Coordinated Effects in Merger Cases[1]

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Abstract

Mergers can give rise to two types of anticompetitive effects: unilateral effects and coordinated effects. The latter arise if after a merger, firms can increase their market power by coordinating their actions. The objective of this Report is to explain what coordinated effects are and how they can be identified, our ultimate aim being to offer practical guidance to antitrust agencies in their analysis of mergers. We review the economic meaning of collusion, and assess the factors that allow firms to reach and enforce collusive outcomes. We also review some approaches for quantifying coordinated effects, and provide an overview of European mergers cases involving coordinated effects.

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1. Introduction and Summary

Merger control is one of the pillars of antitrust policy. It is necessary in order to ensure that anticompetitive mergers - that is, mergers which lead to a price increase, lower production, less variety, fewer innovations, etc. - do not take place. There are two mechanisms whereby mergers can give rise to anticompetitive effects: unilateral effects, and coordinated effects.

The concept of *unilateral effects* refers to a situation where the merger allows the merging firms to unilaterally - that is, independently of the reaction of the remaining competing firms - increase their market power: because of the lower competitive constraints (a merger reduces the number of independent competitors in the industry), firms which would not have increased their prices (or reduced production, etc.) may find it profitable to increase them after the merger, even if all other firms' prices remained unchanged.[2]

The concept of *coordinated effects* refers instead to the fact that after the merger it will become more likely that the merging firms *and* (at least an important subset of) their rivals will increase their market power by coordinating their actions. In other words, the term "coordinated effects" indicates the higher probability that after the merger the main firms in the market will reach a (tacit or explicit) collusive outcome or - if collusion was already taking place - would strengthen such an outcome, for instance by managing to reach higher collusive prices, or by making collusion more stable.

This Report deals with coordinated effects of mergers, and its objective is to explain what they are and how they can be identified, our ultimate aim being to offer practical guidance to antitrust agencies in their analysis of mergers.

[2]It is important to note though, that *after* the merging firms increase their prices (or reduce their output), rival firms will modify their decisions in turn. However, the overall effect will generally be anticompetitive.

What is collusion?

Since a full understanding of collusion is fundamental to explain coordinated effects, in Section 3 we draw on the theoretical and empirical economic literature to answer two basic questions: 'what is collusion?' and 'what facilitates it?', which will later be at the basis of our policy implications for the analysis of coordinated effects in mergers.

In this part, we shall explain that collusion arises when firms are able to coordinate on high prices and sustain them over time,[3] under the fear that deviations from the agreed behavior would trigger periods of intense rivalry. Collusion is thus composed of two main mechanisms: (i) *coordination* (which often, but not always, involves some form of *communication*) and (ii) *enforcement* (or s*ustainability*).

For simplicity, consider first the role of enforcement and to do so imagine that coordination is not an issue. Suppose firms *know* what the collusive price is - either because they have communicated with each other and discussed what the optimal price is (in this case, this would be explicit collusion) - or because for some reasons they have found a way to understand each other without communication (this would be tacit collusion). Still, despite the ability to coordinate it is far from clear that firms will be able to achieve the collusive price. Each firm will probably be tempted to slightly undercut the collusive price (that is, to *deviate* from the collusive action) so as to increase its share of the market and its profits - to the detriment of the rivals. However, a firm will understand that after its deviation sooner or later the rivals will realize that someone has deviated and they will *retaliate* or *punish* the deviation, by decreasing their prices in turn, perhaps triggering a long price war during which all firms have little profits, or even losses. Each firm will therefore carefully consider the trade-off between sticking to the collusive action or

[3] Competitive prices may already incorporate a mark-up over marginal costs. This is the case in all oligopolistic models, except for the Bertrand model of price competition and perfectly homogenous goods. Hence, prices above marginal costs do not necessarily reflect a collusive outcome.

deviating from it, the latter implying getting some temporary additional 'deviation' profits followed, however, by lower profits during the 'punishment' period.

Therefore, a collusive outcome can be sustained only if all firms find it privately convenient not to deviate. Clearly, the quicker and more efficient the ability to monitor each other, and the more timely, credible and strong the punishment following a deviation, the more likely that the collusive outcome can be sustained.

Now consider mechanism (i), namely the role of coordination, and for simplicity suppose that a collusive outcome would be sustainable. If firms do not understand each other in the first place, and do not know what the collusive price is supposed to be, collusion (a) may not deliver very high profits, or (b) may even be at risk.

To understand (a), note that without communicating with each other, it is not clear which price - among all the feasible ones - firms may reach. If each of the two firms is convinced that the rival thinks the collusive price should be, say, $100, such a collusive price will emerge - provided of course that the sustainability conditions are satisfied (that is, monitoring is timely and a strong punishment is credible). But if each firm is convinced that the collusive price should be $50, then - again provided sustainability conditions are satisfied - the market price will turn out to be $50. And so on for any other feasible price: economic theory suggests that any price between marginal costs and joint profit maximization price could be a feasible outcome. This illustrates the first important role of communication, which is to allow firms to coordinate on the (jointly) optimal among all the feasible collusive prices: if they could talk to each other, and if $100 was the highest mutually convenient price, firms would coordinate on such a price.

To understand (b), consider a situation in which firms have so far sustained a collusive price of, say, $100. But now there has been a demand or cost shock, so that market conditions are different and the collusive price would have to be lower. If firms do not talk to each other (and if they are not absolutely certain that the shock affects them in

exactly the same way) or have no other way to coordinate their actions, it is likely that collusion might break down. For instance, when one of the two firms decreases its price to, say, $80 so as to adjust to the new market situation, the rival may misunderstand this price cut as a `deviation' and may react by triggering a price war, choosing a price lower than $80. Should instead they be able to talk to each other, the two rivals would exchange views about what the appropriate price should be after the shock, and would certainly avoid price wars which would be triggered by `misunderstandings'.

This also explains why in reality colluding firms often want to talk to each other even if they know very well that collusion may arise even without communication, that is, without being explicit.

When antitrust authorities are concerned with cartels,[4] the focus of their investigation will be on explicit collusion, and hard evidence on rivals communicating to each other is necessary to prove an infringement. Under the analysis of coordinated effects in merger control, instead, antitrust authorities do not have to establish explicit collusion, but coordination may still play a crucial role.

Which factors facilitate collusion?

For the above reason, when analyzing an industry, it is important to identify factors which facilitate collusion not only by making sustainability more likely, but also by favoring coordination among the firms. Fortunately, though, in general, factors which make collusion more sustainable also make it easier for firms to coordinate, as appears from our analysis of facilitating factors in Section 3.3.

Indeed, the next step of our analysis is to identify those factors and variables that -

[4] The relevant provisions being, for instance, article 101 of the EU Treaty in Europe on anticompetitive agreements, and Section 1 of the Sherman Act in the US, on conspiracies.

by making sustainability and/or coordination easier - will also facilitate collusion, and which therefore may give rise to coordinated effects.

In the Report, we classify these factors in four broad categories: supply factors, demand factors, those that affect firms' ability to communicate and exchange information, and those related to corporate governance issues.

For instance, on the supply side, high market *concentration* means that few firms have market positions which really matter, implying that coordination will be easier (intuitively, the more parties the more difficult to "agree") but also that collusion is more likely to be sustainable (a firm with a larger market share will have less incentive to deviate and lower prices, because by doing so it loses profits on a larger inframarginal number of units).

Symmetry among market shares, capacities, and technological capabilities, will make sustainability easier because no firms will have a stronger incentive to deviate, and it will also make coordination easier, because the colluding firms will know that any shock will have a similar impact on all of them, thereby implying that they will tend to react in the same way to the shock.

Barriers to entry and/or to expansion of operations may help coordination in the sense that it is more difficult that after a shock a new understanding is necessary with other players, but more importantly they make higher collusive prices more likely, because a price rise will not be likely to invite entry from new competitors. For similar reasons, an *inelastic market demand* and *lack of countervailing power* from buyers makes collusion more 'detrimental'. That is, when buyers are more powerful, they will also make monitoring more difficult, since they will likely extract better prices from suppliers through secret negotiations.

On the demand side, a *stable demand* will make the market more transparent (it will be easier to identify a deviation) and will also make it less likely that there will be demand

shocks which oblige the firms to reach new terms of coordination.

Frequent market interactions and *regular orders* also make sustainability of collusion easier, because the reaction to a deviation will occur more quickly when firms meet frequently in the market, and because if there were occasional orders of large magnitude a firm may have the temptation to deviate so as to get these large and unusual orders and will fear less a future punishment which will regard relatively smaller orders.

Among other factors which facilitate collusion, *transparency of information* among rivals plays a crucial role. When competitors are able to exchange price and quantity data about past transactions (for instance when trade associations organize a reliable system of *exchange of information*), especially when such data are disaggregated, individualized and recent, they will be able to monitor each other, thereby making collusion more sustainable.

But situations in which firms are able to exchange information about future prices and outputs (without this information being available to consumers or without having any commitment value towards them) are also of extreme help to collusion, because they make firms able to interpret each other's wishes and therefore to coordinate their conduct when they face shocks.

Last, regarding corporate governance factors, *cross-ownerships* tend to make sustainability of collusion easier because each firm internalizes that a deviation will hurt the other partly-owned firm - whose profits contribute to shareholders' gains. Also, like *cross-directorships* and *joint ventures*, they may offer opportunities for competitors to talk to each other, thereby making coordination easier.

Coordinated effects in practice

The analysis of collusion and of the factors which facilitate it is the building block for the analysis of coordinated effects in mergers, and provides us with important hints on how to

conduct such analysis in *practice*. Whenever an agency is facing a merger, it will have to make an analysis of the market, to gather hints as to whether the merger may raise unilateral effects, or coordinated effects, or whether it raises no danger of increased market power. When conducting such an analysis, some hints of whether coordinated effects may be relevant at all could be obtained by looking at very *simple indicators*.

In principle, all factors indicated above may represent a useful first screening device, but in our opinion the following will be especially important. First, we believe that, in general, tacit collusion is unlikely to arise unless after the merger there will be two or three firms with a very important share of the market (say, more than 70%), and there will be considerable symmetry among them.

Second, a motivated suspicion of strengthening of coordinated effects should arise whenever one discovers that the industry has a past history of collusion (for instance, cartels have been investigated following suspicious conduct, or successfully prosecuted, perhaps also in similar or adjacent markets), when firms have developed a web of relationships (joint ventures, purchasing and/or distribution agreements, cross-directorates etc.), when they have established a system of exchange of information (or other price schemes which allow to improve monitoring), or when suspiciously parallel price movements have taken place over time (in this respect, we shall explain in Section 4.2 that there are a number of relative simple collusive `markers' or `screens' one may want to look at).

