particular, another major producer could potentially purchase Eurotecnica and would potentially face the same types of incentives to use the technology position of Eurotecnica to control downstream capacity additions and output, as the purchaser would now effectively be vertically integrated as well. This argument was presented for the AMI link at (*IPIC Man/Ferrostaal* at 43-45), in fact, showing that even minor effects on the downstream price would make refusal to license profitable. Hence, there would be a concern about such refusals for a potentially wide set of purchasers downstream. Divestment to a research specialist or patent pool could potentially be a viable alternative in this case to maintain the incentive to license widely.

C. Incentives for an Effective Transfer of IPRs and Complementary Assets

As we saw in our review of the EU experience as summarised in the merger remedies document, both identifying the IPRs that need to be transferred and ensuring that these assets are transferred smoothly and in a timely manner is not a trivial matter. Often the merging entities involved appear to drag their feet and/or to try to deprive the recipient from some of the assets that are required for an efficient commercial exploitation of the transferred IP. While such problems might be minimised through intense *ex post* monitoring,

such monitoring is costly and – as pointed out in the remedy report – not always effective. One might therefore wonder whether the divestment process might itself be designed to maximise the divesting parties' incentives to comply. The report on remedies presents anecdotal evidence that giving potential recipients the liberty to negotiate directly with the divesting entities might have some value, as knowledgeable bidders will use their own expertise to specify what needs to be included in the package in order to justify a sizeable payment. In a similar vein, one could think of divesting the relevant IPRs to a profit-maximising patent pool, and then giving a share of these profits (but no control) to the divesting party. This would provide that party with some incentives to ensure that the patent pool receives the assets it needs to offer a commercially attractive package.

D. Divesting IPRs from both merging parties

So far we have assumed that the required divestment involved the IPRs *held by one of the merging parties* when this IP overlaps significantly with IPRs held by the other merging party. We therefore only had to ensure that this divested IP was again available from a party independent of the merged entity and with incentives similar to those of the pre-merger divesting entity. It is not always clear that a merger that creates an undue concentration of IPRs always calls for the divestment or licensing of a set of patents initially held by only one of the two merging parties. Let us now assume, then, that the set of patents to be divested or licensed includes a number of patents from each of the merging parties. Further, let us still assume, for simplicity, that the merging parties are not active downstream. Would setting up an independent profit-maximising patent pool endowed with these patents be an effective remedy? The answer must be negative, as one moves from a pre-merger situation where these rights were sold by two independent parties to one where they are sold by a single pool. This raises some interesting issues. For example, should the merged entity retain the right to license these patents itself independently of the pool so as to constrain the pool's own market power? Would it be more efficient to set up two profit maximising pools, each one corresponding to the patents withdrawn from the control of a single merging party? We do not have answers to these questions at this point, but they merit investigation.

f. Licensing

As a merger remedy, licensing is very similar to divesting. In particular, the issues raised by what should be licensed and to whom are mostly the same as for divestment. There are, however, a few significant differences.

Firstly, unless the licensing contracts allow for sublicensing, licensing takes patent pools and other research specialists out of the picture. The set of “technology recipients” is therefore narrower than under a divestment remedy. Secondly, unlike divestment deals, licensing agreements often include some form of output-related payments. As discussed amply in the section on cross-licensing, such payments both raise the cost of the licensees and decrease the merged entity’s incentives to compete intensely with its licensees. Thirdly, the flip side of the previous argument is that, precisely because the merged entity keeps getting output related revenues from its licensee and such revenues increase with the quality of the bundle of IP and complementary assets licensed, licensing would provide greater incentives to actually give the recipient effective access to the relevant IPRs. This, however, is not convincing. One should remember that the very reason why divestment or compulsory licensing is deemed to be required is the belief that the merged entity would not otherwise grant access to the relevant IPRs on reasonable terms. Given this belief, then the merged party still strictly prefers not to license than to license on the terms (including royalties) imposed by the competition authority. The presence of royalty payments does not therefore change the fact that the merged entity would still prefer to suppress the licensing deal if it possibly can. Finally, and most importantly, licensing can only be an effective remedy to the increased concentration of IP control achieved by the merged entity if the terms of licensing are set adequately by the competition authority. This is not an easy task. Not only does it involve specifying maximum royalties and/or a minimum number of licensees, but attention needs also be paid to a large number of conventional licensing contract clauses (e.g. grant backs) that can themselves be used to limit the competitive pressure exerted by the licensees. Indeed, this would be a concern regarding the FRAND licensing remedy cum disclosure remedy in the *Axalto/Gemplus* case, given the lack of incentives to license for the merged entity signalled in the case and the reliance of the rest of the industry on Axalto and Gemplus to disclose information on the nature of innovation (see *Axalto/Gemplus* at 59) for the apparent “delegation” of information generation to the merging entities). Overall, then, it does not seem that licensing has any consistent advantage over the divestment option. When feasible, then, divestment seems to be the preferred form of remedy. This seems to be in line with our previous review of the EU experience that suggested that, although

imperfect, divestment remedies have proved to be more effective than remedies based on compulsory licensing. Indeed, we see in the *Intel/McAfee* 2011 case summarised in appendix 2 the following statement: “From the outset, the Commission recalls that divestitures or the removal of links with competitors are the preferred remedy to eliminate certain competition concerns and that commitments relating to the future behaviour of the merged entity may be acceptable only exceptionally in very specific circumstances. In any case, divestitures are the benchmark for other remedies in terms of effectiveness and efficiency.” (*Intel/McAfee* at 305) The case goes on to specify that in the particular circumstances at hand, an access remedy may be more appropriate, however. In this particular case, there are potential synergies in the provision of security and hardware as well as research related to the security segment in terms of optimising hardware to security requirements. Of course, the downside of this is that the parties could use this optimisation to simultaneously degrade interoperability with other security providers or use the possibility of internal optimisation to suppress previously disclosed information. Access is a remedy that can allow any such synergies to be reaped by the merging parties but still address the targeted issues of interoperability and information access. In some sense, then, the licensing remedy in this case maintains a principle of the minimal intervention necessary to address the competitive concerns in the case, which are primarily access concerns.

g. Conclusions

There are four main conclusions from our discussion. Firstly, remedies involving the transfer or compulsory licensing of IPRs are typically harder to effectively implement than remedies that involve more concrete assets such as productive capacity or product lines. This means that, others things equal, competition authorities should be tougher on mergers that involve IP issues than on those that do not. Secondly, both types of remedies are likely to be harder to implement when the merging firms are integrated into some of the relevant product markets than when they are not. Thirdly, divesting IPR to patent pools does not offer any obvious advantage over the alternative of divesting to another firm that is present in some of the relevant downstream markets. Finally, divestment seems to be generally preferable to compulsory licensing.

4. SUMMARY AND CONCLUSIONS OF THE REPORT

This report has been a selective review of recent economic analysis on technology transfer issues, with a focus on feeding issues into policy debate about the Technology Transfer Guidelines. While the literature is highly incomplete, even in our areas of concentration, we can still generate a number of areas of focus for the policy debate and some issues to consider for the technology transfer framework.

We began by setting the stage. First, while licensing activity comprises a large amount of economic activity, it tends to occur much more heavily in certain sectors and in certain companies so that it is not evenly distributed across the economy. It often occurs in sectors associated with patent “thickets”. Although this term has sometimes been used to refer to an important concentration of patents within a single entity, the recent economics literature on IP describes thickets as “overlapping sets of patent rights requiring that those seeking to commercialise new technology obtain licenses from multiple partners”⁶¹. This is the meaning retained throughout the report. Thickets can be associated with inefficiencies. First, when a large number of patent rights must be accessed from different parties in order to commercialise a final product, the resulting royalty burden can become excessive for both the licensee and the set of licensors. Intuitively, each independent IP owner prices its own IPRs without taking into account that a higher price, by reducing the sales of the final product, also hurts the income of other IPR holders. Second, the bargaining process by which licensing conditions are set is likely to occur under less than ideal conditions such as asymmetric information. Under such conditions even agreements that would be in principle beneficial to all parties might fail to materialise. Such inefficient bargaining outcomes are more likely to arise if the number of parties holding relevant pieces of IP is large. This being said, the current state of measurement of patent thickets does not allow us to judge empirically the size of the inefficiency associated with patent thickets. On the other hand, empirical work has made more inroads on judging how frequently thickets arise, identifying industries where they are likely to occur frequently (audio-visual technology, telecommunications, semiconductors, optics, and information technology) and those where they are likely to arise moderately (electrical machinery, handling and printing, macromolecular chemistry, engine pumps and turbines, and transport). While cross-licensing and patent pools both can serve to clear patent thickets, then, the desirability of

⁶¹ Shapiro (2001).

doing so depends not just on the efficiency gains associated with clearing the thicket – which are currently unknown -- but also on other potential efficiency gains and losses of these practices. Hence:

C.1: It is too early to systematically weaken the traditional “safeguards” that competition law imposes on cross-licensing and pool agreements. Even in “thicket-prone” sectors of activity, a more lenient approach toward such agreements should require a demonstration that there are actual thickets that would be cleared by the agreement and possibly evidence of the magnitude of the benefits involved in clearing these thickets.

We next turn to a more complete evaluation of cross licensing and patent pools.

Ex post cross licensing, where the relevant innovation already has been developed, can give rise to unilateral and coordinated effects. In terms of unilateral effects, the cross-license may involve (possibly bilateral) variable royalties, which can raise the cost of a rival and move the firms towards a less competitive outcome. Second, more aggressive price or quantity behaviour now potentially reduces the royalty income, which can reduce the intensity of product market competition. When the inputs that are cross-licensed are essential to the production of a good, cross licensing increases consumer welfare despite these concerns. Where the inputs are complementary but not essential, we must weigh the benefits in terms of, for example, greater quality against the deleterious effects. Current TT guidelines are completely in line with this latter reasoning. Parallel conduct may be facilitated by cross licensing of substitute or unrelated pieces of IP to the extent that punishment strategies may be easier to design. Again, the TT guidelines are in line with this reasoning, although more clarity on the severity of these effects and the form they might take could be included. Hence:

C.2. Further clarification in the TT Guidelines on how cross-licensing might “increase transparency and control certain behaviour” by means of examples could be helpful to industry. The mechanisms through which cross-licensing could facilitate tacit collusion and the strength of the resulting welfare effects have yet to be evaluated fully by the economics literature, so that empirical and theoretical work could be solicited to clarify this.

We also insist on the importance of consistency of treatment of cross licensing and related agreements such as research joint ventures. Given that cross-licensing does not involve the complementarities that a research joint venture might, but could have similar negative effects on innovation incentives, one might wonder whether the current treatment of cross-licensing is not relatively more lenient than the current treatment of RJVs: according to the latest

Horizontal Guidelines, an RJV without synergies would be seen as anti-competitive, while it seems that a similar *ex ante* or *ex post* cross-licensing agreement would not for similar levels of market power. Hence:

C.3: Consistency in treatment of cross-licensing and research joint venture agreements needs to be considered, given the similarities in effects but the potentially lower level of synergies in cross-licensing agreements.

Finally, cross-licensing agreements can potentially allow large/dominant firms to leverage their size/dominance to gain a further advantage in the market at the expense of rivals with smaller patent portfolios. Such practices may appear to warrant antitrust scrutiny, as they have been found to exist in some empirical work in the area. Hence:

C.4: Cross-licensing agreements potentially can disadvantage smaller firms where barter is a prominent form of exchange. Such practices may warrant particular antitrust scrutiny.

