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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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Disclaimer

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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 that 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 no-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. 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.

Outline

1. INTRODUCTION: THE INTERFACE BETWEEN PATENT AND COMPETITION POLICY 10

2. CONTRACTUAL AGREEMENTS 11

a. Licensing - background 11

b. Patent “Thickets 12

c. Cross-licensing 17

d. Patent Pools 21

e. Empirical Approaches to the Measurement of Patent Thickets 33

f. Grant-backs 38

i. A Brief History of the Antitrust Treatment of Grant-back Clauses in Europe and the US 40

ii. Economic Analysis: Grant-backs and Innovation 48

iii. Efficiency Arguments in Favour of Grant-back Clauses 51

iv. An Economic Analysis of the “but for...” Defence of Grant-back Clauses 53

PART I: EX POST ANALYSIS 54

PART II: EX ANTE ANALYSIS 61

PART III: DOES LICENSING INCREASE THE LIKELIHOOD OF LICENSEE INNOVATION? 64

v. Consistency 66

vi. Economic Analysis: Grant-backs and Exclusion 67

g. A Remark on Open Source 69

h. Pass-through 70

3. MERGER CONTROL 77
a. Complementary IP rights 77
b. Substitute IP Rights and Other Issues Raised by Cases 80
c. Remedies 82
d. The EU Experience 82
e. Divestment 87
f. Licensing 93
g. Conclusions 94
4. SUMMARY AND CONCLUSIONS OF THE REPORT 95
5. References 103
6. Appendix 1: A Model Of Grant-Back Clauses 111
7. Appendix 2: Some Illustrative Merger Cases 131

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 elsewhere[1] – 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 IPRs[3]. 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 multi-lateral agreement. Indeed, the difficulties encountered within standard-setting organisations themselves[5] 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 use[7] 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 afterthought[8]. 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 rights[10]. 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 conduct[11]. 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 research[12]. 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 excusive, 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 not[13].

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 useful[14].

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 that 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 upon[16].

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 that 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 members[17]. 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:

$$B \equiv (C^{U} + C^{D})S$$

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

$$S \equiv \frac{\sum_c A^{ic} A^{jc}}{\sqrt{\sum_c A^{ic}} \sqrt{\sum_c A^{jc}}}$$

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 concentrated[18]. 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 count[19].

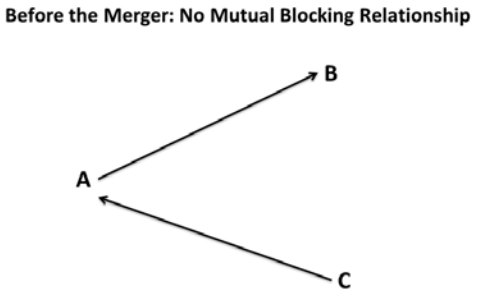

Figure 1: No Mutual Blocking

[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.

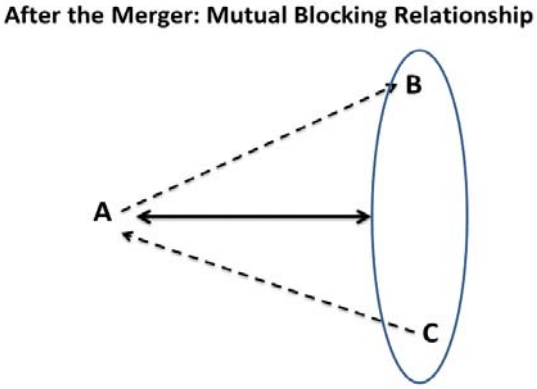

Figure 2: Mutual Blocking

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 anyway[20].

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 them 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 whole[21].

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 clauses[22]. 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 payments[25]. 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 *Boussois/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 competition[26]. 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 term[27].

[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 made[30]. 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 already[31]. 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 question[32]. 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 circumstances[33].

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 cases[34], even though the decision received considerable criticism[35]. 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 itself[36]. 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 licenses[38]. 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."