In all such cases, a coordinated effects investigation would be justified. In such an investigation -which we presume will not occur with high frequency- the agency should study the market more in depth. It should look, in particular, at the factors analyzed above, and possibly rely on a variety of sources of information, such as customer surveys, interviews with current and prospective rivals, with distributors, internal documents from the merging parties, and - if resources and data permit- undertake an empirical analysis of

past prices.

In particular, during the investigation, one should really try to understand to what extent a collusive outcome may be sustained in the industry: is the market transparent enough on the suppliers' side for monitoring of deviations to be timely? And is there a credible punishment mechanism?

Coordinated effects in European merger control

Since we believe that the analysis of past policy and cases are fundamental to better enforce competition policy, we devote a part of our Report (Sections 5 and 6) to the issue of how coordinated effects have been applied in European merger control, both in general and through a description of the most topical EU cases.

The analysis of coordinated effects has been extremely important in European merger policy. Originally, the EU Merger Regulation 4064/89 -no preventive authorization system for mergers was in place before 1989- stated that mergers which would *create or strengthen a dominant position* (defined as the ability to behave to an appreciable extent independently of rivals and customers - and effectively amounting to the possession of very large market power) would be declared incompatible with the common market. The relevant test for mergers did not necessarily coincide with a substantial lessening of competition test, as conceivably there may be mergers which lead to higher prices without creating dominance, and possibly also vice versa, if efficiency gains are not properly taken into account, and, until recently, in Europe they were not.

Indeed, the European Commission soon realized that there were mergers which appeared to be anticompetitive even if they did not give rise to a (single-firm) dominant position. To see why, consider for instance an industry where two firms having a 20-25% market share each decide to merge, and they face a firm that has a 50% market share. The presence of a rival which is no smaller than the merging entity would make it impossible to

prohibit the merger on the grounds that it would create a dominant position, yet the creation of such a concentrated market would likely increase market power (unless strong efficiency gains would follow from the merger). To cope with such situations, the European Commission borrowed from the existing jurisprudence the concept of *collective dominant position* (or joint dominance), which was then applied to several cases (in an increasingly extensive manner), and which was arguably used as a way to address possible anticompetitive situations, perhaps also beyond the concept of coordinated effects.

After some initial case law which was hardly clarifying, in the landmark *Airtours* case the Court of First Instance - whose judgment was in full accordance with economic theory- clarified that the concept of collective dominance in mergers coincides with the concept of coordinated effects, and established that the Commission could prohibit a merger on this ground only if it could prove that the merger was very likely to create or reinforce collusion in the industry.

This judgment was later confirmed by the European Court of Instance in *Impala*, and the Commission's own Horizontal Merger Guidelines (HMGs) are now based on the principles indicated by *Airtours*, and are fully consistent with what economic analysis would suggest. To challenge a merger on the basis of coordinated effects, the Commission has to proceed in three steps.

First, it has to conduct a detailed analysis of the market -which would typically touch upon the facilitating factors we have delineated above- and show that *coordination* among firms in this industry is very likely.

Second, it has to show that *sustainability* of collusion in the industry is very likely. For this purpose, the Commission will have to show that (i) the market is very transparent on the suppliers' side, so that they can monitor in a timely way possible deviations; (ii) there exists a credible retaliatory mechanism, for instance, firms would hold sufficient production capacities to trigger a decrease in market prices; and (iii) it is unlikely that

outsiders could be an obstacle to a price increase, that is, that there exists little buyer power and that there are important barriers which would impede new entrants into the industry, or which would prevent existing small rivals to expand their business successfully.

Finally, the Commission should convincingly argue that the merger is likely to change market outcomes, in the sense that it would either create the conditions for (tacit or explicit) collusion to exist, or -if collusion already exists or there is a strong suspicion it does- that it would make collusion more stable and/or the firms likely to coordinate on even higher prices.

The last part of the Report (Section 6) contains a brief description of the most relevant EU merger cases in the domain of coordinated effects. We believe that this analysis helps emphasize the importance of an accurate economic analysis, and offers some helpful suggestions on how to conduct coordinated effects investigations in practice. It also stresses that the analysis of coordinated effects is often very delicate and complex, that failure to understand how the industry works may lead to important mistakes, and *a contrario* that the in-depth study of the market may help discriminate among situations which at first sight may appear identical (see for instance the recent case *ABF/GBI*, which also helps illustrate how the Commission applies the Guidelines).

Structure of the Report

The rest of the Report is structured as follows. Section 2 describes the potential anti-competitive effects of horizontal mergers: unilateral and coordinated effects. Section 3 addresses the main questions that need to be explored in an assessment of coordinated effects: whether collusion in the ex-post merger market would be sustainable (enforcement problem), whether firms would be able to reach a mutual understanding or agreement (coordination problem), and whether the merger would relax both problems, thus facilitating collusion. Section 4 reviews some approaches which should help identify

coordinated effects and "quantify" their relevance in practice. Sections 5 and 6 describe respectively the evolution of the policy on coordinated effects in European Merger control, and discuss the most important cases in the EU jurisprudence. Section 7 concludes.

2. Mergers and Collusion

2.1 Anti-competitive effects of horizontal mergers

Unilateral versus coordinated effects

A merger between competitors - known as a horizontal merger-[5] might give rise to an increase in prices and thus be anti-competitive. This might be due to two distinct effects: unilateral and coordinated effects.

To illustrate these effects, consider a set of single-product firms selling substitute products. An increase in the price of one product translates into an increase in the sales of another. However, this positive externality is not taken into account by firms when setting their prices given that the increase in sales benefits rival firms. A merger between two firms would allow them to internalize such externality and, absent any cost synergies,[6] would induce them to push prices up. This holds true regardless of the reaction of the outsiders. If such firms optimally react by also increasing their prices, the *unilateral effects* of the merger would be enhanced.[7] This leads to a new outcome in which all firms end up

[5] Unless explicitly mentioned, through the report we focus on horizontal mergers among producers. Similar principles also apply to horizontal mergers among buyers, who have an incentive to reduce demand and lower prices. However, mergers among buyers can lead to a distinctive feature, namely, buying power, whose impact on coordinated effects is discussed in Section 3.3. Coordinated effects in vertical merger cases are also discussed in that section.

[6] Horizontal mergers can also generate efficiency gains. If such gains are sufficiently strong, they might offset the anti-competitive effects of mergers. See Farrell and Shapiro (1990) for a formal analysis. In Section 3.3 we also discuss the effect of cost asymmetries on coordinated effects.

[7] This effect is shared by all models with "strategic complements", e.g., in which the marginal profit of increasing one's price is higher the higher the price charged by the other firms. This does not hold true in the

charging higher prices than before the merger, with the merged firm charging relatively higher prices than the non-merged firms.

Firms could also sustain higher prices after a merger by coordinating their actions. A merger leads to *coordinated effects* if it makes it more likely that the merging firms *and* ,at least an important subset of their rivals, increase their market power through coordination. In other words, the term "coordinated effects" indicates the higher probability that after the merger the main firms in the market will reach or strengthen a tacit or explicit collusive outcome.

In general, unilateral and coordinated effects tend to be mutually exclusive. For instance, coordinated effects are clearly not present in a merger from duopoly to monopoly, as with a single firm there is trivially no risk of collusion.[8] Furthermore, as discussed in the next section, a factor that enhances the merging firms' incentives to unilaterally increase prices would tend to make coordinated effects less likely. This is so since, for the merging firms, coordination becomes less profitable relatively to the competitive benchmark, thus strengthening their incentives to disrupt the agreement. In contrast, a merger that induces a more competitive outcome -thus removing any concerns over its unilateral effects- would make coordination relatively more attractive.

However, it is not always clear at first sight which of the two effects dominates. And there are cases where the antitrust authority may want to seriously investigate both unilateral and coordinated effects, for instance when the industry would turn out to be very concentrated after the merger but it is not a priori clear whether the few remaining firms

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presence of "strategic substitutes", e.g., when the marginal profit of increasing one's quantity is higher the lower the quantity produced by the other firms. In particular, when firms compete by choosing output, the outsiders react by expanding their output after the merger. However, the overall effect of the merger is an output contraction, given that the merging firms' output reduction is stronger than the outsiders' output expansion.

[8] See for instance the decision on the merger between Ryanair and Airlingus, which was prohibited by the European Commission. (Very recently, in September 2012, Ryanair has again announced it intends to merge with Airlingus.)

have unilateral or coordinated incentives to increase prices.[9] For this reason, it is often necessary to conduct a careful assessment of both unilateral and coordinated effects.

Coordinated effects in Europe and the United States

The impact of mergers on the likelihood of collusion has been a major concern of antitrust authorities since the inception of merger control. Indeed, unilateral effects concerns were first mentioned in the 1992 US Horizontal Merger Guidelines (US HMGs),[10] whereas the 1984 US HMGs already noted that *mergers should not be permitted to create or enhance ´market power' or to facilitate its exercise,* and *where only a few firms account for most of the sales of a product, those firms can in some circumstances either explicitly or implicitly coordinate their actions in order to approximate the performance of a monopolist.* In an important antitrust case in 1986,[11] Judge Richard Posner echoed this view when he wrote that the *ultimate issue*" in reviewing a merger under antitrust law is "*whether the challenged acquisition is likely to hurt consumers, as by making it easier for the firms in a market to collude, expressly or tacitly, and thereby force price above or farther above the competitive level.* Concerns over coordinated effects are also present in the most recent 2010 version of the US HMGs, which state that "[*A*] *merger can result in market concentration sufficient to strengthen such* [*rivals'*] *responses or enable multiple firms in the market to predict them more confidently, thereby affecting the competitive incentives of multiple firms in the market, not just the merged firm.*" (Section 7 of the US HMGs).

Similarly, as we shall see in Section 5, the European Commission has taken into account the

[9] One such case is *FTC v. CCC Holdings et al.* Our reading of this case is that the FTC decided to bring both arguments to Court but privileged the hypothesis of unilateral effects, relying also on quantitative evidence. The judge (in our view surprisingly) dismissed the FTC's unilateral effects analysis but eventually blocked the merger on coordinated effects grounds (where the evidence was less clear-cut).

[10] See Coate (2005: 285).