Ex ante cross licensing agreements are better treated alongside patent pools, to which we next turn our attention. Economic analysis provides some support for the current antitrust treatment of *patent pools*. In particular, current analysis broadly suggests a rather relaxed attitude towards pools that form spontaneously and voluntarily as long as independent licensing clauses are included. The result is quite stark in the sense that it suggests that there is no reason to look at the substitutability or complementarity of patents in the pool as long as the pool forms voluntarily and under an individual licensing provision.

There are exceptions to this conclusion, however, which are crucial to its application. First, this conclusion clearly does not hold for pools that are imposed by regulatory activity. One should therefore pay close attention to the governance rules of pools that are set up as remedies to antitrust or merger issues. Second, the result requires that the governance structure of the pool reflects the variable value of patents its members contribute when a large number of firms are members of the pool. The specifics of how governance affects the social desirability of the pool depend on the particular assumptions of pool formation, however. For example, the most recent contribution on the topic where partial pools formation is analysed suggests that the independent licensing clause might need to be accompanied by specific royalty-sharing schemes and/or restrictive membership rules in order to effectively “screen” welfare-increasing patent pools, as membership rules affect the incentive of firms to unilaterally deviate from the pool (which affects the pool’s stability). In other words, the literature is not settled in this area. Third, conditional on the existence of the pool, vertically integrated pools might tend to charge excessive royalties to each other,

although this is controversial in the literature: it remains to be resolved whether there is any systematic effect on royalty levels of the type of firm in the pool. One area of discrepancy between current guidelines and the economic literature is the view that pools should be restricted to include only essential intellectual property. Finally, the current TT Guidelines restrict the safe harbour on patent pools to just such collections of essential IPRs. While the Guidelines do not imply that other pools would necessarily be objectionable, their exclusion from the safe harbour suggests that defending such pools might be significantly more demanding. This very cautious approach is not supported by the more recent economic literature. Nevertheless, we argue that the economic literature is not yet quite robust enough to consider changing the current approach. Still, additional guidance as to how a pool that is not limited to essential IPRs might get clearance would be helpful.

Hence, given that the literature is as yet unsettled, we draw several conclusions in respect to patent pools in order to recognise the concerns of the literature but still proceed with caution on approving pools:

C.5: Keep the safe harbour to essential patents. In practice, this might mean that the safe harbour only covers SSO oriented pools where essentiality might be more easily assessed.

C.6: Under a rule of reason, recognise that SSO oriented pools might need to include some non-essential patents in order to achieve a degree of legal certainty. More generally, greater leniency should apply to pools that include IPRs that are mostly complements.

C.7: Members of the pool should be allowed to keep licensing their IP freely outside of the pool.

C.8: Pools with selective membership rules still can be pro-competitive. However, some justification as to why the selective membership rules are needed should be provided.

C.9: Low levels of royalties are not required for a pool to be pro-competitive. Rather than focus on royalty levels (or impose maximum royalty rules), competition authorities are better off focussing on the type of IPR included in the pool as well as on some simple governance rules that tend to promote socially desirable pools. Scrutiny of unusual royalty schemes is warranted.

C.10: There are no general reasons to believe that pools that contain a number of “pure research” members are likely to be less competitive than pools that only include firms that are also involved in the corresponding downstream product market(s). Still, “research only” members are likely to push for higher royalties – and thus less competitive outcomes – when technological competition is intense and is subject to significant network effects.

C.11: Rules that would trigger the demise of the pool in case of substantial defections are potentially pro-competitive as they help ensure that welfare-improving pools are formed.

Grant-backs, while a common feature of licensing agreements, have not been analysed either comprehensively or compellingly in the economic literature. Still, the basic point made by the legal literature that grant-backs tend to reduce innovation incentives seems compelling from an economic standpoint. A traditional defence of grant-back clauses is that, in their absence, a pro-competitive licensing agreement would simply not be reached in the first place: spooked by the possibility that the licensee might use its intimate knowledge of the technology to improve on it or invent around it, the IP holder would simply prefer not to license its technology. Indeed, the current practice, where agreements that are exclusive and involve severable innovations are subject to more intense scrutiny than agreements that are non-exclusive and involve non-severable innovation, can be seen as an attempt to balance the innovation concerns and the traditional “but for” defence.

Given the dearth of literature on the topic, we develop our own economic analysis of this traditional “but for” defence. We investigate this “but for...” argument from both *ex post* and *ex ante* perspectives. Our *ex post* analysis suggests that, once the initial technology has been licensed, the licensor cannot be hurt by non-severable innovation but may be hurt by severable innovation. Hence, the “but for...” argument appears to be stronger for severable than non-severable innovation. While this suggests that current leniency towards non-severable innovations may be misplaced, we step back from recommendations that grant-backs of severable innovations be looked at more favourably for two reasons. First, from the perspective of the “but for...” argument, the only justification for grant-backs at all is that innovation would be “triggered” by licensing agreements. If the potential licensee would be equally as likely to come up with a severable innovation without a license as with a license, then this innovation capability should be irrelevant for the initial licensing agreement. If licensing does not *trigger* severable innovation, then grant-backs cannot be justified in this case. In practice, determining whether or not a given innovation was triggered by the licensing agreement is likely to be difficult. Second, patent law and policy already both

require disclosure as part of the patent document and attempts a balance of innovation incentives under the possibility of follow-on innovation using “leading breadth”. Revisiting this trade-off via competition policy would not be justified if we assume that intellectual property law already obtains a socially correct balance.

We then turn to an *ex ante* analysis where we ask two related questions. Firstly, would the prohibition of grant-back clauses lead to fewer licensing agreements? Secondly, even if licensing agreements would be signed regardless of the availability of grant-back clauses, would the *terms* of these agreements be more competitive (i.e. involve lower output-related royalties) if grant-back clauses can be used? Although our analysis should be seen as just a first step toward a better understanding of these issues, our results provide further support for the claim that grant-back clauses relating to non-severable innovations are actually efficiency-enhancing. Hence:

C.12: Overall, that is, taking into account both *ex post* and *ex ante* arguments, our analysis shows that there are reasons to query current policy whereby grant-backs of non-severable innovations are treated with leniency.

We also note that in situations where the experimental exemption is in force, other methods of transferring information about the innovation may be present, further weakening the “but for...” defence. While we find the interaction between elements of IP policy such as the experimental exemption and grant-backs intriguing, rigorous study is lacking in this area.

The treatment of grant-back clauses should be compatible with other innovation-related arrangements, most prominently research joint venture policy. Research joint ventures have been reviewed recently as part of the Horizontal Guidelines, concluding that, like grant-backs, they can actually decrease the innovation rate of an industry. This implies that research joint ventures involving undertakings of significant size should only be tolerated if they involve significant complementarities. We note that a grant-back does not by itself trigger direct complementarities, calling into question a lenient approach. On the other hand, where licensing may facilitate further innovation, an indirect complementarity may be present. As a result, a complementarity based argument justifying grant-backs and consistent with research joint venture treatment is present where grant-backs occur in the presence of a license that significantly increases the licensee’s ability to innovate. We have, then, an analogue to our recommendation R.3:

C.13: The treatment of grant-back clauses should be reviewed for compatibility with other innovation-related arrangements, most notably research joint venture policy.

Pass through refers to situations where a license of technology to a manufacturer also guarantees that clients using the manufacturer's output in their own products are protected from infringement claims by the licensor upstream. These clauses may have real effects on the market due to both current uncertainty on their antitrust status, and because these clauses can amount to bundling of intellectual property rights in some cases. Further, one could argue that these agreements may amount to price discrimination, which can put some downstream firms at a competitive disadvantage. Still, given the absence of competition law case history and the uncertainty that still surrounds pass-through clauses as a matter of IP law, it would be overly ambitious for us to suggest any precise guidelines about the possible antitrust aspects of such clauses. This is a clearly an issue on which DG Comp will have to wait until a number of cases have been assessed before seriously considering the lessons that can be drawn from this case experience and economic analysis. Hence:

C.14: We recommend that pass through be scrutinised by competition authorities so that they can be reviewed in the future once a portfolio of relevant legal cases have accumulated to serve as a basis for the analysis.

Finally, we turn to merger policy. We find that, while joining complementary assets generally argue in favour of the merger, mergers can raise intellectual property-related issues even if they include complementary intellectual property rights. While consolidating control of the merging parties' complementary intellectual property rights tends to reduce "thicket" issues, it may also decrease the merged entity's incentives to settle infringement issues with third parties. Our concerns relating to bargaining suggests that mergers that make the distribution of intellectual property rights less symmetric should be treated with more attention than those that do not.

We review the recent EU merger remedies study and some selected cases included in the appendix to isolate a variety of issues surrounding the implementation of mergers. We revisit certain remedies, specifically divestment and compulsory licensing, in the cases where intellectual property is involved. We note that adequately defining the set of assets to be divested is likely to be a more challenging task when the merging parties are vertically integrated, as the intellectual property involved will likely include tacit or uncodified know how along with codified intellectual property. Hence:

C.15: We suggest that mergers that make the distribution of intellectual property less symmetric and mergers involving vertically integrated parties where intellectual property issues are prominent be scrutinised more carefully.

Licensing does not seem to offer any consistent advantages over divestment, as we question both the ability of regulatory authorities to specify the licensing contract fully and the incentives of the licensor to grant access in a way that renders the licensee an effective competitor. Divestment can be a realistic alternative, but we still face incentive problems to obtain divestment of assets complete enough to create competition. In order to implement the divestment and solve this incentive problem, divesting to a profit maximising patent pool in which the divesting firm(s) have a share but no control could be a way forward. On the other hand, divesting to a pool compared to divesting to a vertically integrated entity offers both advantages and disadvantages. The advantage is that the pool maintains full incentives to license the intellectual property on to others. The disadvantage is that a pool would normally license to others for an output-related royalty, which would create a competitive disadvantage compared to a vertically integrated entity that was not subject to output-related royalties. A full analysis of the optimal form of divestiture in a variety of merger situations is beyond the scope of this study, but would be beneficial to generate concrete recommendations to address the issues raised by the merger remedies study.

C.16: We recommend follow-up on the recommendations of the merger remedies study, as a full analysis of the optimal form of divestiture in a variety of situations is currently lacking.

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6. Appendix 1: A Model Of Grant-Back Clauses

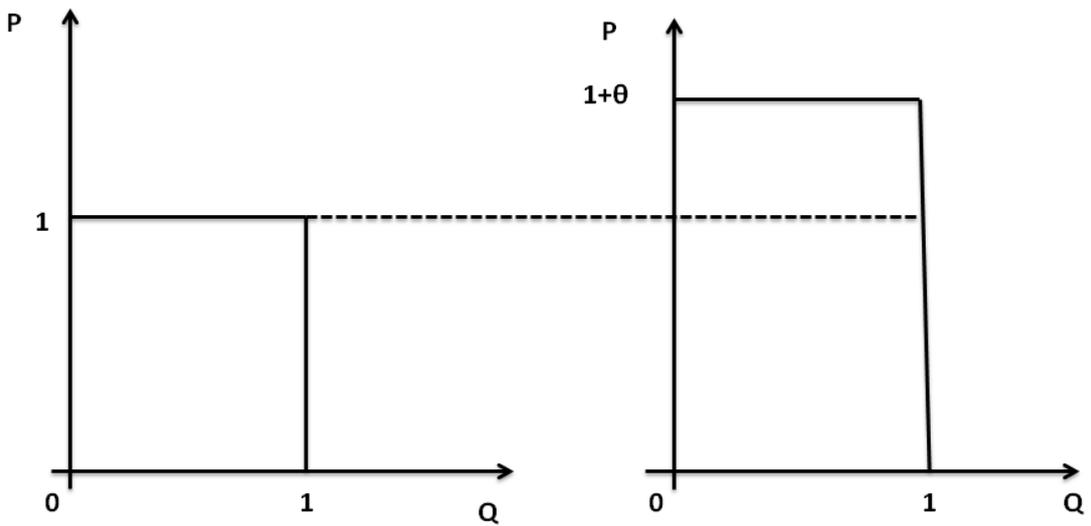
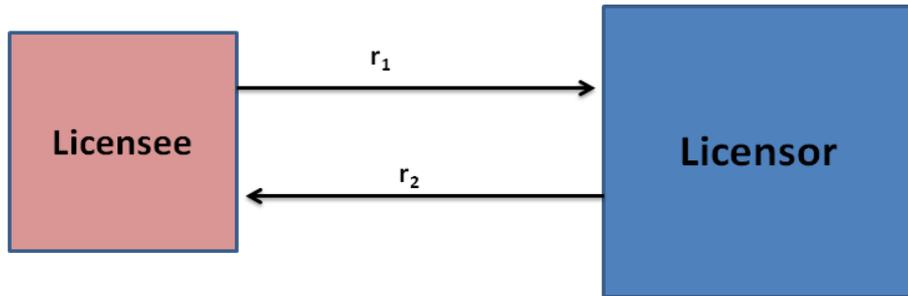
The purpose of this appendix is modest. We only aim at presenting an extremely simple formal model that helps illustrate some of the main points made in the text. The model presented here is therefore not meant to capture all important aspects of grant-back clauses. Indeed, as we will discuss farther down, even some of the effects discussed in the text are not captured in our formal analysis. Given the dearth of formal economic literature on grant-backs, this appendix should therefore be seen as a first attempt to provide a model of reference. While the results from this model do support the less formal (but more complete) discussion presented in the main body of the report, we clearly cannot be sure at this stage that those results would survive if other aspects of grant-back clauses were included.