[11] Hosp. Corp of Am. versus. Federal Trade Commission.

potential collusive effects of mergers, at least since its ruling over the Nestlé/Perrier merger case in 1992. Since coordinated effects were not explicitly contemplated in the initial European Merger Regulation,[12] the Commission first drew on the notion of a dominant position *by one or more undertakings* contained in Article 86 (current Article 102) of the original EC Treaty. This notion was referred to as *collective dominance* and was used in a number of important merger decisions up to the publication of the European Horizontal Merger Guidelines (EU HMGs) in 2004. These guidelines introduce the distinction between the unilateral (or non-coordinated) effects and the coordinated effects of mergers, and define the latter as follows: a merger may change *"the nature of competition* [*making firms*] *significantly more likely to coordinate and raise prices or otherwise harm effective competition. A merger may also make coordination easier, more stable or more effective for firms*... (paragraph 22).[13]

Coordinated effects have been at the heart of several merger cases in the United States and Europe. For instance, in 2003 the US Department of Justice blocked the proposed acquisition of Morgan Adhesives by UPM-Kymmene Oyj; in 2004, the Federal Trade Commission unsuccessfully challenged the acquisition of Triton Coal Company by Arch Coal; and more recently, in 2009 the FTC succeeded in blocking the merger between CCC Information Services and Mitchell International.[14] In Europe, as we shall explain in

[12] Council Regulation (EEC) No 4064/89 of 21 December 1989 on the control of concentrations between undertakings, Official Journal L 395, 30/12/1989.

[13] The section on coordinated effects in the EU HMGs (paragraphs 39 through 57) is divided in four chapters: Reaching terms of coordination, Monitoring deviations, Deterrent mechanisms and Reactions of outsiders, reflecting that the notion of coordinated effects in Europe is firmly grounded in economic principles.

[14] See United States v. UPM-Kymmene Oyj, Raflatac, Inc., Bemis Company, Inc. and Morgan Adhesives Company; Statement of the Commission in the Matter of Arch Coal, Inc., et al.; and FTC v. CCC Holdings INC, et al.

Section 5, the policy on coordinated effects (or rather we should say on 'joint dominance', using the EU legal jargon) has been extremely important in EU merger control. Indeed, there exists an extensive list of merger decisions, the most important ones being reviewed in Section 6.[15]

In sum, there is consensus both in Europe and in the US that coordinated effects refer to the impact of a merger on the incentives to tacitly or explicitly collude. For this reason, we next turn to the economic analysis of collusion for the assessment of coordinated effects.

3. Understanding Collusion to Bring a Coordinated Effects Case

3.1 Preliminary considerations

To assess whether a merger would create coordinated effects, one should address the following three questions:[16]

1) Would collusion post-merger be possible and sustainable? [*enforcement problem*]
2) Would firms be able to reach a collusive agreement and adapt it to the possibly changing market conditions? [*coordination problem*]
3) Would the merger enhance the likelihood of collusion? [*coordinated effects*]

The first question refers to the *enforcement problem*: for collusion to be sustainable,

[15] Coordinated effects cases are also important at the national level in Europe, and we shall occasionally refer to some of them, although we focus on the mergers which fell within the jurisdiction of the European Commission: national competition policy is largely modeled after the decisions of the Commission and of course the jurisprudence of the Community Courts. For an example of a national case involving coordinated effects, see the merger between Unión Femora and Gas Natural, analyzed by the Spanish Competition Commission in 2007.

[16] In line with this approach, the EU Hags state that "[t]*he Commission examines whether it would be possible to reach terms of coordination and whether the coordination is likely to be sustainable. In this respect, the Commission considers the changes that the merger brings about*" (paragraph 42).

firms must find it in their own interest to respect the collusive agreement. The stability of collusion in the ex-post merger market is therefore a necessary condition for the merger to give rise to coordinated effects.

However, it is not sufficient: the fact that firms could sustain collusion does not mean that they actually succeed in doing so.[17] For the market outcome to be collusive, it is also necessary that firms solve a *coordination problem*, i.e., they have to agree on which strategy to follow, which price they want to set or which level of output they want to produce, how they will adapt it to changes in the market environment, among many other dimensions of the agreement. The coordination problem might be particularly acute when firms are asymmetric or when they sell differentiated products, as such features may give rise to a conflict of interests among them. Instead, communication among firms might allow firms to more effectively solve the coordination problem. These issues are addressed by the second question above.[18]

There is often a positive link between the circumstances that make collusion more easily enforceable, and those that facilitate coordination on a collusive equilibrium.[19] For instance, as we discuss below, enforcing collusion and coordinating on a collusive equilibrium is easier the smaller the number of firms. However, enforceability does not

[17] Even when collusion is sustainable, there are typically many outcomes that firms could end up reaching, which involve lower equilibrium profits, e.g. the equilibrium at the competitive benchmark. Firms might also have conflicting interests as to which equilibrium to play, or as to how to adapt it to changing market conditions.

[18] While policy discussions tend to put most emphasis on the coordination problem, the standard modeling approach focuses on the enforcement problem. Indeed, economic theory provides many insights on the nature of collusive equilibria, but says little on how firms coordinate (or not) on a particular collusive equilibrium, and on which one. There are some recent exceptions. See Harrington (2012b) and Lu and Wright (2010) for analyses on how firms reach a mutual understating through price leadership and price matching. See also discussion in Section 4.3.

[19] As Harrington (2012a) notes: "*conditions for a firm to optimally initiate collusion are, to some degree, dual to the conditions for a firm to optimally sustain collusion.*"

imply coordination, or vice-versa, i.e., there might be contexts in which coordination is possible and yet collusion is not enforceable, or vice-versa.

Answering the first two questions allows to assess whether the merger would give rise to coordinated effects. On the one hand, one could argue that the sustainability of collusion and firms' ability to coordinate on a collusive equilibrium are not sufficient to prohibit a merger on the basis of coordinated effects. For instance, if firms already collude in the pre-merger market structure, one could be tempted to conclude that the merger does not have any incremental effect on collusion. However, whereas this might be a possibility in economic models under particular assumptions,[20] it is unlikely to hold in practice. If collusion took place before the merger, most likely the merger will enhance it, by making it more stable (there would be a lower risk that a shock might result in a breakdown of collusion) or permitting firms to reach higher prices among the sustainable collusive ones.

Therefore, if the first two questions indicate evidence of collusion before the merger takes place, then the merger should not be allowed on the basis of coordinated effects.

Perhaps the only caveat in this respect is a *de minimis* argument. Indeed, one might argue that a merger between two small competitors is unlikely to further enhance coordination even in markets where collusion was already sustainable. Even in this case, though, one may object that allowing a merger between small firms may lead to other such mergers which would eventually result in a much more concentrated industry.

In the next sections we first define the term "collusion" and describe the mechanisms by which firms can make it sustainable over time. We then examine the factors that facilitate collusion by relaxing the enforcement and the coordination problems. Last, we finally turn

[20] For instance, if the discount factor is very close to one (see Box 1) and if coordination problems are assumed away, then collusion on the monopoly outcome will be possible regardless of the number of firms.

to the issues that need to be examined when evaluating the coordinated effects of horizontal mergers.

3.2 What is collusion?

Tacit versus explicit collusion

For economists, collusion arises when firms are able to sustain prices above some competitive benchmark,[21] under the fear that deviations from the agreed behavior would trigger periods of intense rivalry. Thus, economists put the emphasis on the market outcome and the incentive structure supporting it, regardless of whether firms achieve such an outcome through either *tacit* or *explicit* collusion. Instead, lawyers, judges, and antitrust authorities are concerned about the means by which firms reach and sustain a collusive outcome. As Joseph Harrington puts it, *there is a gap between antitrust practice -- which distinguishes explicit and tacit collusion -- and economic theory -- which (generally) does not.*[22]

In most jurisdictions, only explicit agreements, for which there is hard evidence of communication, are considered illegal. In contrast, tacit collusion is generally not considered as a violation of antitrust law.[23] , [24] However, both explicit and tacit collusion

[21] It is important to stress that the competitive price may already incorporate a mark-up over marginal costs. This is the case in all oligopolistic models, except for the Bertrand model of price competition and perfectly homogenous goods. Hence, prices above marginal costs do not necessarily reflect a collusive outcome.

[22] See Harrington (2005) `The Collusion Chasm: Reducing the Gap Between Antitrust Practice and Industrial Organizational Theory', Slide 7, CSEF-IGER Symposium on Economics and Institutions. For a discussion on the distinction between the economic and legal approaches to collusion, see for instance Kaplow and Shapiro (2007).

[23] See Motta (2004) and Mezzanotte (2009) for a discussion.

[24] In the UK, the instrument of market investigations might allow the authority to intervene in industries characterized by tacit collusion.

are taken into account when assessing the coordinated effects of horizontal mergers. Indeed, a merger might potentially facilitate cartel formation as well as give rise to conditions that relax the enforcement problem faced by firms when colluding either explicitly or tacitly.

For instance, the 2010 US HMGs argue that "[a] *merger may diminish competition by enabling or encouraging post-merger coordinated interaction*", and define the term "coordinated interaction" as follows: "*Coordinated interaction can involve the explicit negotiation of a common understanding of how firms will compete or refrain from competing. Such conduct typically would itself violate the antitrust laws. Coordinated interaction also can involve a similar common understanding that is not explicitly negotiated but would be enforced by the detection and punishment of deviations that would undermine the coordinated interaction....Coordinated interaction includes conduct not otherwise condemned by the antitrust laws*."[25] Similarly, the 2004 EU HMGs state that a *merger in a concentrated market may significantly impede effective competition...because it increases the likelihood that firms are able to coordinate their behavior in this way and raise prices even* without entering into an agreement.[26] Accordingly, the assessment of coordinated effects through merger control can constitute a powerful ex-ante tool to deter cartel formation as well to fight tacit collusion. The latter is particularly relevant given the difficulties in fighting *tacit* collusion ex-post.

[25] The 2010 US Merger Guidelines add an apparently new type of collusion: "*Coordinated interaction alternatively can involve parallel accommodating conduct not pursuant to a prior understanding. Parallel accommodating conduct involves situations in which each rival's response to competitive moves made by others is individually rational, and not motivated by retaliation or deterrence nor intended to sustain an agreed-upon market outcome*". Harrington (2012a) criticizes this addition to the US HMGs, as the so called "parallel accommodating conduct" requires of "retaliation or deterrence" just as any other form of collusion.

[26] EC Horizontal Merger Guidelines, paragraph 39, emphasis added.

How can firms sustain collusion?

Both theory and experience suggest that frequent interaction among firms may have a dramatic effect on market performance: in a dynamic setting, firms may learn to coordinate their strategies, and hence compete less aggressively with each other over time, through either tacit or explicit agreements. However, colluding is not an easy task as each firm is tempted to cheat on the tacit agreement. This is true even when firms collude explicitly, given that if one firm does not comply with the agreement, such a firm can clearly not be taken to the Courts for breach of contract by the other cartel members.[27]

To illustrate the incentives faced by colluding firms, let us consider a simple set-up. Suppose that all firms in the market sell their products at a price above the competitive price as they understand that it is in their common interest to do so. Knowing that all other firms are setting a high price, any firm could profitably deviate by undercutting it, as the firm would increase its sales with only a slight price reduction. So, what discourages firms from undercutting each other? It is the fear that the rivals will react by setting very low prices as soon as they detect a price-cut. In other words, the fear that the price deviation will trigger periods of intense rivalry is the disciplining device that makes firms overcome their short-run temptation to deviate, and allows them to sustain collusive outcomes.[28]

In order to sustain collusion, it is necessary that firms are able to detect deviations, for which they need to monitor each other. The ability and possibility of monitoring each-

[27] In the presence of leniency programs, the deviant would be the one to denounce the cartel to the antitrust authority. After the deviation the cartel would in any case destabilize, but thanks to the leniency application the deviant would benefit from a reduced fine or even amnesty. For this reason, leniency programs hinder collusion. See Motta and Polo (2002).

[28] This explains why collusion can only be reached in dynamic settings (i.e., when firms interact repeatedly): in static settings the reduction in future profits cannot be used as a credible threat to discourage deviations simply because the future does not exist. Nevertheless, repeated interaction is not sufficient: interaction has to be infinite, or last for an undetermined number of periods. Otherwise, in the last period all firms would deviate knowing that future punishments are not feasible. In turn, this makes it impossible to threaten firms in previous periods, so that collusion unravels in all periods.

other is thus a key ingredient of any collusive agreement, as well as all the factors that facilitate it: transparency, information exchange, simplicity and homogeneity of the products or services offered so as to allow for accurate price comparisons, etc. In contrast, if firms could not infer from the observable data whether other firms act according to the collusive agreement, any firm would deviate knowing that it would have no consequences. Collusion would then simply collapse or would have to take a more complex, unstable and less profitable form (as illustrated in the model by Green and Porter (1984)).

Equally critical for the sustainability of collusion, is firms' ability to credibly retaliate when they detect a deviation. Retaliation, also referred to as *punishment*, can take several forms. For instance, it may imply the break-down of collusion, so that firms' punishment profits would be those at the competitive benchmark. Punishment might also involve a temporary price-war,[29] with prices even below "normal" levels, followed by a return to cooperation after some time. Since the reduction in profits following a deviation represents the cost of deviating, the lower the punishment profits (i.e., the stronger the punishment) the more easily collusion can be sustained. However, there is a limit as to how low punishment profits can be, as firms must find it possible and in their own interest to carry out the punishment. For instance, it is simply not credible to reduce punishment profits to zero if firms do not have sufficiently capacity to flood the market in order to drive prices to marginal costs.

When is tacit collusion sustainable?

The possibility of inflicting strong punishments is nevertheless not enough to sustain collusion, as the losses from punishment have to be assessed relative to the gains from

[29] Some punishments may involve market-wide price wars, while others may be tailored to the deviant. For instance, in *Compagnie Maritime Belge* (Case C-395/96P) shipping companies chartered fighting ships that were specifically designed to compete against the ships of a targeted company.

deviation.

Indeed, colluding firms face a trade-off. On the one hand, if a firm respects the collusive agreement, it gets collusive profits in the current period as well as in all future periods. On the other hand, if it deviates, it gets a higher profit in the current period, but much lower profits in the future as the deviant will be punished. Collusion will thus be sustainable if the value of current and future collusive profits exceed the value of current deviation profits followed by the flow of future punishment profits. This trade-off involves current short-run gains versus future losses. Therefore, any factor that enhances the future losses from deviating or that mitigates the current short-run gains from deviation will tend to facilitate collusion. We expand on this in the next section.

Box 1 below briefly describes the main ingredients of the economic models that assess the sustainability of collusion.

Box 1. Economic analysis of collusion. *The standard economic models of collusion assume that firms interact for an infinitely number of periods. Whereas unlimited interaction among firms is probably an unrealistic assumption, it is fully equivalent to assuming that firms do not know for sure whether they will be interacting the period after. This is a key assumption given that if firms knew that other firms would not be able to react after a deviation, deviations in the last period would become costless, and collusion in all previous periods would collapse.*

The fact that firms interact for an endless number of periods allows them to use strategies that specify the actions that firms should take (e.g. price or output choices) depending on the actions taken by all firms in all previous periods. For instance, the strategy might call firms to charge the monopoly price for ever unless they detect a deviation, in which case they should start pricing as at the competitive benchmark forever. Collusion is sustainable if no firm has incentives to deviate from the collusive

strategy, given that all other firms are also following the same strategy.

Let us illustrate this by writing down the condition for the sustainability of the collusive strategy described above.[30] *For this purpose, let us use* π^d *to denote the profits that a firm gets when it deviates; let* π^c *denote the profits that a firm gets when all firms respect the collusive agreement, and let* π^p *denote the value of punishment profits that all firms get after a deviation. Furthermore, given that we want to assess firms' current incentives to respect the agreement, we have to compute the net-present value of all future profits. For this purpose, we introduce another piece of notation,* $\delta \in (0,1)$, *which represents the discount factor, i.e., 1€ tomorrow is worth a* δ *€ today; 1€ the day after tomorrow is worth a* δ^2 *€ today, and in general, 1€ in* t *periods time is worth a* δ^t *€ today. Given that receiving profits in the future is worth less than receiving them today, e.g., because a firm can get interest rates by depositing the money at the bank, we assume* $\delta < 1$. *A high discount factor is associated with a low interest rate, or with frequent interaction among firms, among other features.*

The condition for the sustainability of collusion can be expressed as follows:

$$\pi^d + \delta\pi^p + \delta^2\pi^p + ... \leq \pi^c + \delta\pi^c + \delta^2\pi^c + ...$$

Noting that the infinite sum $1 + \delta + \delta^2 + ...$ *can be approximated by* $1/(1-\delta)$, *allows to rearrange the expression above as*

$$\pi^d - \pi^c \leq \frac{\delta}{1-\delta}\left(\pi^c - \pi^p\right).$$

In words, the "one-shot deviation gain" (left-hand side of the above equation), which is given by the increase in profits from colluding to deviating, cannot exceed the

[30] See Motta (2004)'s Chapter 4 for more details and other references cited in the text.

"losses from cheating" (right-hand side), which are given by the reduction in profits from colluding to being punished in every future period.

Solving the above expression as a function of the discount factor,

$$\delta \geq \hat{\delta} = \frac{\pi^d - \pi^c}{}$$

shows that for collusion to be sustainable the discount factor has to exceed a critical threshold, $\hat{\delta}$ i.e., firms have to be sufficiently patient. If firms discounted the future more heavily, the net-present value of the future punishment threat would not be sufficient to mitigate their short run temptation to cheat. Last, note that the condition for the sustainability of collusion is more demanding the higher the deviation profits, the lower the collusive profits, and the higher the punishment profits. Accordingly, in order to assess the effects of industry features or firm practices on the sustainability of collusion, one can look at how these affect this critical threshold of the discount factor. There are several collusive strategies other than the one described above. Strategies typically differ in the type of punishment firms use to deter deviations. One form of punishment involves the so-called stick-and-carrot strategy:[31] *after a deviation, there is a first phase of intense rivalry, with profits even below "normal" levels (the stick), and all firms revert thereafter to collusion (the carrot) if they had all adopted the stick; otherwise, a new punishment phase starts, thus delaying reversion to collusion. Even though it might not be in the short run interest of all firms to indeed adopt the stick, they have long-run incentives to do so as reversion to collusion would not follow otherwise.*

[31] This work was pioneered by the seminal papers of Abreu (1986, 1988) and Abreu, Pearce and Stacchetti (1990).

3.3 Which factors facilitate collusion?

A factor facilitates collusion if it allows firms to sustain and to agree on a collusive strategy in markets where collusion would otherwise not be sustainable. A facilitating practice may also strengthen collusion, by allowing firms to raise the profitability of the collusive agreement in markets in which firms were already sustaining prices above the competitive benchmark.

A correct identification of the factors that facilitate collusion is particularly relevant in merger analysis as it is in those industries more vulnerable to collusion where the coordinated effects of mergers are more likely to arise. The section on coordinated effects of the EU HMGs starts by noting that "[i]*n some markets the structure may be such that firms would consider it possible, economically rational, and hence preferable, to adopt on a sustainable basis a course of action on the market aimed at selling at increased prices*." (paragraph 39). The aim of this section is to identify the factors that make some markets particularly more prone to collusion than others.

A factor facilitates collusion if (i) it relaxes the conditions that guarantee that firms have no incentives to deviate from the collusive agreement (*enforcement problem*);[32] or if (ii) it facilitates coordination on a collusive equilibrium (*coordination problem*). The first condition is met if collusive profits increase, deviation profits are reduced, or if the punishment threat becomes more severe. An improvement in monitoring, so that deviations can be more quickly and more accurately detected, would also relax the enforcement problem and thus facilitate collusion. The second condition is met when firms' conflict of interests are mitigated, or when they can more effectively communicate to coordinate their actions.

[32] In Economic Theory, these are referred to as *Incentive Compatibility Constraints* (ICC), see Box 1.

For ease of exposition, we classify the factors that affect collusion under four broad categories: (i) supply factors, (ii) demand factors, (iii) transparency, communication and information exchange; and (iv) corporate governance structures.

3.3.1 Supply factors

Number of firms

The number of firms in the market plays a crucial role in determining the likelihood of collusion. As expressed in the 2004 EU HMGs, "*it is easier to coordinate among a few players than among many*". In other words, a small number of competitors find it easier to overcome the coordination problem.[33] Furthermore, once firms have reached a consensus on the collusive agreement, it is the easier for them to sustain collusion the fewer they are. That is, a small number of competitors also find it easier to overcome the enforcement problem: first, the smaller the number of firms in the industry the easier it is to monitor each other; and second, the temptation to deviate from the collusive agreement is also weaker since collusive profits have to be shared among fewer firms.

To see this in more detail, consider for instance a market in which a large number of symmetric firms, with unlimited production capacity, compete in prices. If they collude, all such firms would split sales equally. However, if one of them decides to unilaterally deviate by slightly undercutting the collusive price, it could capture the whole market for itself. The negative relationship between collusion and the number of firms thus follows from the fact that deviation profits are the same regardless of the number of firms, but the costs of deviation, i.e., the forgone collusive profits, are lower the more firms there are in the

[33]The idea that coordination is easier the smaller the number of firms is intuitive, but there is little economic literature on this result. See Compte and Jehiel (2001). Huck et al. (2004) and Engel (2007) provide experimental evidence in the lab supporting this result.

market. This implies that, all else equal, collusion might be sustainable in markets with few firms but not in markets with several competitors.