1. *One licensee*

There are two firms, the licensor L and the licensee. There are also two markets. The structure of demand in these markets is extremely simple: consumers will purchase a total of one unit of the good as long as its price is below their willingness to pay. In the absence of further innovation, we assume that this willingness to pay is equal to 1. Both the licensor and the licensee have a natural home market. Each firm can serve its home market at zero cost, while serving the other market involves an additional unit cost of $c > 0$. It is because of this unit cost that licensing makes sense in the first place.

If the licensor's technology is indeed licensed, then access to that technology allows the licensee to further improve on the technology, raising the willingness to pay of consumers to $1 + \theta$. This captures the typical argument that licensee might "take advantage" of their access to the technology to develop further expertise of their own. For now, we will assume that this innovation is non-severable in the sense that it can only be used by licensees of the original licensors who still pay the agreed upon royalty.

The size of c matters. If $c > 1$, then each firm has a de facto monopoly over its home market. If on the other hand $c < 1$, then, in the absence of licensing, the licensor would still find it optimal to serve all markets. Perhaps more importantly for our purpose, a value of c well in excess of 1 also means that, even after improving on the licensor's initial technology, the licensee could not directly challenge the licensor in its home market. In that sense, the high c case is less favourable to the "but for" efficiency defence of grant-back clauses since it appears to minimise the harm that further innovation by the licensee can do to the licensor's interests. In order to give the "but for" defence as fair a hearing as possible, most of this appendix will therefore proceed under the assumption that $c < 1$. Still, as a benchmark, it seems useful start each section with the case of a prohibitively high royalty.



The timing of the game is very simple. In a first stage, the licensor decides whether or not to license its technology. If it does not, then it is free to serve both markets itself, although it incurs an additional cost of c when serving what would have been the licensee's territory. If licensing occurs, further innovation by the licensee occurs instantaneously. The licensing terms are set through a bargaining process. We keep the terms of the contract as simple as possible, assuming that the parties agree on a per unit royalty r . Since we have inelastic demand, such a royalty is in fact formally equivalent to a fixed fee, as long as the payment of such a fixed fee does not depend on whether or not the licensee actually uses the licensed technology. We also assume that the licensing agreement includes traditional territorial restrictions so that neither the licensee nor the licensor can sell in each other's territory.

When bargaining over the royalty r_1 attached to the initial licensing agreement, the parties take into account whether or not the agreement includes a grant-back clause. If it does, then the improved technology reverts back to the licensor. To keep matters simple we will assume that the technology is granted back without further royalty payment and that the licensee retains the right to use its own technological improvement without additional payments to the original licensor. In the absence of grant-back clause, then the licensee must decide whether or not to license this improvement to the original licensor. If it occurs, such licensing involves a per unit royalty equal to r_2 . Again, this royalty is set through bargaining. All bargaining subgames are solved by using the Nash Bargaining Solution (henceforth NBS).

As in the text – and is legal practice – we distinguish between severable and non-severable innovations. If the innovation is severable, then the innovative licensee can sell a product of quality $1+\theta$ without relying on L's initial technology. It can therefore sell such a product without owing any royalty to L. Furthermore, since the product can be sold without relying at all on the technology covered by the initial agreement, all territorial restrictions *on the licensee* associated with this agreement are now void. On the other hand, territorial restrictions on the original licensor still bind as long as it is the technology that was licensed initially. If the licensee licenses its new technology to the original licensor, then we assume that traditional territorial restrictions are included so that each firm enjoys a monopoly in its own local market.

If the innovation is non-severable, then it cannot be used without also using (in legal terms at least) the original technology. The initial licensing agreement therefore still applies fully: territorial restrictions still bind for both parties and the licensee still owes the agreed upon royalty r_1 to the licensee.

As mentioned above, let us first briefly go through the case where c is prohibitively high, making it impossible for anyone but the home firm to serve a given market. This means that, in the absence of licensing the profits of the licensor are equal to 1 as it can only extract the full surplus from a single market. Assume now that there is licensing but without grant-back. The licensee then innovates. In this simple context, there is not much difference between severable and non-severable innovation. In both cases the licensee can use its innovation without the further approval of the original licensor L. Moreover, since c is prohibitively high, no territorial restriction that could have been included in the initial agreement can possibly be relevant. The royalty rate for the improvement is therefore set ex post according to the following Nash Bargaining Solution:

$$\text{Max}_{r_2} (r_2)(\theta - r_2)$$

So that:

$$r_2 = \frac{\theta}{2}$$

Anticipating this result, the two firms first negotiate a licensing agreement for the original technology without which the licensee cannot innovate. This is where the only difference between severable and non-severable innovation appears: with severable innovation, the innovating licensee can use its new technology without relying on the initial technology. This means that the licensee *will not pay* the royalty contracted in the initial licensing contract. In

this case, the licensor's expected pay-off from licensing is simply $1 + \theta - r_2 = 1 + \frac{\theta}{2} > 1$. So, even if the induced innovation is severable, the licensor will always find it optimal to license so that the "but for defence" does not apply, at least in its most extreme form. If the innovation is non-severable, then the original royalty is set so that:

$$\text{Max}_{r_2} (1 + \theta + r_2 - r_1)(\theta - r_2 + r_1)$$

So that

$$r_1 = \frac{\theta + 1}{2}$$

Leaving the initial licensor with pay-offs of $\frac{3(1 + \theta)}{2}$. So, again, L will license its technology.

Let us now check what would happen in the presence of a grant-back clause. In this case the licensee can use its own improvement but the improvement can also be used by L. Moreover, since the grant-back is part of the initial agreement, the licensee must keep paying the initially agreed royalty whether or not the innovation is severable. Under a grant-back regime and our current assumption of high values for c , then, severable and non-severable innovations can be treated in exactly the same manner. There is no ex post negotiation over additional royalties so we only need to solve for the initial royalty:

$$\text{Max}_{r_2} (1 + \theta - r_1)(\theta + r_1)$$

So that

$$r_1 = \frac{1}{2}$$

So, with a grant-back clause, L produces at zero royalty rather than face a positive royalty without the grant-back clause. As for the licensee, it faces a lower royalty with the grant-back clause than without it if the innovation is non-severable. If, on the other hand, the innovation is severable, then the licensee produces royalty free when there is no grant-back clause. So, in this simple framework at least the milder version of the "but for" defence appears to hold for non-severable innovations but not for severable ones. Unfortunately, as we will see

below, this simple result does not survive once we consider lower values of the parameter c . So, let us now assume that $c < 1$.

I. No licensing

In the absence of licensing, the licensor serves both markets for a total profit of:

$$\pi_L^N = 1 + (1 - c) = 2 - c$$

A. Non-Severable Innovation

A.1. Licensing Without Grant-Back

We must first determine the royalty rate at which the licensee would license its innovation back to the licensor. The NBS is obtained by maximising the following expression with respect to r_2 :

$$c_2(1 + \theta - r_2) - 1 = c_2(\theta - r_2)$$

So that the chosen rate of royalty is

$$r_2 = \frac{\theta}{2}$$

The corresponding ex post profits of the two parties are therefore:

$$\pi_{L2} = 1 + \theta - r_2 + r_2 - 1 + \frac{3\theta}{2} - r_2$$

$$\pi_{L2} = 1 + \theta - r_2 + r_2 = 1 + \frac{\theta}{2} + r_2$$

Moving back to the initial licensing agreement, the royalty rate r_1 is the solution of the following maximisation problem:

$$\text{Max}_{r_1} \left(1 + \frac{3\theta}{2} - r_1 \right) \left[1 + \frac{\theta}{2} + r_1 - (2 - c) \right]$$

i.e.

$$\text{Max}_{r_1} \left(1 + \frac{3\theta}{2} - r_1 \right) \left(\frac{\theta}{2} + r_1 + c - 1 \right)$$

So that:

$$r_1^{NN} = 1 + \frac{\theta - c}{2}$$

Notice then that the net royalty earned by the licensee is equal to

$$r_1^{NN} - r_2 = 1 - \frac{c}{2}$$

The equilibrium profits of the two parties are then:

$$\pi_I^{ng} = \frac{3\theta + c}{2}$$

$$\pi_L^{ng} = 2 + \frac{\theta - c}{2}$$

Comparing π_I^{ng} to π_I^g , we see that the licensor does prefer to enter into a licensing agreement even if there is no grant-back clause. Moreover we see that, even without a grant-back clause, the licensor benefits from the licensee's further innovation as its payoff is increasing in θ .

A.2. Licensing with Grant-Back

The initial royalty rate is determined by the following NBS:

$$\text{Max}_{r_1} = (1 + \theta - r_1)(1 + \theta + r_1) - (2 - c)$$

So that:

$$r_1^{ng} = 1 - \frac{c}{2}$$

We notice immediately that, as expected, the net royalty earned by the licensor is higher than in the absence of grant-backs. Not surprisingly then, the licensor's profits are also higher in the presence of a grant-back clause.

$$\pi_L^{ng} = 2 + \theta - \frac{c}{2}$$

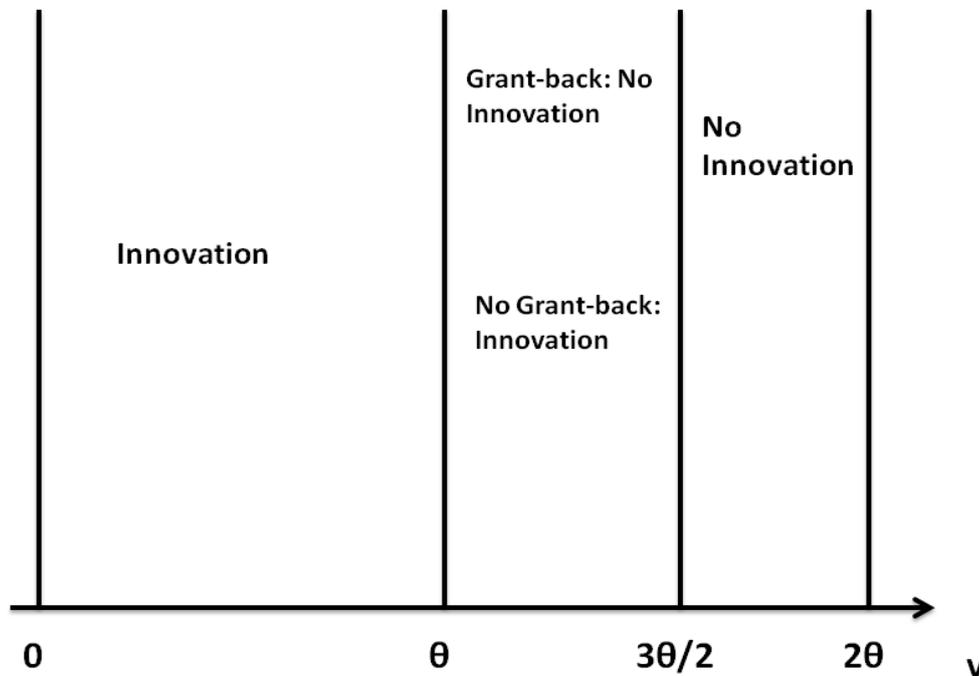
$$\pi_I^{ng} = \theta + \frac{c}{2}$$

This, however, does not mean that grant-back clauses increase the occurrence of licensing since the licensor prefers to license both with and without grant-back clauses. Moreover, the fact that licensing will trigger further innovation is not an obstacle to licensing since the payoffs of the licensor are increasing in the size of the subsequent innovation. The traditional "but for" defence of grant-back clauses is therefore not justified, at least in its extreme form. A milder form of the defence is that, absent grant-backs, the total royalties incurred by producers would be higher than in the presence of grant-backs. What can we say about this?

With a grant-back clause, the licensor has marginal costs of 0 and the licensee has marginal costs of $1 - \frac{c}{2}$. Without a grant-back clause, the licensor has a higher marginal cost of $\frac{\theta}{2}$,

while the licensee faces a marginal cost equal to $1 + \frac{\theta - c}{2}$. Hence a grant-back clause does lower the marginal cost of both the licensee and the licensor. So, grant-backs have the unambiguous effect of lowering marginal production costs, thereby offering an efficiency advantage to be weighed against their negative effect on innovation.

This negative effect of grant-back clauses on innovation is easily recovered within our model. Let us just assume that further innovation by the licensee is costly. Define the associated cost as v . To ensure that innovation is socially worthwhile we assume that $v < 2\theta$. The following graph shows when innovation would actually occur with and without grant-back.



So, relatively costly innovation would be discouraged by the inclusion of a grant-back clause.

B. Severable Innovation

B.1. No Grant-Back

Under our assumptions, the licensee's innovation immediately makes the original innovation obsolete. This means that the owner of the original IPR cannot extract any payment from the licensee: even if an initial royalty rate r_1 is agreed upon, it cannot be collected since – under our assumptions – the licensee does not actually use the licensed technology. In this sense, as explained above, our royalty r_1 can be understood as either a unit royalty or a recurring fixed fee but not as an upfront fixed payment. Assuming that licensing takes place in the first place, the pay-offs are therefore determined by the outcome of an ex post licensing game between the original licensee I who has a technology of quality $1 + \theta$ that it can use in either market without infringing the original technology and the original licensor, who has a technology of quality 1 which it can only use in its own market. In the absence of licensing

agreement for the improvement, the innovator makes a profit of $1 + \theta$ in its own market but only a profit of $(\theta - c)$ in the original licensor's home market. There are therefore two cases.

If the innovation is relatively small ($\theta < c$), then the corresponding NBS is:

$$\text{Max}_{r_2} [(1 + \theta + r_2) - (1 + \theta)][(1 + \theta - r_2) - (c - \theta)]$$

i.e.

$$\text{Max}_{r_2} (r_2)(1 + 2\theta - c - r_2)$$

So that:

$$r_2^{*n} = \frac{1}{2} + \theta - \frac{c}{2}$$

And the pay-offs of the two parties are:

$$\pi_L^{*n} = \frac{1}{2} + \frac{c}{2}$$

$$\pi_I^{*n} = \frac{3}{2} + 2\theta - \frac{c}{2}$$

In terms of the effective marginal costs of the two firms we note that both firms produce the top quality product, one at zero marginal cost and the other at a marginal cost equal to r_2^{*n} .

Comparing the pay-offs of the licensor with and without licensing of the original technology, we see that licensing occurs only if:

$$\frac{1}{2} + \frac{c}{2} > 2 - c \Leftrightarrow c > 1$$

In other words, licensing occurs only if, in the absence of licensing, the owner of the initial technology would not find it at all profitable to serve the market of the potential licensee itself, which is the assumption under which our results have been obtained. In the case of severable innovation then, the "but for" argument has some force since the fact that the initial license might lead to further innovation by the licensee can indeed prevent licensing from taking place *at all*. In other words, the fear of further innovation completely quashes licensing activity.

For completeness, let us now consider the case where the innovation is relatively large (i.e. $\theta > c$). The relevant NBS is now:

$$\text{Max}_{r_2} [(1 + \theta + r_2) - (1 + \theta + \theta - c)][1 + \theta - r_2]$$

i.e.

$$\text{Max}_{r_2} (\theta_2 + c - \theta)(1 + \theta - r_2)$$

So that:

$$r_2^{*n} = \frac{1 - c}{2} + \theta$$

Which is exactly the same level as in the previous case. The corresponding profit levels are:

$$w_L^{FB} = \frac{1+c}{2}$$

$$\pi_L^{FB} = \frac{3}{2} + 2\theta - \frac{c}{2}$$

Again, one can check that L prefers to license in the first place if and only if $c > 1$.

B.2. Grant-Back

With a grant-back, the solution is exactly the same as with non-severable innovations, hence we get:

$$r_1^{GB} = 1 - \frac{c}{2}$$

$$\pi_L^{GB} = 2 + \theta - \frac{c}{2}$$

$$\pi_I^{GB} = \theta + \frac{c}{2}$$

With grant-back, the licensor will decide to license its original technology if and only if:

$$2 + \theta - \frac{c}{2} > 2 - c$$

This condition is always satisfied. So, indeed, with severable innovation, the presence of a grant-back clause can ensure that efficient licensing takes place when it would not without such a clause.

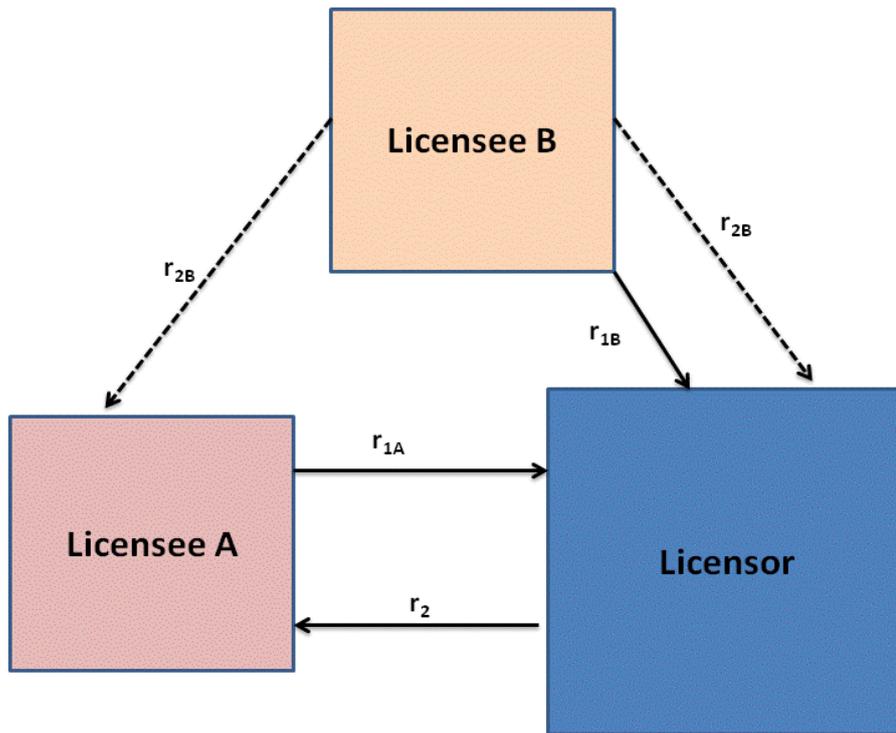
2. Two licensees

The reason for exploring a situation with more than one licensee is that one licensee's innovation threatens not only the licensor's own operations in its own market but it might also threaten the profitability of other licensees. One might then believe that such licensees would be reluctant to pay a high royalty to L unless they can be assured that they will not be adversely affected *ex post* if another licensee innovates. This reluctance to pay might then in turn reduces the profitability of the licensor compared to a world where further innovation by licensees is not possible. To bias the analysis as much as possible in the direction of such an adverse effect, we assume that only one of the two licensees innovates.

We limit ourselves to the case of one licensor L and two potential licensees A and B. A is the licensee who would innovate if given access to the original IP.

As can be seen from the graph, each licensee pays a royalty r_1 to the licensor for the right to access the original technology. This royalty can differ across licensees. As licensee A then innovates, in the absence of grant-back it charges a royalty r_2 to L for the right to use its improvement. What happens to B following innovation by A would depend on whether or not

there is a grant-back and how this grant-back is enforced. In the absence of grant back we assume that A would negotiate a separate licensing agreement with B. If there is a grant back then either B gets access to the new technology for free or it has to pay an additional royalty to the original licensor L (if the original agreement does not include grant-back from L to B). We will limit ourselves to the first scenario.



As before, we assume that as long as A uses the licensor's initial technology, it is still bound by the territorial restrictions that were part of the initial licensing agreement. This certainly means that A cannot sell in L's territory. Whether or not this implies that A cannot sell in B's territory depends – under current EU practice – on the time that has elapsed between the initial licensing agreement. Unless otherwise specified, we will assume that territorial restrictions between licensees still hold.

1. No licensing

When considering the no licensing option we assume that L is licensing to B at a royalty rate of r_{1B} . If it is not licensing to B, then the no-licensing pay-offs are exactly the same as in the case with only two firms. We get:

$$\pi_L^N = 1 + r_{1B} + (1 - c) = 2 + r_{1B} - c$$

, where r_{1B} is determined by the following NBS:

$$\text{[Max]}_{r_{1B}} (1 - r_{1B}) [1 + r_{1B} - (2 - c)]$$

So that:

$$r_{1B} = 1 - \frac{c}{2}$$

Giving the licensor profits of

$$\pi_L^{BN} = 3 - \frac{3c}{2} > 2 - c$$

So, if L does not license A it will always license B.

A. Non-Severable Innovation

Let us again begin with the extreme case where c is prohibitively high. This means that, absent licensing, L's profits are limited to $1 + \theta$. This also implies that L will always license to the non-innovative firm B. If it only licenses to B then it can extract a first period royalty determined by

$$\text{Max}_{r_{1B}} (1 - r_{1B})(r_{1B})$$

So that $r_{1B} = \frac{1}{2}$ and the licensor gets total profits of $3/2$. Given that B is always licensed, A will also be able to sell its improvement to B if there is no grant-back. Ex post then, A

charges a royalty of $r_2 = \frac{\theta}{2}$ to both L and B. Hence the initial negotiation between A and L yields a royalty r_1 determined by

$$\text{Max}_{r_1} (1 + \theta + 2r_2 - r_1)(\theta + r_1 - r_2)$$

So that

$$r_1 = \frac{1}{2} + \frac{3\theta}{4}$$

Leaving the licensor with total profits of $\frac{3}{2} + \frac{5\theta}{4}$, which is higher than if L did not license to A. Hence licensing will occur. In order to check the "royalty" version of the "but for" efficiency

defence, we now compute the equilibrium in the presence of a grant back clause. Let us define as r_{1AB} and r_{1BA} the royalties charged by L to A and B respectively. These royalties are determined by the following two NBS:

$$\text{Max}_{r_{1BA}} (1 + \theta - r_{1BA})(r_{1BA})$$

$$\text{Max}_{r_{1AB}} (1 + \theta - r_{1AB})(\theta + r_{1AB} + r_{1BA} - r_{1B})$$

Where $r_{1B} = \frac{1}{2}$ is the royalty that L could have extracted from B if L did not also license to A. This gives us

$$r_{1BA} = \frac{1 + \theta}{2}$$

$$r_{1AB} = \frac{1}{2} - \frac{\theta}{4}$$

Overall, then imposing a grant-back clause leaves B facing exactly the same marginal cost as without the clause while both L and A face lower marginal costs. So, again, the “royalty” version of the “but for” argument holds weakly when the innovation is non-severable and the parameter c is prohibitively high.