In other contexts, e.g., when firms sell differentiated products or when firms compete by choosing quantities, profits at the competitive benchmark might also depend on the number of firms in the market. Since competition among few firms tends to be weak, the costs of deviating, e.g. reducing profits to those at the competitive benchmark, are also weaker the smaller the number of firms. Even though this effect goes in the opposite direction, the impact of the number of firms on the incentives to deviate is stronger than on the value of punishment profits. Therefore, even in those contexts in which punishment profits depend negatively on the number of firms, the statement that collusion is more easily sustainable in markets with few firms still holds true.

Entry

The number of firms in an industry can increase through entry. As acknowledged by the 2004 EU HMGs, one of the conditions for the sustainability of collusion is that "*the reactions of outsiders, such as current and future competitors not participating in the coordination...should not be able to jeopardize the results expected from the coordination*" (paragraph 41). Indeed, in industries with low barriers of entry, firms will find it difficult to sustain collusive agreements.[34] This holds true regardless of how the entrant behaves and how the incumbents react to entry.[35] If the incumbents decide to accommodate entry, by including the new firm into the cartel agreement, there will be an increase in the number of firms in the post-entry scenario. This could either disrupt the collusive agreement all

[34]Very often entry occurs in industries in which future demand is growing, and these two facts might affect collusion in opposite directions. See below for a discussion of collusion under demand fluctuations.

[35]The lysine cartel provides an example of how incumbent firms react to entry. See Connor (2001) for details.

together, or make it less attractive for firms to collude given the bigger number of firms among which collusive profits have to be shared. Anticipating the stronger incentives to deviate, cartel firms might be forced to reduce the collusive price in order to temper the incentives for undercutting, which in turn would further weaken the stakes from collusion. Alternatively, the entrant may follow an aggressive strategy and steal market share from the incumbent firms.[36] Again, this would reduce collusive profits, thus rendering it less attractive for the incumbent firms to collude.[37]

Entry of new investors can also affect the amount of existing assets (e.g. installed capacity), and through this have an additional effect on collusion, as discussed next.

Excess Capacity

The degree of firms' excess capacity is a key ingredient affecting collusion possibilities. When firms are capacity-constrained, capacity constraints affect the size of the market that a firm can capture for itself when it deviates. Hence, the larger the firm's unused capacity, the greater its incentives to deviate. However, capacity constraints also affect the scope of other firms to flood the market in order to reduce profits following a deviation. Hence, the larger the degree of excess capacity in the industry, the more effective is such disciplining device. Since these two forces move in opposite directions, it is a priori not possible to conclude whether larger capacities at the industry level facilitate or hinder collusion.

[36] In policy discussions, such a firm would be referred to as a "maverick". The 2010 US HMGs (section 2.1.5) refer to a maverick as "*a firm that plays a disruptive role in the market to the benefit of customers*" or "*[a] firm that may discipline prices based on its ability and incentive to expand production rapidly using available capacity also can be a maverick, as can a firm that has often resisted otherwise prevailing industry norms to cooperate on price setting or other terms of competition.*"

[37] For models of entry and collusion, see Harrington (1989), Harrington (1991) and Friedman and Thisse (1994), among others.

Firms' Asymmetries

The discussion so far has implicitly assumed that all firms in the market are symmetric. This has allowed us to compare the likelihood of collusion in markets with different numbers of firms, holding the rest equal. Since for firms with symmetric market shares, fewer firms imply a higher degree of concentration, one could conclude from the above that concentration facilitates collusion. However, concentration depends both on the number of firms and on the degree of market share asymmetry, so that markets with fewer firms can be less concentrated than markets with more firms if firms' market shares are more evenly distributed in the former.[38]

For the ease of exposition, we first discuss the effects of asymmetries on the enforcement problem, and then move on to discussing its effects on the coordination problem.

Size asymmetries

Let us start by considering a market made of symmetric firms, in the sense that they all sell homogenous products that they can produce at equal costs. Any move away from symmetric market shares (which would raise concentration) would also hinder collusion. This is so since the firm with the small market share has more to gain by deviating and less to lose from being punished.

Differences among firms - such as differences in their productive capacities, in the features of their products, in the size and content of their product portfolios, or in their production costs - typically explain why market shares are asymmetric. The question is then: how do such fundamental asymmetries, which often translate into asymmetric

[38] For instance, a market with three firms with market shares (90%, 5%, 5%) has an HHI of 8150, while a market with two symmetric firms has an HHI equal to 5000.

market shares, affect collusion?

While asymmetries might have a different impact on the mechanisms affecting the incentives to collude, there is a robust result that says that firms' asymmetries hinder collusion. Indeed, as we describe below, firm symmetry facilitates both the enforcement as well as the coordination problem.

Firm symmetry relaxes the enforcement problem, for one key reason: the scope of collusion is determined by the firm facing the greatest difficulties to collude (be it the large, or the small firm);[39] as firms become more symmetric, there is a transfer in the ability to collude from those that find it easier to collude to those that face the greatest difficulties in colluding. This re-balancing in the incentives to collude unambiguously facilitates collusion.

To fix ideas, consider a context in which market share asymmetries derive from differences in firms' product lines (Kühn (2004) and Motta (2004)). If the size of a firm is a function of the number of product varieties it holds, then it is the small firm the one that faces the greatest difficulties in colluding.[40] For a large firm, a reduction in the price of one of its varieties has a negative effect on the profits it makes through its other varieties. Hence, a large firm has a weaker incentive to deviate as compared to a single-product firm, since the latter does not internalize the negative impact of a price cut on other varieties. Similarly, low prices after a deviation hurt the large firms relatively more than the small firm, and so the large firms' ability to hurt the small one is limited.

When market share asymmetries derive from capacity asymmetries, the mechanisms sustaining collusion differ from the one just described. Let us consider a model in which firms sell homogenous products but are subject to asymmetric capacity constraints (Compte, Jenny and Rey (2002)). The large firm, and not the small one, is now the one that

[39] Technically speaking, this is the firm whose incentive compatibility constraint is binding.
[40] A similar result also arises in models with asymmetric capacities, which give rise to cost asymmetries (Vasconcelos (2005)).

would benefit most from deviating, given that it could capture a greater fraction of the market were it to undercut the collusive price. Furthermore, the small firms cannot inflict strong punishments on the large firm given that, even when operating at full capacity, the residual demand left for the large firm would still be significant. Hence, the bigger the large firm the more difficult it is to discourage such a firm from deviating. A more equal distribution of firms' capacities would realign their incentives to collude and their capacity to punish deviators, thus facilitating collusion. In general, this implies that capacity asymmetries hinder collusion. Still, differences in concentration due to differences in the size of the small competitors should have no impact on the sustainability of collusion, as long as the size of the large firm remains unchanged.

In sum, the conclusion that firms' asymmetries hinder collusion appears to be robust, regardless of whether size asymmetries derive from capacity asymmetries or from differences in the size of their product lines. As we argue next, a similar conclusion applies to other factors that also give rise to firms' asymmetries.

Cost asymmetries

Cost asymmetries also hinder collusion. In this case, the low cost firm, which is typically also the large firm, finds it more tempting to deviate from the collusive agreement: it has more to gain by deviating as at any price its markup is higher, and it fears less the punishment that can be inflicted by its high-cost rivals.[41]

Matters are more complex when firms do not know each others' costs. Athey and Bagwell (2001)[42] analyze a model of collusion with private cost information in which firms

[41] In contrast to this result, Miklos-Thal (2009) finds that, if side-payments are allowed, cost asymmetries facilitate collusion.

[42] See also Athey, Bagwell and Sanchirico (2004), who assume persistence in cost shocks instead of assuming that cost shocks are independent across periods.

might face independent cost realizations in every period. They show that successful collusion among firms with asymmetric costs might sometimes entail productive inefficiencies: a high cost firm must be given incentives to report its true cost, and such incentives may require that the high cost firm serves an inefficiently large share of the market.[43] Such productive inefficiencies hinder collusion as they reduce collusive profits. Incentives for the high cost firm to truthfully report its cost might also come through side-payments by the low cost firm, but these would leave traces of explicit collusion and cartel firms would thus risk being detected and fined.

Coordination among asymmetric firms

When assessing the role of firms' asymmetries, it is also equally important to understand how they affect the coordination problem. According to the 2004 EU HMGs, "[c]*oordinating firms should have similar views regarding which actions would be considered to be in accordance with the aligned behavior and which actions would not*." (paragraph 44) and "[f]*irms may find it easier to reach a common understanding on the terms of coordination if they are relatively symmetric, especially in terms of cost structures, market shares, capacity levels and levels of vertical integration.*" (paragraph 48). In other words, symmetry is generally assumed to relax the coordination problem.

When firms are engaged in tacit collusion, identifying a focal point in terms of prices or market shares, may become less obvious the more asymmetric firms are. When firms sell homogenous products and face equal costs of production, there is a single monopoly price which all firms should be able to compute, as they all share equal information. However,

[43] Athey and Bagwell (2001) also show that if firms are sufficiently patient, perfect collusion can be achieved without sacrificing productive efficiency. This can be achieved by promising a high cost firm today with a higher market share in a future period in which both firms have equal costs. Market transfers so achieved are sufficient to ensure truth-telling as long as the discount factor is sufficiently high.

when their costs or the features of their products differ, agreeing on a common collusive price might not be an easy task, and firms might face conflicting interests as to which price to select. For instance, under cost asymmetries, low cost firms may prefer to collude on lower prices than high cost firms, and successful collusion might be preceded by periods of trial-and-error through prices until firms achieve a tacit agreement on a given price.[44]

When firms are engaged in explicit collusion, they can agree on the most profitable price through bargaining, even when cartel firms are asymmetric.[45] However, this can be jeopardized when firms' asymmetries are private information (e.g., firms do not know each others' costs, the features of their rivals' products, etc.). Therefore, to the extent that firms' asymmetries go hand in hand with asymmetric information, it is reasonable to expect that such asymmetries might hinder coordination.

To conclude the discussion of collusion among asymmetric firms, let us mention that the existing evidence is (arguably) not fully consistent with the view that asymmetries hinder collusion. As reported by Davies et al. (2011) and Grout and Sonderegger (2005), while tacit collusion is typically found in only symmetric duopolies, explicit cartels usually display strong asymmetries in the members' market shares. Ganslandt et al. (2012) provide a theoretical answer for this empirical fact: forming and organizing a cartel entails an indivisible cost, which is often incurred by a cartel leader.[46] Hence, for a cartel to be sustainable, there must be a sufficiently large firm which finds it optimal to cover such

[44] Mason, Phillips and Nowell (1992) provide experimental evidence showing that cooperation is more likely among firms with symmetric costs.