We now turn to the analysis for $c < 1$. As we will see, even the royalty form of the “but for” argument becomes ambiguous once competition across markets is allowed.

A.1. Licensing Without Grant-Back

Let us begin at the stage where A has obtained a license and has innovated. A would then have an incentive to license back this innovation to both L and B. This bargaining is exactly the same as the bargaining between L and A in the one licensee case. Hence we have that A charges the same royalty to B and L and that this royalty is equal to:

$$r_A = \frac{\theta}{2}$$

This royalty would also apply to the agreement with L if L had initially decided not to offer a license to B. Critically, since the innovation is non-severable, A cannot license B if B does not already have a license from L.

Let us now turn to the determination of the original licensing fee. The first case to look at is when L licenses A but not B. It is straightforward to show that, in that case, we get:

$$r_{1LW} = 1 + \frac{\theta - c}{2}$$

If, on the other hand, L licenses only to B the royalty rate is determined by:

$$\text{Max}_{r_{1BN}} (1 - r_{1BN})(1 + r_{1BN}) \quad (c < 1)$$

So that:

$$r_{1BN} = 1 - \frac{c}{2}$$

We must now determine r_{1AB} and r_{1BA} , i.e. the royalty rate agreed upon with L when each potential licensee expects that the other one will also sign a licensing agreement with L. The terms of the agreement between A and L are given by the following NBS:

$$\text{Max}_{r_{1AB}} (1 + \theta + 2r_2 - r_{1AB}) (1 + \theta - r_2 + r_{1AB} + r_{1BA}) - (2 - c + r_{1BN})$$

The first term represents the profits of licensee A. They include the profits from exploiting its reserved market, $(1 + \theta)$, the profits from licensing its innovation to both L and A, $2r_2$ minus the royalty to be paid to L. The first term inside the second bracket is the licensor's profits if it does license to A. This includes its profits in its home market, magnified by the innovation that it gets from A, and the royalties it gets from A and B minus the royalty paid ex post to gain access to A's improvement. The second term inside the second bracket is L's profits if it does not license A. This includes the (lower) revenues obtained from its home market plus the (lower) royalty that L can now extract from B. This royalty is lower than if L also licenses A because B anticipates that, if A is on board, it will get access to its better technology and obtain some additional surplus from this transaction. This NBS can be rewritten as:

$$\text{Max}_{r_{1AB}} (1 + 2\theta - r_{1AB}) \left(r_{1AB} + r_{1BA} + \frac{\theta}{2} + \frac{3c}{2} - 2 \right)$$

So that:

$$r_{1AB} = \frac{3}{2} + \frac{3\theta - c}{4} - \frac{r_{1BA}}{2}$$

The terms of the agreement between L and B are given by the following NBS:

$$\text{Max}_{r_{1BA}} [1 + \theta - r_2 - r_{1BA}] [1 + \theta - r_2 + r_{1AB} + r_{1BA}] - (2 + \theta - c - r_2 + r_{1BN})$$

The explanation for the various terms is similar to that presented above. This NBS can be rewritten as:

$$\text{Max}_{r_{1BA}} \left(1 + \frac{\theta}{2} - r_{1BA} \right) \left(r_{1AB} + r_{1BA} + \frac{3c}{2} - 2 - \frac{\theta}{2} \right)$$

So that:

$$r_{1BA} = \frac{3}{2} + \frac{\theta}{2} - \frac{3c}{4} - \frac{r_{1AB}}{2}$$

Combining the solutions that we have obtained, we get:

$$r_{1AB}^{NN} = 1 + \frac{2\theta}{3} - \frac{c}{2}$$

$$r_{1BA}^{NN} = 1 + \frac{\theta}{6} - \frac{c}{2}$$

The corresponding profits for the licensor are:

$$\pi_L^{NS} = 3 + \frac{4\theta}{3} - c > 3 - 2c$$

These profits are higher than the profits obtained without licensing. So, even if grant-back clauses are not available, all efficient licensing will take place. Moreover, these profits are increasing in the size of the innovation. Hence the fact that licensing triggers further information helps the initial licensor. This, again, casts serious doubts on the traditional “but for” defence for grant-back clauses that apply to non-severable innovations.

Let us also notice that, in equilibrium, all firms use the superior technology but they face different marginal cost. L faces a marginal cost of $r_2 = \frac{\theta}{2}$, A faces a marginal cost equal to r_{1AB} and B faces a marginal cost equal to $r_{1BA} + r_2 = 1 + \frac{2\theta}{3} - \frac{c}{2}$.

A.2. Licensing With Grant-Back

Under our version of grant-back, the improvement produced by A would be shared freely with both L and B. To determine the terms of the licensing agreement between A and L, we solve the following problem:

$$\text{Max}_{r_{1AB}} [1 + \theta - r_{1AB}] [(1 + \theta + r_{1AB} + r_{1BA}) - (2 - c + r_{1BN})]$$

$$\text{With } r_{1BN} = 1 - \frac{c}{2}$$

So that:

$$r_{1AB} = \frac{3(2 - c)}{4} - \frac{r_{1BA}}{2}$$

Similarly, the rate of royalty that L charges to B is given by:

$$\text{Max}_{r_{1BA}} [1 + \theta - r_{1BA}] [(1 + \theta + r_{1AB} + r_{1BA}) - (2 + \theta - c + r_{1AN})]$$

Where r_{1AN} is obtained as:

$$\text{Max}_{r_{1AN}} (1 + \theta - r_{1AN}) (1 + \theta + r_{1AN} - (2 - c))$$

So that

$$r_{1AN} = 1 - \frac{c}{2}$$

Therefore, r_{1BA} can be derived as:

$$\text{Max}_{r_{1BA}} (1 + \theta - r_{1BA}) \left((1 + \theta + r_{1AB} + r_{1BA}) - \left(3 + \theta - \frac{3c}{2} \right) \right)$$

Or,

$$\text{Max}_{r_{1BA}} (1 + \theta - r_{1BA}) \left((r_{1AB} + r_{1BA}) + \frac{3c}{2} - 2 \right)$$

Yielding:

$$r_{1BA} = \frac{3}{2} + \frac{\theta}{2} - \frac{3c}{4} - \frac{r_{1AB}}{2}$$

Using the two conditions that we have obtained, we can now solve for r_{1AB} and r_{1BA} :

$$r_{1AB}^{ng} = 1 - \frac{\theta}{3} - \frac{c}{2}$$

$$r_{1BA}^{ng} = 1 + \frac{2\theta}{3} - \frac{c}{2}$$

Giving payoffs for the licensor equal to:

$$\pi_L^{ng} = 3 + \frac{4\theta}{3} - c$$

These profits are higher than without licensing and slightly higher than the profits without grant-back.

In terms of marginal cost, L faces a marginal cost of 0, which is thus lower than without grant-back. Firm B faces a marginal cost of

$$r_{1BA}^{ng} = 1 + \frac{2\theta}{3} - \frac{c}{2}$$

Instead of $1 + \frac{4\theta - 5c}{6}$. Hence the marginal cost is always higher under grant-back. The marginal cost faced by firm A is now

$$r_{1AB}^{ng} = 1 - \frac{\theta}{3} - \frac{c}{2}$$

Instead of

$$r_{1AB}^{nn} = 1 + \frac{2\theta}{3} - \frac{c}{3}$$

Without grant-back. Therefore, grant-backs lead to a lower marginal cost for firm A. Overall, then the effect of grant-back clauses on marginal costs is again ambiguous although the overall effect is more favourable than in the two-firm case. This should be a rather general tendency. Intuitively, grant-backs make the deal more attractive to the licensor, so that it will satisfy itself with a lower royalty charged to A. The more attractive the grant-back is, the stronger this effect. But of course, since the grant-back also makes the deal more attractive to other licensees, L can extract a higher royalty from them. So, the larger the number of licensees, the more attractive the deal is for L and the lower the royalty paid by A should be. When the number of licensees is significant, we would therefore expect grant-back clauses to lower the marginal cost of both the licensor and the innovative licensee, while it might increase the marginal cost of other licensees.

A question that we have not addressed is what the effect of grant-back clauses on royalties would be, if all licensees were potentially innovative. Based on the intuition above, we would expect the effect on the royalties paid by each licensee to be ambiguous.

B. Severable Innovation

Again, the analysis of the severable innovation case depends crucially on our interpretation of the royalty rate agreed upon between the original licensor and its licenses. If it is understood as a fee that is only paid if the technology is used, then, given the timing of our game, where further innovation arises immediately, the licensor can never collect on such royalties. If, on the other hand, we consider that those royalties are upfront payment in order to get access to the technology, then the licensor can still extract surplus from A since A cannot innovate without access to the technology. As in the case with only two firms, let us focus on the situation where the royalty payment must be considered as an on-going payment to get access to L's technology.

As usual, we start by assuming that c is prohibitively high so that, absent licensing, L only earns 1. As with non-severable innovations, L will license to B if it does not license to A. This will be done at a royalty of $\frac{1}{2}$, leaving L with total profits of $\frac{3}{2}$. The relevant issue then is whether L will prefer to also license A, triggering severable innovation. In the absence of grant-back, L will not be able to get a royalty payment from A. On the contrary it will have to pay an ex post royalty determined by:

$$\text{Max}_{r_{2L}} (r_{2L})(\theta - r_{2L})$$

So that $r_{2L} = \frac{\theta}{2}$. Licensing from A to B occurs at a royalty rate r_{2B} determined by

$$\text{Max}_{r_{2B}} (r_{2B})(\theta - r_{2B} + r_{1BA})$$

So that:

$$r_{2B} = \frac{\theta + r_{1BA}}{2}$$

However, with a severable innovation, B will never want to pay any positive royalty to L since it can directly access the better technology without holding a previous license. Hence $r_{BA} = 0$

and $r_{2B} = \frac{\theta}{2}$. Since L will not be able to collect on any royalty granted to A either, this leaves L with total profits of $1 + \frac{\theta}{2}$. So licensing will occur if and only if $\theta > 1$. In the case of severable innovation then, the "hard" version of the "but for" defence does get some support.

To check the "royalty" version of the "but for" defence, we need to calculate the level of royalties with a grant-back. First, we need to compute the royalties that would be paid if L

licensed only one of the two firms. It is straightforward to show that $r_{1BN} = \frac{1}{2} = r_{1AN}$. We can now determine the royalties charged if L licenses to both A and B:

$$\text{Max}_{r_{1AB}} (1 + \theta - r_{1AB})(\theta + r_{1AB} + r_{1BA} - r_{1BN})$$

$$\text{Max}_{r_{1BA}} (1 + \theta - r_{1BA})(\theta r_{1BA})$$

Solving, we get:

$$r_{1BA} = \frac{1 + \theta}{2}$$

$$r_{LAB} = \frac{1}{2} - \frac{\theta}{4}$$

Comparing the equilibrium with and without grant-back, we conclude that a grant-back clause leads to lower marginal costs for L. On the other hand, both A and B have higher marginal cost when a grant-back clause is imposed. So, were licensing to occur with and without grant-back, the royalty version of the "but for" clause would not be verified.

We now turn to the case where $c < 1$. Assume that there is no grant-back clause. Once A has obtained its severable innovation, it can use it in any of the three markets without owing any royalty to L. Of course, A prefers to license the innovation to both B and L if this is efficient. Let us first consider licensing to L. To determine the rate at which this licensing would take place we must make some assumption about the relative size of θ and c . If $\theta > c$, then, in the absence of licensing, A makes a profit of $\theta - c$ in L's market in the absence of licensing and L makes zero profits. If, on the other hand $\theta < c$, then, without ex post licensing, A does not get any revenue from the other market and L makes a profit of $c - \theta$ in its home market by using its own technology. Therefore, if $\theta > c$, the ex post licensing royalty between A and L is given by the following NBS:

$$\text{Max}_{r_2} [r_2 - (c - \theta)](1 + \theta - r_2)$$

So that:

$$r_{2L} = \theta + \frac{1 - c}{2}$$

If $\theta < c$, on the other hand, the royalty rate is determined by:

$$\text{Max}_{r_2} (\theta r_2)[1 + \theta - r_2 - (c - \theta)]$$

Or

$$\text{Max}_{r_2} (\theta r_2)(1 + 2\theta - c - r_2)$$

So that

$$r_{2L} = \theta + \frac{1 - c}{2}$$

Which the same expression as in the previous case.

Let us now turn to the ex post licensing between A and B. The only difference with respect to the licensing between A and L is that, in order to use the initial technology, B must pay a royalty r_{1BA} to L. In other words, B's threat point, when negotiating ex post with A, depends

on the royalty that B would have to pay L if it were to keep using the technology.⁶² This means that there is now a greater range of parameters for which, in the absence of licensing, A would get positive profits from the other party's home market. As above, whether $c + r_{1BA} > \theta$ does not affect the equilibrium ex-post royalty. We can therefore get this royalty as follows:

$$\text{Max}_{r_2} [r_2 - (c + r_{1BA} - c)](1 + \theta - r_2)$$

So that:

$$r_{2B} = \theta + \frac{1 - c + r_{1BA}}{2}$$

Notice that the ex post royalty is increasing in the ex ante royalty rate that B would have to pay L if it were to keep on using the old technology. Let us check briefly that the same royalty obtains is $\theta + r_{1BA} < c$, so that, in the absence of licensing, B could still out-compete A in B's home market.

$$\text{Max}_{r_2} [r_2](1 + \theta - r_2 - (c - \theta - r_{1BA}))$$

Which is equivalent to:

$$\text{Max}_{r_2} (r_2)(1 + 2\theta + r_{1BA} - c - r_2)$$

So that, indeed,

$$r_{2B} = \theta + \frac{1 - c + r_{1BA}}{2}$$

Just as before.

We now turn to the licensing of the initial technology. Consider first a situation where L licenses B but not A.

$$\text{Max}_{r_{1BN}} (1 - r_{1BN})(r_{1BN} - (1 - c))$$

So that

$$r_{1BN} = 1 - \frac{c}{2}$$

The corresponding profits for the licensor are:

$$\pi_{LBN}^m = 3 - \frac{3c}{2}$$

⁶² There is an issue of semantics here. Strictly speaking, if B does not agree with A, B's presence forces A to set a lower price in B's market but B does not actually make any sale...and might therefore not owe any royalty to L. Since this is an artifice of our demand functions that would disappear with any amount of product differentiation, we prefer to assume that B would still owe the royalty to L.

If now L only licenses to A, then innovation will occur. Under our interpretation of the royalty payment, we know that, in any situation where innovation occurs, i.e. any situation where A is licensed, then the royalties determined ex ante are never paid. This means that L can only license A for free, collecting profits equal to

$$\pi_{LAN}^{ex} = 1 + \theta - r_{2L} = \frac{1+c}{2}$$

Finally, we determine the ex ante-royalties if both A and B are licensed by L. Let us first consider the rate of royalty that B would agree to pay to L. *Given that L licenses to A*, B knows that the further severable innovation will occur so that, it will not have to pay any royalty to B in equilibrium. Furthermore, the severable innovation will be available to B regardless of whether or not it has an agreement with L. Finally, B also knows that the royalty it will have to pay to A ex post increases with the royalty it agrees with L. This implies that B will refuse to sign a contract with L if it expects that A and L will reach an agreement. As argued above, the royalty paid by A to L is irrelevant since it is never collected and does not affect any pay-off in the following subgames. In effect, then, L's only decision is whether or not to license A *for free*. If it does, then it gets a pay-off equal to

$$\pi_L^{ex} = 1 + \theta - r_{2L} = \frac{1+c}{2}$$

Under our assumption that $c > 1$, such a pay-off is always lower than the pay-off that can be achieved by licensing B only. *So, again, the prospect of severable innovation leads L not to license to the potential innovator A*. By restoring the profitability of licensing to A, a grant-back clause would therefore be efficiency enhancing.

Extension: Upfront Fee

Let us now turn to a situation where, instead of using a recurring royalty, the potential licensing contract between L and A or B includes only an upfront fee. For the reasons just discussed, B would never pay such a fee if it expects that A will be licensed. Hence the only two relevant situations – besides no licensing – are those where L licenses either to A or to B. The ex post royalties charged by A to B and L are exactly as above except that the recurring royalty paid by B is now zero so that:

$$r_{2L} = r_{2B} = \theta + \frac{1-c}{2}$$

The upfront payment that arises if L only licenses B are determined exactly as in the case of recurring royalties so that the associated pay-off for L is

$$\pi_{LBN}^{ex} = 3 - \frac{3c}{2}$$

The upfront payment that arises if L only licenses A is given by

$$\text{Max}_{r_{1AN}} [1 + \theta + 2r_{2L} - r_{1AN}] [1 + \theta + r_{1AN} - r_{2L} - (3 - 2c)]$$

,which is equivalent to

$$[\text{Max}]_L (r_{1AN}) (2 - c + 3\theta - r_{1AN}) (r_{1AN} + (5(c - 1))/2)$$

So that

$$r_{1AN} = \frac{9}{4} + \frac{3\theta}{2} - \frac{7c}{4}$$

And L's corresponding pay-offs are

$$\pi_{L1AN}^m = \frac{11}{4} + \frac{3\theta}{2} - \frac{5c}{2}$$

Comparing L's payoffs in these two situations, we conclude that L will license to A if and only if

$$\pi_{L1AN}^m = \frac{11}{4} + \frac{3\theta}{2} - \frac{5c}{2} > 3 - \frac{3c}{2}$$

This condition is satisfied for $\theta > \frac{1}{6} + \frac{2c}{3}$, so that the efficient licensing pattern is only reached in equilibrium if the severable innovation is sufficiently large. The intuition for this result is fairly simple. The use of an upfront fee allows the licensor to capture some of the surplus associated with the future innovation since A cannot innovate without getting a license from L. On the other hand, *any* severable innovation, however small makes the original licensor's technology obsolete, which makes it impossible for the licensor to directly collect any royalty from other licensees and also forces the licensor to pay a royalty ex post for the use of the improvement. It is only if the innovation is big enough that this trade-off works sufficiently in favour of the licensor to induce licensing to A in the first place.

7. Appendix 2: Some Illustrative Merger Cases

Axalto/Gemplus 2006-- Comp/M.3998

Relevance of case to text: licensing as trading versus for monetary payments and disadvantage for smaller firms/merger of innovators increasing innovation incentive or ability versus decreasing it in the presence of very quick imitation outside of IP protection/patent thicket essentially making it hard for infringer to know what is infringed and relying on thicket owner to tell them/foreclosure by decreased incentive to guarantee interoperability/theory of harm is foreclosure via thicket and certification for interoperability/remedy is access: non-exclusive FRAND licensing and disclosure of interoperability information.

Background: Axalto manufactures secure plastic cards and related products and services, point of sale terminals and related software. Gemplus is supplier of secure plastic cards (especially “smart cards”), software, hardware and services.

The whole market for secure plastic cards (including stripes, chips, holograms, scratch panels, photos, printing, embossing), including SIM cards, payment cards, healthcare and identity cards, transport cards etc is probably too broad a definition for the relevant market. Smart cards have considerably more applications and other features than regular plastic cards, and within this segment, there is a distinction according to whether the chip is a memory or microprocessor chip in terms of cost. Within the microprocessor segment, the apps differ by whether they are telecom, banking or government & ID. The first is by far the largest (76%), the last (3.7%) is the highest growth area.

Payment card production lines can be converted to other types (SIM cards), but not the other way around, since payment cards are more sophisticated. Personalization of cards may occur at the original manufacturer or other levels. The SIM chip is three times more expensive than the payment card chip, and the price also depends on the capacity of the chip. As the price and technology standards differ by application, the market segments are SIM operators, financial institutions, health and government entities and so on. There are differences across groups, but much similarity within groups. Hence, for competition purposes, the market is segmented by application. The companies also organise around these applications.

The installed base of microprocessor smart cards is more than double that of memory cards and this gap is expected to grow.

While the main business is manufacturing and selling the plastic cards, the companies conduct many ancillary activities. These include a platform (OTA) which is used to administer SIM cards, including providing additional applications through the cards, updating information on the cards, and communication between cardholders and the telecommunications company. While the OTA services are most often sold along with the cards by the two parties, they need not be and in fact are provided separately in the market by some providers. Hence OTA platforms can be considered as distinct and relevant product market, served by both integrated and non-integrated specialist firms.

Markets for cards appear national in scope, as nations differ by their technological requirements in providing chips on cards or magnetic strips. The OTA market is worldwide, however, or at least Europe-wide.

Parties argue that entry is not difficult for existing worldwide or new entities, as strong competitors exist and no contracting barriers such as long term commitments or single sourcing are present. The technology is available on FRAND conditions. Customers are large, savvy organisations that can switch suppliers easily. However, innovation is clearly important in this market, with some competitors attempting to be first to market with advances and investing in R&D while others lag behind to focus on the commodity part of the business.

This is an auction market. Client overlap is not high between the two parties and the cases where the two were within the two top bidders for contracts are also relatively low. In other words, a separate firm has been a close bidder in many cases. Hence, post-acquisition we should not expect that the bidding market structure would result in higher prices in and of itself. Indeed, the parties and their customers contend that the synergies they would reap (buying inputs at lower prices) could lower their bids.

Innovation in smart cards: Innovation is a key competitive variable, as SIM card customers seek to compete by offering upgrades such as new products and services. The two merging companies were the lead innovators in the field, introducing 7 of 11 of the last major innovations since 2000. With a merger, it is possible that the innovative incentive would be maintained, as the margins earned are high only in the first year after introduction of a new feature. After a year, entry and “copying” drive down margins to a very low level. Indeed, the parties claim that merger will increase innovation as it will increase R&D capability by allowing for combined efforts and “escaping the competition” will provide the competitive incentive to innovate. Indeed, several customers have welcomed the merger as a spur to innovation.

Technology is proprietary, and the leaders claim this to be crucial. They hold large patent portfolios compared to others in the industry, with only G&D holding a comparable number. OCS holds less than half the portfolio of the two merging firms. Sagem-Orga also holds a smaller patent portfolio spread.