[45] Indeed, in bargaining models with sequential offers (Rubinstein, 1982), agreement is efficient from the firms' point of view as otherwise they would continue bargaining until all efficiency improvements get exhausted.

[46] This is consistent with empirical evidence: as reported by Ganslandt et al. (2012), in 10 out of 43 EU cartel cases during the period 2002 to 2007, a ring leader was found by the Court.

indivisible cartelization cost. This, together with the fact that firms have to be sufficiently symmetric for collusion to be enforceable, implies that cartels are more likely to emerge in markets with mild asymmetries in market shares. Nevertheless, it is also fair to note that this evidence might suffer from an identification problem: as we can only study discovered cartels, the finding of asymmetries among cartel firms would also be consistent with the fact that cartels among asymmetric firms are weaker and hence tend to to destabilize faster than cartels among symmetric firms, which facilitates detection.

Multi-market contact

The possibility to sustain collusion might also depend on the number of markets in which the same set of firms interact; this is referred to as *multi-market contact*.[47,48] Building on the intuition described above on the effects of asymmetries, pooling the incentives to sustain collusion across asymmetric markets can help mitigate asymmetries within markets. Furthermore, multi-market contact facilitates collusion through increases in the frequency of interaction.

The simplest example is probably given by the effects of multi-market contact among two firms interacting in two markets. Suppose that markets are a mirror image of each other in terms of firms' market shares, i.e., if one firm has a market share in one market, its market share in the other market is *(1-s)*. Even though within-markets asymmetries might preclude collusion in each market taken in isolation, multi-market contact restores full symmetry, thus facilitating collusion.

[47]For example, Bernheim and Whinston (1990) show theoretically that, in some cases, multi-market contact can improve firms' abilities to sustain high prices by pooling the incentive constraints that limit tacit collusion.

[48]See Phillips and Mason (1992) and Evans and Kessides (1994) for evidence of multimarket contact and collusion.

3.3.2 Demand factors

Demand elasticity

Demand factors also play a crucial role in determining the scope for collusion. Indeed, a low price elasticity is commonly perceived as a facilitating factor. For instance, the US HMGs state that since "[c]*oordination generally is more profitable, the lower is the market elasticity of demand*", firms will find coordination relatively more appealing in markets with low demand elasticity.

However, from an economic theory perspective, the effects of demand elasticity on the sustainability of collusion remain ambiguous.[49] One can find model specifications in which demand elasticity either facilitates collusion, hinders collusion, or simply has no effect on the scope for collusion.[50] On the one hand, the assertion made by the US HMGs is correct: the monopoly price is inversely related to the elasticity of demand, so that the stakes of collusion are higher the less elastic demand is. On the other hand, to the extent that deviation profits are also inversely related to the elasticity of demand (e.g., when either the deviant can capture the whole monopoly profit, or when it sells its full capacity at the monopoly price), a low price elasticity also implies large gains from undercutting. Furthermore, demand elasticity might also affect the severity of punishments: while a low elasticity increases the profitability of collusion, it results in milder punishments.

Arguably, a more meaningful factor is the elasticity of the individual demand faced by each firm, i.e., how much demand a firm can gain by undercutting the collusive price. The market demand function can be very elastic and yet the individual demands faced by

[49] A distinct issue refers to the impact of collusion on consumer surplus. Demand elasticity reduces the monopoly price, so that there will be less reason to worry about potential collusion if demand elasticity is high.

[50] For instance, with homogenous products, the demand elasticity has the same impact on deviation and collusive profits, so that the critical discount factor is the same regardless of demand elasticity.

each firm can be very inelastic; for instance, if all consumers are locked in to their current providers, a deviant would reach very few customers if it reduces its price. The opposite can also hold true; for instance, if firms sell homogenous products by choosing prices, each firm's individual demand is perfectly elastic around the collusive price, regardless of the elasticity of overall market demand. Indeed, the elasticity of each firm's residual demand depends on several factors other than the elasticity of market demand, including: the mode of competition, the degree of product differentiation, switching costs, network effects, consumers' price awareness, among many others.[51] As these factors may affect collusion in opposite directions, it is in general not possible to provide an unambiguous answer on how the elasticity of each firm's residual demand function affects the scope for collusion.

Demand movements

The sustainability of collusion also depends on demand movements over time. Consider first the case of a market whose demand is known to steadily grow over time. Collusion in this market is more easily sustainable than if the demand is decreasing for a simple reason: future demand affects the losses from deviating, which are greater the higher future demand.[52]

The same logic extends to contexts in which demand moves cyclically over time, across booms when demand is rising and across recessions when it is declining. If one

[51]Note that the elasticity of each firm's residual demand is not always exogenous to firms' choices. For instance, when firms compete by choosing supply functions, as in electricity markets, they might choose inelastic supply functions which result in inelastic residual demands. Similarly, firms can artificially create switching costs to reduce the elasticity of each firm's residual demands.

[52]This logic might nevertheless be reversed if future punishment profits also depend on the value of future demand and the impact of future demand movements is greater on punishment profits than on collusive profits. Fabra (2005) shows that collusion is more easily sustainable when demand declines if firms are subject to severe capacity constraints.

compares the sustainability of collusion across two periods of the cycle with equal demand, one in a boom and the other one in a recession, the incentives to deviate are the same but the losses from deviating are greater at the former. Hence, the scope for collusion is greater during booms than during recessions (see Haltiwanger and Harrington (1992)).

Nevertheless, the above discussion assumes that the market structure remains unchanged despite demand movements. However, in markets where entry barriers are not too high, this need not be an adequate assumption. Indeed, entry is more likely during booms, just as exit is more likely during busts.[53] The question is thus whether the impact of such changes in market structure prevail over the impact of demand movements on collusion.

In contrast to our previous discussion, both the European Commission and the Court of First Instance view demand growth as a factor hindering collusion.[54] We can think of two plausible explanations for this divergence: first, competition authorities and courts emphasize the role of demand growth on promoting entry (Vasconcelos (2008)); and second, they view demand growth as a source of demand instability, which - as discussed below - might jeopardize collusion sustainability.

Unexpected demand shocks

When expected future demand is the same across all periods, so that the expected losses from deviating are also constant, unexpected positive shocks in demand can disrupt collusion by enhancing firms' current incentives to deviate (Rotemberg and Saloner (1986)). For this reason, even when demand shocks can be observed ex post, demand volatility

[53]Demand movements might also generate changes in market structure through investment. See Lepore and Knittle (2010) for an extension of Fabra (2005) with endogenous capacity choices.

[54]The decision of the Airtours/First Choice merger case illustrates this view, as the CFI argued that evidence of "strong growth" in demand would undermine attempts to collude. See Section 6 for a discussion.

hinders collusion.

Buying power

Demand volatility can be exogenous, e.g. as in electricity markets, or endogenous, e.g. when it is driven by the demand of a big buyer that can decide how to schedule orders. Following the same logic as above, a big buyer is able to disrupt collusion by concentrating its purchases rather than scheduling frequent and regular orders (Snyder (1996)). In this sense, buying power, which gives the buyer the ability to reduce the frequency of the interaction, hinders collusion. In line with this reasoning, the 2004 EU HMGs state that "*if a market is characterized by infrequent, large volume orders, it may be difficult to establish a sufficiently severe deterrent mechanism*" (paragraph 53). The 2010 US HMGs contain a similar statement: "*A firm is more likely to be deterred from making competitive initiatives by whatever responses occur if sales are small and frequent rather than via occasional large and long-term contracts*"" (Section 7.2).

The practice of concentrating large volume orders at infrequent times was for instance followed by the US government when it bought vaccines in bulk in order to undo collusion (Scherer (1980)).[55] By buying in bulk, the government both increases the stakes of each procurement auction and reduces the frequency of such auctions, thus increasing the bidders' incentives to deviate and constraining their ability to punish each other in the near future.

A similar logic applies to the frequency of price adjustments. If firms cannot change prices very often, regardless of how often transactions take place, firms cannot react to deviators in the short term. In other words, in order to discourage deviations, it is

[55]These are also the recommendations issued by the OECD to the IMSS in Mexico to avoid collusion in medicine purchases for the social security administration.

important that firms react quickly. Note that the frequency of price adjustment can be exogenous, e.g. when by law firms have to stick to the prices announced in their catalogues at the beginning of the season and sales can only take place at specific dates at the end of the season; but it can also be endogenous, e.g. when price commitments are agreed (or not) voluntarily among the firms.

Demand uncertainty

Demand volatility very often comes hand in hand with demand uncertainty.[56] If demand changes over time and if such movements cannot be publicly observed, then firms might find it more difficult to monitor each other as a reduction in demand - which depresses all firms' sales - can be wrongly confounded with a rival's price cut. In contrast, when market demand is stable, inferring deviations from publicly available data is easier than when the demand is volatile. We postpone the discussion of collusion when there is imperfect monitoring to Section 3.3.3, where we discuss the role of market transparency in facilitating collusion.

3.3.3 Transparency, communication and information exchange

In this Section, we first discuss the importance of market transparency, which by increasing the observability of prices and quantities, improves monitoring. We then turn to the importance of communication in facilitating coordination among firms on a particular outcome. We emphasize the role and effects of different types of communication (whether it refers to future conduct or current and past data, whether it is public or private, and whether it includes detailed or aggregate data) on both the risk of collusion and the

[56]However, this is not necessarily always the case. For instance, demand can be perfectly observable and perfectly predictable, and yet it can change and be volatile over time.

potential efficiency losses of banning communication.

Transparency

In order to sustain collusion, it is necessary that firms are able to detect deviations, for which they need to monitor each other. Monitoring is thus a key ingredient of any collusive agreement. One can distinguish two features that characterize the effectiveness of monitoring: how long it takes firms to detect any potential deviation, and how precise is the information that firms receive on whether a deviation has indeed taken place. Monitoring is clearly the more effective the quicker it allows to detect deviations and the more accurate it is in reporting whether a deviation has taken place. Transparency improves monitoring in these two dimensions.[57]

In order to understand the role of transparency, let us consider the case in which market demand is uncertain and transaction prices cannot be publicly observed. Firms only see their own sales, but do not observe demand shocks. Firms cannot infer deviations from the data they observe, given that low sales can be due either to a low demand realization or to undercutting by the rival firm. If periods of low sales were not followed by a number of periods of intense rivalry or price wars, then firms would deviate knowing that they would go unpunished. Hence, in opaque markets, price wars are a disciplining device needed to avoid deviations, even when such deviations do not take place. Given that during price war periods firms make low profits, the profitability of collusion is lower in opaque than in transparent markets, as in the latter price wars are not used in equilibrium.