Others contend that the merger will alter the patent bargaining positions in the industry, despite the FRAND commitments. Indeed, before the transaction, a third party could go to either Axalto or Gemplus for a license to a technology. It was in the interest of each to have such clients both for the licensing revenues and to increase the reach of their technologies. The assertion is that post-merger there is a thicket issue that emerges: so many patents are filed by the parties that it is hard to know whether or what patents of the parties are infringed. Currently, the way infringement and licensing work is that Axalto or Gemplus reverse engineers any new product that its competitors come out with. They then inform the competitor of which patents they need to license in to avoid infringement. This clearly affects the competitors' ability to offer low prices in bidding, obtain good margins on their products, or even stay in the market. As bids in these markets are extremely close (differing by only one cent in some cases), any fee on the IP can have strong competitive consequences.

Gemplus has some paper trail confirming that raising its rivals' costs is a reasoning that they could follow. Margins are very tight in this industry, so keeping costs low is at a premium. Gemplus also has internal documents suggesting that the top firms coordinate their IP portfolio so as to repulse attacks by competitors.

The strategy of tagging royalties onto competitors could be worsened by refusing to license at all to smaller competitors that have no patents to "trade".

Hence, the case document argues that the ability and the incentive to marginalise competitors exist with the merged entity.

Innovation in OTA card administration: Despite commitments to interoperability, SIM cards from different SIM vendors often are not completely interoperable among each other and with other OTA platforms. If a SIM card and operator are the same entity and sell their system together, there is no problem with interoperability, but if a different SIM card is to work with the OTA platform, it needs to be certified and verified for that platform before being sold. Further, applets have to be developed by the card manufacturer (or presumably another manufacturer under license) according to the relevant proprietary features and fulfilling the OTA requirements. These are then loaded onto the SIM card.

There is no incentive to delay card certification or otherwise favour a single card by, for example, reducing interoperability, as the market stands, as it is easy for a customer facing delay or barriers to interoperability to switch to another provider of either OTA or cards or both. While the case dismisses bundling as a concern, it is concerned that given that the merged entity will have around 50% of the markets and that OTA is generally a long term platform choice for customers, there is a possibility of the merged entity's having the incentive to reduce interoperability or delay certification of larger competitors at the least. This is essentially a monopoly leveraging argument that the large position in the OTA market could allow the merging firms to leverage that into the card market by favouring their own cards or delaying other cards' certification.

The case dismissed the following argument. The chip that constitutes about half the cost of a card is likely to be subject to shortages and is likely to be available both more consistently and at a lower price to a large entity such as the merged entity than to smaller firms. Further, as much of the innovation occurs in the chip and a large firm would be more likely to have an advantage in cooperating with chip manufacturers in developing innovations, the merged firm would have more of an innovative advantage. Finally, the competitors fear that they could have delayed access to the newest chip technologies if a larger merged firm were treated more favourably or had closer cooperation with the chip manufacturer. The case argues that the merged entity would still be small compared to others on the market, shortages are fewer than before, and most firms multi-source anyway. As chip manufacturers don't innovate much for this market (since it is small compared to the rest of the electronics industry), it is not clear that the merger will have any effect on R&D on chips.

Commitments of the Parties: It is clear that the initial submission was more favourable to the combined entity and they were “bargained down” to the following:

1. For 10 years, the new entity will grant a FRAND non-exclusive license on any of its current or future patents.
2. For 8 years, the combined entity will disclose interoperability information to any third party qualified to supply SIM cards to any customer who has purchased an OTA platform from the combined entity.
3. The combined entity appoints a trustee to monitor compliance.
4. Any dispute arising will be resolved by fast-track arbitration.

Syngenta/Monsanto (Sunflower Seeds) 2010 -- Comp/M5675

Relevance of case to the text: *licensing for trade versus for monetary payment by smaller/larger firms and disadvantage for smaller firms/reduction in licensing following merger where different firms own complementary inputs to the breeding process/theory of harm includes reduction in innovation following merger of two main rivals in innovation/reduction in variety after a merger of rivals/monopolisation of essential inputs/remedy includes commercialised product (seeds) and also upstream breeder’s rights and licenses (source of future seeds)/remedy is divestiture of upstream breeding/parental lines as well as inventories of seeds developed in an interim period (only).*

Background: Syngenta, which includes a seed and crop protection business (breeding and commercialisation activities in sunflower seeds) proposes to purchase Monsanto’s sunflower seed business, which includes inventories of seeds, germplasm, IPR, know-how, contracts, commercial data and some employees.

The stages of the value chain in this industry include breeding of the parents and hybrid plants, commercialisation /production of the seeds, growing and oil crushing. Breeding can require 8 to 10 years to end up with a new registered hybrid variety that is protected under plant varieties protection. Both public institutes and private breeders participate in breeding. Biotechnology techniques can shorten the breeding cycle to 6 to 8 years. Licensing of parental lines between breeders is common to improve the portfolios of breeders. Royalties for parental lines are high – at 10-12.5% up to 25% of the sale price. Royalties for hybrids are higher than for parental lines, at 20-25% of the sale price. A protected variety can be used for breeding purposes (“breeder’s exemption”) in a manner similar to the experimental exemption but authorisation is required for production or reproduction of the variety. Once this has occurred, the new variety can be used to produce commercial seed, which is then treated to impart various resistances, packaged, registered, and sold. Most buyers are cooperatives/distributors. A hybrid variety usually has a life of 6 years or so.

The top companies in Europe are all integrated into breeding and commercialisation, but there are a number of players – public and private – at just one of these stages. Consumer demands for new traits plus pressure from new diseases/parasites mean that this is an R&D intensive industry. The last 10-15 years have seen the number of players providing 90% of the seed dwindle from 22 to 4 or 5, with a diminished public institute role.

The parties are active in breeding and commercialisation, licensing in and out at both parental and hybrid levels. The investigation confirmed that these are two separate markets, with seed companies engaging in trading of parent and hybrid plants at the first stage, and distributors and cooperatives buying at the second stage (but not trading varieties, as in the first stage). This is also clear in that several companies/institutes are only present at one of the two stages. Companies often are organised so that these activities are separated out. The activities tend to be carried out in different geographic areas, as the climatic requirements are different. Neither is the trading of varieties purely ancillary to the production of seed, but is commercially significant in itself. There are no sub-segments within the sunflower seed market, as various hybrids seem quite substitutable and exert pricing constraints on each other. Fungicide and insecticide treatment of seeds constitute different markets. Geographically, the scope of the breeding market is Union-wide based on where actual out-licensing occurs and on the regulatory framework, although the market for commercialisation appears national in scope. The market for commercial seed is national, as farmers have a variety of local preferences, we can see prices differing across markets with little cross-shipping of seed, market shares differ significantly across national boundaries, and the regulatory framework differs slightly.

Innovation Concerns: The germplasm portfolio clearly is key to the long term success of a seed company, especially given the differentiation according to traits in recent years, and is the main rationale for the acquisition. Appropriate germplasm to the local climatic conditions also is important for entry. Breeding is crucial as the driver in the industry and is the most time consuming and resource intensive of the stages.

Monsanto is quite active (ranked number 1) in the market for trading varieties, while Syngenta is quite large (one of top two) in the market for commercialising seed. Indeed, since large seed commercialisation firms seem to have a large portfolio of germplasm, it is not surprising that they are less active in the market for varieties (and the reverse holds as well). Hence, there is a legitimate concern of input foreclosure if the merger goes through. Indeed, the combined entity would have the largest germplasm portfolio in Europe. Given the need for third party germplasm in creating new hybrids, this reduction in the incentive to license and perhaps the increase in license fees could impair others' activities. Several indicators were used to determine the strength of the combined entity in this area, including R&D expenditure, number of elite parental lines, number of molecular markers, and number of successful registrations of new hybrids. The combined entity appears to be in a leading position by all measures, including in sub-segments of the market (including the high oleic and variously resistant segments). The public institutes cannot step into the gap, as they have suffered funding difficulties and a change towards basic research that do not make them significant enough players on supplying parental lines or in breeding activities that are close to the market in general.

The reduction in trading activity could reduce the number of varieties in the final market, as well as create difficulties for smaller firms to compete at all (for lack of germplasm). Also, one could expect the combined firm to "cannibalise" any redundant varieties in its portfolio. Not only could one expect a price rise for access to germplasm from the combined entity, but also one could expect that less availability would result in entry barriers to greenfield entry – which would be effectively cut off. Public institutes also face the effects of increased royalties, of course (although the case notes that they license in very little already). Entry by those who do not have germplasm well-adapted to local conditions would need at least 10

years to develop it, whereas access via licensing could potentially shorten the development period to 3 to 5 years. Hence, large players that are planning entry will take a long time before exercising any competitive constraint, at the least.

Combining the R&D capabilities of the firms, given that Monsanto appears to be the competitive constraint in the submarkets analysed below, would appear to be likely to reduce innovation incentives.

Analysis of Submarkets (Spain and Hungary): Analysis of the Spanish market indicates that the two merging firms have been not only the top players in the market, but have been fierce rivals. The concentration would remove the competitive constraint now exercised in this market, particularly in the Orobanche resistant category, which is the crucial trait for Spain. Indeed, few players seem able to produce hybrids capable of resisting the most recent strain of Orobanche, and Monsanto seems to be one of the more innovative companies with capabilities in this area. While it has not traditionally been a strong player in the Spanish market, this has been changing recently, with increases in market share.

There does not appear to be significant enough buyer power in Spain to counteract the power of the suppliers. In particular, there would only be two players in Orobanche F resistance: the combined entity and Pioneer. The buyer power is nowhere near this concentrated.

For any particular market, of course, there are other entry barriers such as development of a sales force, regulatory barriers, reputational barriers (i.e., folks prefer to purchase from known sources) and so on. Indeed, no entry has occurred in Spain in the last decade, and increasing concentration has occurred instead.

Competitors and customers alike indicated concern in the areas we have isolated: innovation, variety, and price following the merger. Added to this is the concern about entry barriers and the fact that distributors felt that they could pass on any price increases to farmers and one concludes that there are concerns about the merger from the Spanish perspective.

The concerns in Hungary are broadly similar. An issue raised in Hungary is whether seed that has been licensed in should count as part of the market share of the licensor or the licensee. The case decides it should count for the licensee since the license contained no restrictions on selling strategy or method. Second, it rejects the argument that if a firm licenses in a product it is evidence that the firm is somehow weak in the market. First, licensing in is quite common to fill in gaps in product portfolios or otherwise supplement own breeding programmes. Second, licensing in can be thought of as a prelude to a more solid presence in a market, so it can be part of a strategy of entry or building strength.

The Hungarian portion of the report confirms that several varieties were withdrawn from the market after the combination occurred in 2009, and internal Syngenta documents referred to cannibalisation issues. As Monsanto has tended to be lower priced than Syngenta (although still premium quality, as Syngenta is), withdrawing these hybrids could lead to price rises. It also notes that single sourcing is discouraged, even by Syngenta, for farmers because of the increased risk it entails. With the combination there would only be three players in the Hungarian market. While concentration levels in general seem high in this case, the Hungarian market seems particularly concentrated.

Syngenta is a large player (80-90% market share) on the market for seed treatments, while Monsanto does not participate here at all. In terms of whether the combination would have any vertical effects in seed treatment, the case notes that seed treatments are “must have” products even if they don’t account for much of the seed’s cost. The treatments are not crop or country-specific, however, so that it is not clear that there is any increased incentive to foreclose after the merger. There is some generic presence and there is some possibility of retaliation to foreclosure in other crops, so there is not a great worry about this factor.

Remedy: As a remedy to the concerns in the case, the “improved remedy package”, reached after some bargaining, proposes to:

1. Divest a series of hybrids commercialised by Monsanto in 2009, 2010 in Spain and those by Monsanto in 2009 and Syngenta in 2010 where Monsanto germplasm has been used in Hungary, know-how related to production and commercialisation of these hybrids, production of those hybrids as a transition service for two or three years, all inventory of commercial seeds related to the hybrids and some other related services. Syngenta retains the right to commercialise these hybrids outside of Spain and Hungary, however.
2. Syngenta also divests the parental lines and pipeline/future hybrids relevant to Spain and Hungary and related to those listed under point 1. The purchaser would obtain the IP for all national IP, and for super-national IP would obtain a non-assert from Syngenta (which would retain these latter rights). Syngenta retains the rights globally for these with the exception of the Spanish and Hungarian markets.

While there are concerns that the scope of the remedy limits the pool of potential purchasers to those with already well-established breeding and commercialisation programmes, and concern that the number of lines is too small, as well as a concern that the markets to which the purchaser could sell are too restrictive (in particular, that they do not extend to Turkey, Russia, and Ukraine). The problem with restricted market sales is that breeding is very expensive and time consuming, so a large market is needed to amortise the expense.

IPIC(International Petroleum Investment Company)/MAN FERROSTAAL AG 2009 -- Comp/M.5406

Relevance of case to text: Theory of harm is a combination of capacity limitation and coordinated effects, both facilitated by licensing activities/Licensing as a means of controlling capacity expansion and acquiring normally confidential information on other industry participants/ licensing as a means of preventing the uncoordinated effects that could, in turn, limit the potential coordinated effects in the industry/Remedy is divestiture of a licensing business.

Background: IPIC wishes to purchase Man Ferrostaal. IPIC has control over AMI, which operates petrochemical plants for the production of melamine (among other things). Man Ferrostaal, among other things, builds turnkey industrial plants.

The main concern is the effect of the acquisition on the melamine market. High grade melamine appears to form a separate market from low-grade melamine based on demand-side price differentials and technical characteristics. Within this market, however, high grade

melamine is a commodity product used in a variety of industries including construction, automobiles, and furniture. Some of the producers use captively basically all they produce (BASF). The market is predicted to grow at about 5% per year. On the supply side, current high grade melamine producers can expand their capacity regardless of whether they produce using the low pressure technology (LPT) or high pressure technology (HPT). Three major producers exist in the EEA for high grade melamine: AMI, DSM, ZAP. BASF and Cytec operate at somewhat lower levels. Capacity utilisation is high (90-100%) for current producers in the EEA while in China it is lower (although this capacity is unlikely to have the capability to produce high grade melamine). Plants are built close to natural gas sources as the feedstock. New plants take a while to build, and plant extensions also take time.

Melamine has some shipping cost, apparently, as there is a lead time for shipments coming from outside the EEA and there can be price differences of about 10% between EEA regions.

Currently, producers of high grade melamine use either LPT (eg. DAM, BASF, AMI) or HPT (AMI). None of these producers licenses its technology. There are two technologies available for license, however: a LPT technology available from Tsinghua University/Lurgi and a HPT technology available from Eurotecnica. The Tsinghua University technology does not appear suitable for producing high grade melamine, but the Eurotecnica technology is. ZAP relies on licensing while AMI, DSM and BASF have their own proprietary technologies.

Technological Issues and Competition: Most plants built worldwide in the last decade have used Eurotecnica's technology. Man Ferrostaal, owing to its shares plus the way voting works in the firm, has control over Eurotecnica. In addition, the way the shareholders' agreement works at Eurotecnica is to require a lot of information on clients to be revealed. This means that if Man Ferrostaal and AMI, effectively, merge through this deal, any client of Eurotecnica's technology could potentially have sensitive information revealed to AMI – a major competitor in the melamine market. This information could also be used to obtain deals with clients that induce firms to accept joint ventures with AMI rather than compete with them. In other words, it would have the effect of making the market less competitive. Further, AMI as a competitor in the market might use its power at Eurotecnica to delay capacity addition by competitors. This would also potentially have negative effects.

Hence, the merger involves putting an input technology on which Eurotecnica has effectively a monopoly in the hands of a firm that holds a large market position (20-30%) and competes downstream. Further, the licensing contract would allow AMI access to information on cost and planned capacity increases as well as control over how these occur currently or in future. Note, too, that the dependence on Eurotecnica extends to maintenance or capacity extension within plants in current operation. The incentive to foreclose would depend on losing licensing revenue at Eurotecnica versus increasing downstream price in a market on which AMI is active. Even if there were a relatively modest effect on price, this strategy could pay according to empirical estimates.

Finally, the uncoordinated effects, as detailed above, open the door for coordinated effects in the sense that a competitive constraint on the coordination of two main players, AMI and DSM, is removed. Specifically, the market is relatively transparent on cost, transaction price, and contract structure (as contracts are published weekly). Incentives and ability exist for the two symmetric and large players in the market, AMI and DSM, to coordinate in the light of

AMI's ability to control any capacity expansion by other players that could challenge such coordination.

Remedy: IPIC submits a commitment to divest Man Ferrostaal's shareholding in Eurotecnica to remedy this. The usual riders apply to this, that the purchaser be financially viable and completely independent, that the seller not maintain any lien over the intellectual property of the divested entity, and that a trustee be appointed to monitor the process and continuation of the divestment. This is found acceptable by the Commission.

Intel/McAfee 2011 – Comp/M.5984

Relevance of case to text: innovation requiring integration that may also engender unfair advantages of merging firms –i.e., difficulty is to get innovation synergies without technical tying and interoperability degradation that would cause competitive concerns/merger of complementary areas/divestiture compared to licensing as a remedy in the commission's decision/ability of trustee to verify commitments/

Background: Intel develops and produces CPUs and chipsets. CPUs are the brains of computers, while chipsets connect the CPU to other components. There are two main CPU architectures (CISC and RISC), of which the x86 family uses CISC. CPU and chipsets need to be compatible, clearly, to function. AMD and Via design and sell CPUs but outsource their fabrication. Intel is integrated into manufacturing, however. McAfee develops and provides security services for a variety of devices. Security needs, at a minimum, complete interface information on CPU and chipsets to function and be optimised. Some embedding of security solutions in hardware may lead to more robust or faster security solutions. As security is necessary on most devices, McAfee and Intel operate in complementary areas both technologically and commercially.

The relevant CPU market is the worldwide market for x86 CPUs, with the main buyers being OEMs. Chipsets also have a worldwide market, although subdivisions according to whether an AMD or Intel CPU is used may exist. In any case, Intel's market share is very high in the market (certainly in excess of about 80%). The market for chipsets has consolidated drastically recently to three players, two of which (Intel and AMD) also provide CPUs. Security mainly refers to endpoint security, with potential segmentation according to whether basic or premium security is required, and with at least EEA wide scope. In endpoint security, McAfee's share is about 15%, behind Symantec (at about 35%). Three vendors (add Trend Micro to the other two) dominate the higher end security market and have OEM agreements, while the lower end includes a lot of free products (AVC, Avast etc.) and are available independently. CPUs and Chipsets are sold to OEMs, usually, while security is sold to OEMs, enterprises, ISPs, and via retail.

Barriers to entry into CPUs and chipsets are high due to sunk R&D and facility building costs and economies of scale that yield a high minimum efficient scale. Entry has occurred via licenses from ARM for CPU, from which derivative products have been developed. Competition is largely based on innovation, with payback periods only continuing until a more advanced product is released. Transistor density and CPU architecture are the main areas of innovation. Barriers to entry into the premium security segment are significant, but are low in the low-end market. Entry barriers comprise reputation, range of products,

services and support, including frequent updates and widespread threat detection. Network effects exist in detection, as more users increase the chances of detecting new malware. Significant R&D is necessary to support the premium segment.

Intel has regularly briefed security providers in the past so that software can be optimised to the hardware. The interaction can extend up to 5 years before (Intel) product introduction and occurs on a variety of levels of closeness.

Technological Issues and Competition: The concern is a monopoly leveraging argument: Intel can leverage its CPU/Chipset position into internet security by degrading interoperability, technical tying, commercial bundling or a combination of these, foreclosing the security market to competitors.

In particular, post-merger, Intel could optimise its hardware to McAfee specs and McAfee could have privileged access to CPU information, perhaps including delay or suppression of information previously disclosed. The first channel, of privileged access and design, would be difficult to diagnose and engineer around for competitors. The incentive to degrade interoperability with other security providers exists when McAfee is part of Intel whereas it did not before. Intel's dominant CPU position makes any damage to CPU revenues by switching very unlikely – so that its arguments that its strength depends on maintaining an open system do not necessarily apply. Innovation can be slowed by this process if McAfee (or Intel) competitors' revenues fall, as R&D could no longer be supported with less revenue. Backward compatibility does not exert sufficient limits on behaviour, as it is possible to add specific new code without breaking backward compatibility.

Finally, hardwiring security (essentially technical tying) could change the field of competition entirely, making software vendors uncompetitive. Current technology removes some of the space constraints that used to operate on CPUs so that this integration of security into the hardware seems quite feasible and difficult to unbundle by OEMs or others. Intel has some relevant patents to support the idea that it intends to integrate security into the hardware, as well as supporting statements and internal documents. To be fair, these documents and statements emphasise the importance of integration of hardware and software to tackle upcoming security and other problems in the optimal manner. They also may eliminate double marginalisation by essentially integrating products into the CPU/chipset. On the other hand, some argue that once the hardware enhanced security system is launched, the Intel-McAfee combination would have little incentive to continue innovating, given its likely dominance. Also, a "monoculture" of CPU/security would result in a single target for hackers, possibly reducing final consumer welfare by making security breaches actually more likely rather than less likely.

OEM bargaining power is not likely to be strong enough to counteract any bundling that does occur via negotiations (or via technical unbundling). The argument for incentives to commercial bundling seems relatively weaker than those for technical bundling; however, in combination with technical bundling and degradation of interoperability, commercial bundling could have some detrimental effect and certainly makes the case against the combination no weaker.

Remedy: Intel undertook commitments to remedy these concerns. These included ensuring instructions regarding interoperability for new CPU/chipsets functionalities (but not for

technologies developed jointly with McAfee), would not degrade its performance when operating with non-Intel CPUs, to make the security engine in the hardware accessible to competitors so that they could try to combine it with their own security solutions. Interoperability commitments would be valid for 5 years and technical tying commitments for three.

The response states that divestiture is the preferred remedy (or at least the benchmark against which others are evaluated in terms of effectiveness and efficiency). In this case, where key technology and IP right control may lead to foreclosure and where interoperability must be assured for continued viability of competitors, granting access to competitors may be appropriate. In such a case, non-exclusive licenses or disclosure of information should be implemented. Further, the pricing should be clear, transparent, and should in preference be royalty free. Such commitments should only be acceptable if they are effective and likely to be used. Finally, there is a hesitation to do anything as drastic as denying the possibility to provide hardware embedded security as this would, indeed, hamper innovation in this market.

The case then details a variety of complainant requirements to clarify and make more precise the interoperability and technical bundling remedies, which were too vague as stated in the original commitments. Intel improves the commitments in this area, and removes the exception to the interoperability commitment for merger-specific innovations. The new interoperability requirement has been clarified to the point of being verifiable by a trustee. For technical tying, the agreement duration is extended to 5 years, could be disabled by OEMs and the scope is widened to include a variety of security solutions. A trustee is appointed and dispute settlement procedures established. As commercial bundling was largely only a concern in the presence of interoperability or technical tying concerns, there was no need for it to be addressed specifically.

European Commission

Assessment of Potential Anticompetitive Conduct in the Field of Intellectual Property Rights and Assessment of the Interplay Between Competition Policy and IPR Protection

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The interface between competition policy and intellectual property rights is of growing importance. A main aspect of this interface, addressed in the Technology Transfer Guidelines, is the type of licensing agreements that might have significant anti-competitive effects. This report provides an economic analysis of such agreements, focussing on cross-licensing, patent pools, grant-backs, pass-throughs and the use of licensing and IPR divestment as merger remedies.

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