[57]This is acknowledged in the HMGs both in Europe as well as in the US. For instance, the US HMGs state that *"[a] market typically is more vulnerable to coordinated conduct if each competitively important firm's significant competitive initiatives can be promptly and confidently observed by that firm's rivals. This is more likely to be the case if the terms offered to customers are relatively transparent."* (Section 7.2)

Practices aimed at increasing transparency

Given the importance of monitoring, competition policy should pay special attention to practices that help firms monitor each other's behavior. One example of such a practice is given by communication on past conduct, which is discussed shortly.

Other commercial and pricing practices also increase observability of firms' actions. For instance, collusion is more difficult when firms produce scores of *heterogeneous products*, both because they would have to keep track of prices of too many products (which makes sustainability more difficult) and because different products' prices are likely to be affected in a different way when shocks occur, which makes coordination more difficult. But if firms organize prices in very few and well defined *price categories,* then both coordination and monitoring become much easier. Similarly, practices such as a *basing point pricing* help,[58] because instead of having very different prices according to different geographical locations, all prices are calculated by using not the effective distance between the plant and the buyer, but the distance between a given and same base point and the buyer. Hence, instead of having to monitor very different prices according to different geographical locations, firms just need to monitor a single base price.

In the same vein, *resale price maintenance* (RPM) helps collusion among suppliers. Indeed, as shown in Jullien and Rey (2007), RPM can facilitate collusion by making it easier for firms to monitor each other. To see why this is the case, consider a context in which downstream markets are subject to shocks on demand or retail costs that producers cannot observe. In the absence of RPM, downstream prices would reflect these shocks; for instance, if retailers' costs decrease, part of the cost reduction would optimally be passed-through to retail prices. On the one hand, this allows firms to make higher collusive profits, thus

[58]Under *basing point pricing,* goods are sold at a base price plus the shipping cost to the delivery place, calculated from a given base point, regardless of whether the seller actually is. See Thisse and Vives (1992) for an analysis of its implications for collusion.

discouraging deviations; on the other hand, it also makes it harder for firms to distinguish price cuts due to cost shocks, from price cuts due to deviations. RPM removes retail price flexibility, and thus has the opposite effects: lower collusive profits but more effective detection. The overall effect might seem ambiguous. However, in those cases in which RPM has no efficiency effects, we can be confident that if firms decide to adopt RPM it is because the pro-collusive effect dominates.

A *simple and exclusive distribution system* where distributors are closely related to suppliers - especially when the former have contractual incentives or obligations to report information to the latter - may also facilitate news about possible changes in rivals' strategies - thereby making detection of deviations (and sustainability of collusion among suppliers) more likely.

The importance of communication

In order to assess the role of communication and information exchange, it is first important to understand whether it makes any difference if firms communicate or not. In other words, does it make any difference whether firms collude tacitly or explicitly? On the one hand, through explicit collusion, firms might be able to reach and sustain outcomes they would not otherwise achieve. This is so since explicit communication facilitates agreement among the collusive firms, allows to tailor the pricing and sales policies to the specificities of each cartel member, makes it possible to adapt the collusive policies to changing market conditions, and allows firms to more effectively monitor each others' behavior. On the other hand, communication among cartel firms is costly, as it leaves trails that can then be used to detect the cartel.

The importance of communication is well illustrated in the workings of discovered cartels, for which we have detailed evidence on how they operated. Cartel members often hold meetings to split markets, allocate market shares, agree on prices and monitor

compliance with the agreements (Harrington (2006)). Such meetings also allow firms to exchange information about costs or demand, as well as to implement penalties for non-compliants, potentially allowing them to achieve more profitable outcomes. Indeed, descriptions of detected cartels highlight information exchange as a factor explaining cartel success (Connor (2000); Genesove and Mullin (2001); Levenstein and Suslow (2006); Harrington (2006)).

For instance, the Lysine cartel, which operated from the early 1990s to 1995, illustrates the inner workings of several cartels (see Harrington and Skrzypacz (2011)). The lysine cartel initially operated through exclusive geographic territories and soon moved to a sales quota scheme and to price coordination through cartel meetings. Compliance with the scheme was regularly monitored through a spreadsheet that was managed by one cartel member, who would gather sales and price information through mails and phone calls from all cartel members. In turn, incentives for compliance were provided by a scheme of "guaranteed buy-ins", that required members with sales above the quota to buy the excess from those members below their quotas. Similar practices were adopted by cartels in choline chloride, organic peroxides, sodium gluconate, sorbates, vitamins, and zinc phosphate, among many others (Harrington (2006)).

Types of communication

Given the importance of communication, a powerful tool to fight collusion would be to prohibit communication among firms whenever such prohibition entails no efficiency losses, or rather, whenever the potential gains of deterring collusion exceed the potential efficiency losses of banning communication. For this reason, it is important to distinguish two types of communication. First, firms might communicate about their future intended conduct, e.g., planned production, prices, new product releases, capacity decisions, etc. This information is "soft" as it conveys intentions only, and cannot be verified by rival firms.

Second, firms might communicate about current and past conduct, e.g. current and past sales, prices, product features, input prices, information about customers, etc. This information is "hard" as it can be verified, e.g. through invoices, customers' declarations, etc.

Communication about future conduct is important for sustaining collusion. On theory grounds, it is not straightforward to demonstrate that communication about future intentions helps sustaining collusion, as such communication has no commitment value.[59] Still, it can be a powerful tool for collusive purposes since it might facilitate coordination on a specific outcome, as explained below.

In many contexts, firms can sustain collusion on several prices but first need to coordinate on which price they will all choose. For instance, suppose that collusion at the monopoly price is sustainable and that products are perfect substitutes. Then, prices sufficiently close to the monopoly price should be equally sustainable too, as profits from deviating or colluding at such prices are roughly similar as when the monopoly price is chosen. However, firms face "strategic uncertainty" as they do not know whether the rivals plan to collude at the monopoly price or at prices arbitrarily close to it: if a firm sets the monopoly price but its rivals set a slightly lower price, the former will make zero profits and collusion could collapse. In light of this, firms may prefer to collude on prices below the highest sustainable price.[60] Communication about the price that firms plan to set mitigates

[59] In the jargon of economic theory, this is referred to as "cheap talk".

[60] In games with multiple equilibria, one can apply the concept of *risk dominance* in order to select a plausible equilibrium (Harsanyi and Selten (1988)). In symmetric games (e.g. if symmetric firms charge the same price, they all get equal profits) this criterion allows for a simple interpretation: if firms are unsure about which price the rival will choose and assign equal probability to the rival choosing either a low or a high price, then the low price equilibrium risk dominates the high price equilibrium if the expected payoff from choosing the low price exceeds the expected payoff from choosing the high price. For instance, if firms consider choosing the monopoly price or one slightly below, choosing the latter is the risk dominant equilibrium.

strategic uncertainty, and thus facilitates collusion on higher prices.[61]

However, not all announcements about future prices are harmful. When firms announce their sale prices to consumers, and they commit to serve consumers at those prices, transparency increases on the demand side and it favors `shopping around': prospective customers are better informed on the possible deals, and they will tend - other things being equal - to buy from firms which offer lower prices. In turn, this will make the market more competitive.

It is true that when price announcements are public, prices would become transparent not only on the demand side but also on the sellers' side, and the latter effect would in principle favour collusion, but empirical evidence shows that it is the former effect which prevails.[62]

It is important to stress, though, that for such a pro-competitive effect to take place, announcements should not only be public but also carry a commitment value towards consumers.

Let us provide some examples. A famous case of communication of future intentions involved the Airline Tariff Publishing Company (ATP), which used to collect and store data on airline fares quoted on computer reservation systems. Price announcements through ATP were public but had no commitment value towards consumers: airlines could enter future prices into the ATP system but could also change those prices before they could be effectively available for customers. Therefore, ATP constituted a pure vehicle for price coordination with no real price effects, very much as when firms are sitting around a table

[61]The role of communication in eliminating strategic uncertainty has been explored in experimental settings. It has been shown that in the presence of strategic uncertainty, firms collude on prices below the monopoly level even when pricing at the monopoly level is also an equilibrium. See Cooper et al. (1989) and Van Huyck et al. (1990).

[62]See Motta (2004: 152-156) for a discussion.

discussing future prices (US Department of Justice (1994)). In this case, whether potential buyers see the discussion or not, makes little difference.[63]

Communication about firms' future *production* plans is also unlikely to increase efficiency as it implies no commitment (plans can be changed), and it is unlikely to be informative to consumers. Instead, this type of information exchange may allow firms to reduce strategic uncertainty and thus to more effectively collude too. This example illustrates the practice followed by the US automobile industry, which used to exchange production plans via the trade press (see Doyle and Snyder (1999)).

Communication about past conduct is also very important for sustaining collusion, though for different reasons. As argued above, the ability to monitor each other is crucial to sustain collusion. Therefore, in markets in which firms cannot directly observe each other's price or output choices, timely communication about past conduct allows firms to overcome the lack of transparency. The more disaggregated the data (e.g. individual price choices and individual sales rather than average market price or aggregate sales), and the shorter the delay with which is being circulated, the more effective will communication be in allowing firms to detect deviations and to tailor punishments to the deviant.

Also in this case one has to confront the gains of banning communication about past conduct with its efficiency costs. Information about realized demand might allow firms to fine-tune their output or pricing decisions, and potentially result in efficiency gains, e.g. if better knowledge about demand induces a firm to produce more in high demand periods and less in low demand periods. However, information might also affect strategic

[63]The *Woodpulp* case contains an interesting discussion with respect to price transparency. While the European Commission had argued that the practice of woodpulp producers of using a system of pre-announced prices would favor collusion, the Court showed that it had been introduced following the request of customers, who wanted to know well in advance the price of the raw material which accounted for a large part of its production cost. Similarly, it was argued that the practice of quoting all prices in the same currency would favor comparability of prices, again to the benefit of buyers. See Motta (2004: 211-219).

interaction in the industry, and thus impact on equilibrium outcomes. Unfortunately, the effects of information on pricing efficiency are ambiguous, and vary from one context to another, thus implying that no general statements can be derived for practical purposes. Information acquisition about the performance of other firms in the industry may also allow firms to improve incentive schemes within the organization, for instance, by adopting relative performance schemes or benchmarking (see Kühn (2004)). However, these efficiency gains can be exploited with average industry data, with no need to have detailed and individual information of all firms in the market.

All this suggests that competition authorities should be the more vigilant of information exchange on past conduct the more disaggregated, individualized, and recent the data are.

3.3.4 Corporate and governance structure

Partial ownership arrangements (also referred to as cross-ownership) constitute passive investments as the acquiring firm gains no control over the decision taken by the firm whose stock it has acquired. Still, partial ownership arrangements may impact firms' conduct both in static as well as in dynamic games. In oligopolistic markets, when a firm increases its output it does not internalize the externality it imposes on others as the market price goes down. Hence, firms tend to over-produce above the level that maximizes industry profits. However, when holding shares of competitors, firms are able to at least partially internalize this negative externality, so that the market outcomes approach the monopoly outcome even in a static setting.[64] In the limiting (though probably unrealistic case) in which firms retain control but exchange their stock across them, the monopoly

[64]For instance, in January 2011, the OFT opened an investigation into Ryanair's minority stake in Aer Lingus because it believed that it potentially raised competition concerns. The OFT press release can be found at http://www.oft.gov.uk/news-and-updates/press/2011/01-11.

outcome can be achieved with no need to collude.

Partial ownership arrangements also change firms' incentives to sustain collusive outcomes.[65] Authorities typically view cross ownership as a factor facilitating collusion. For instance, the EU HMGs note that "[s]*tructural links such as cross-shareholding or participation in joint ventures may also help in aligning incentives among the coordinating firms*" (paragraph 48). Indeed, under cross-ownership deviation incentives are mitigated, given that a deviation by one firm imposes losses on others. Hence, cross ownership facilitates collusion.

Like *cross-ownership, cross-directorships* and *joint ventures* may also offer opportunities for competitors to talk to each other, thereby making coordination easier. Similarly, purchasing and/or distribution agreements can also serve the same purpose.

3.4. Is there a coordinated effect?

In this section we review the impact of horizontal mergers on the likelihood of collusion. In other words, we ask ourselves: when would the merger make collusion easier, more stable, more effective, and when would the mechanisms to sustain it be more easily agreed upon after the merger? If, in the light of the analysis developed in the previous section, collusion was already sustainable before the merger, it is highly likely that the merger would further strengthen firms' coordination. Hence, the analysis of whether the merger would create coordinated effects need not go much further. However, in those markets in which collusion was not likely to be sustained before the merger, one should conduct a careful analysis on the impacts of the merger on collusion.

[65]See Gilo et al. (2006) for an analysis of the effects of partial cross ownership on the sustainability of tacit collusion. See also Buccirossi and Spagnolo (2007) for a discussion.

We address this question by discussing the impact of the merger on some of the facilitating factors reviewed above. Since the demand factors are exogenous and hence likely to remain unaffected by the merger, our discussion below only deals with the impact of the merger on the supply factors and the corporate and governance structure that are potentially affected by the merger.

The most straightforward effect of a merger is the reduction in the number of firms in the market. This alone has a direct effect on the incentives to collude: collusive profits have to be shared with fewer firms, so that the temptation to deviate from the collusive agreement is weaker. Indeed, when capacity unconstrained firms compete by choosing prices in order to sell homogeneous products, the condition for the sustainability of collusion is less stringent the fewer firms there are in the market. In other words, the impact of a merger on the sustainability of collusion is stronger in markets with few firms.[66]

The reduction in the number of firms also creates unilateral effects, i.e., even in the absence of collusion, competition tends to be the weaker the smaller the number of firms in the market.[67] While this might weaken the punishment threat, the deviation effect is of a higher order of magnitude than the punishment effect, implying that a reduction in the number of firms facilitates collusion despite the unilateral effects of the merger.

The above, coupled with the fact that the reduction in the number of firms also relaxes the coordination problem (Section 3.3), unambiguously indicates that horizontal mergers facilitate collusion. However, this should not be misinterpreted to conclude that all mergers make collusion sustainable, as other factors also have to be assessed.

Among other relevant factors, it is particularly important to assess the effect of

[66]For instance, moving from 10 to 9 firms has a weak effect on the condition for the sustainability of collusion, whereas the effect of moving from 3 to 2 firms is much stronger.

[67]For instance, this is true in a Cournot model, when firms compete by choosing quantities.

mergers on market structure; in particular, whether market structure becomes more or less symmetric after the merger.[68] As discussed in Section 3.3 above, mergers that make the large firm smaller or the small firm larger (i.e., symmetry increasing mergers) tend to facilitate collusion by relaxing the enforcement problem. Intuition also suggests that symmetry facilitates coordination on a collusive outcome. Hence, even if a merger involves a reduction in the number of firms, it might hinder collusion if it increases asymmetries among firms.

If there are any concerns that a merger would lead to coordinated effects, remedies should involve divestments that increase asymmetries among existing firms. A highly illustrative merger case in this respect is the *Nestlé/Perrier* case, which we discuss in Section 6 below.

While horizontal mergers may weaken competition, they can also induce important **efficiency gains**. Indeed, if efficiency gains are sufficiently large, they may offset the otherwise negative effects of mergers on overall welfare. This question is well understood when it comes to assessing the trade-off between efficiency gains and unilateral effects,[69] but much less attention has been devoted to the analysis of the interaction between efficiency gains and coordinated effects. Still, the discussion of cost asymmetries in Section 3.3 can shed some light on this issue: whenever efficiency gains by the merging firms enhance cost asymmetries, they hinder collusion.[70] Furthermore, even if collusion is still

[68] See Fonseca and Normann (2008) for experimental evidence of the effects of asymmetric mergers on collusion.

[69] See Whinston (2006) and Motta (2004).

[70] Note that efficiency gains introduce cost asymmetries if we start from a fully symmetric situation. However, this need not be the case if firms have asymmetric costs before the merger. For instance, a merger of two high cost firms, who would possibly end up with costs closer to the remaining competitors, would increase symmetry, thus facilitating collusion.

sustainable after the merger, efficiency gains may imply an output transfer from the less efficient to the more efficient firms, as well as a reduction in the collusive price. Assessing the trade-off between efficiency gains and coordinated effects is nevertheless a difficult task: not only prospective efficiency gains have to be estimated (as in a unilateral effects case), but also the impact of such gains on the likelihood of collusion.

Mergers can also affect the sustainability of collusion through its effects on multi-market contact among firms.[71] The idea is that collusion in all markets can be facilitated if mergers make more symmetric the market position of firms across such markets. To illustrate this, let us go back to the example used before: consider two markets, A and B; firm 1 is present in both markets, while firms 2 and 3 are only present in market A and B respectively. In market A, firm 1's market share is *s* and firm 2's is *(1-s)*; while in market B, firm 1's market share is *(1-s)* and firm 3's is *s*. A merger between firms 2 and 3 creates multi-market contact between firm 1 and the new merged entity, and this implies that firms become fully symmetric across markets. Whereas before the merger with market share asymmetries would make collusion difficult, the merger now facilitates collusion by making firms symmetric. While this example involves a concentration among two firms in unrelated markets, i.e., a conglomerate merger, the intuition extends to horizontal mergers with conglomerate aspects.

The structure of cross-ownerships among merging firms also has to be carefully assessed in a coordinated effects analysis. Consider again a simple example. Suppose that firm 1 owns a certain amount of shares of firm 2, while firm 2 owns the same amount of shares of firm 3. The latter finds it more difficult to collude, given that the other two firms' incentives to

[71] Issues of multimarket contact have recently been raised in European merger cases. In 2007, Elopak and SIG, which were the main competitors of Tetrapak in the aseptic and fresh carton markets respectively, planned to merge. The Commission opened an in-depth investigation, but it was closed because the merger bid itself failed in face of an alternative bidder. See Kühn (2008) for a discussion. See also Montero and Johnson (2012) for a recent theoretical analysis.

deviate are tempered by the fact that a deviation hurts them indirectly through their partial ownership of rival firms. A merger between firms 2 and 3 would imply that all firms in the market have fully symmetric cross-ownership on one another, thus facilitating collusion.

3.4.1 Coordinated effects of vertical mergers

Just as horizontal mergers have the potential to facilitate collusion, so do vertical mergers. This can be due to some of the effects highlighted before when assessing the coordinated effects of horizontal mergers. For instance, a vertical merger might make active firms more symmetric if after the merger all firms are vertically integrated and therefore share the same type of production (and distribution) costs. In turn, this would facilitate collusion.

In this section we focus on the coordinated effects which arise only because of the vertical relationship. As shown by Nocke and White (2007),[72] vertical mergers might facilitate collusion among producers. On the one hand, when two firms vertically integrate, the size of the downstream market that a deviant can capture is smaller, given that the integrated retailer is loyal to its upstream subsidiary. This effect, which Nocke and White (2007) refer to as the *outlets effect*, reduces deviation profits and thus facilitates collusion. On the other hand, it is also more difficult to discipline a vertically integrated firm given that it benefits, in any event, from the profits made by its downstream subsidiary. This effect, referred to as the *punishment effect*, reduces the severity of the punishment threat and thus hinders collusion. However, the outlets effect dominates, implying that vertical mergers facilitate upstream firms' ability to collude.

We believe that this conclusion would be strengthened in markets with imperfect observability, e.g. because upstream producers cannot observe each others' prices and these cannot be inferred from retailers' price or output choices. Indeed, if the downstream

[72] See also Normann (2009), which considers linear prices, and allows for the raising rivals' costs effect.

market is subject to random shocks, producers cannot distinguish whether a price cut by a retailer is due to an adverse demand shock or to a deviation by an upstream rival (just as described in Jullien and Rey (2004); see Section 3.3.3 above). In this context, vertical integration would allow the upstream producer to better monitor the behavior of its upstream rivals, given that its downstream subsidiary would have information on retail conditions. This concern is also contained in the 2008 EU NHMGs, which state that "[v]*ertical integration may give upstream producers control over final prices and thus monitor deviations more effectively*" (paragraph 86). This effect, if combined with the *outlets effect* of vertical integration, would again point to the same conclusion: vertical mergers have the potential to facilitate upstream collusion.

This theory was to the best of our knowledge first adopted by the UK Competition Commission in the *Anglo/Lafarge* case. The merger (involving cement and concrete producers) did not create vertical integration, but increased it. According to the Competition Commission, it would have allowed Lafarge better access to information. Integration with Anglo would in particular provide Lafarge with a better understanding (in terms of overall information and its geographic distribution) of the ready-to-mix (RMX) market. The ownership of the RMX plants would increase the knowledge of the local market conditions and allow better monitoring of deviations, whereas absent the merger, Lafarge would find it difficult - in areas where it does not have RMX plants - to understand whether lower sales would be due to an overall decline in demand or a deviation by competitor.[73]

The above conclusion is also reflected both the US and EU Non-Horizontal Merger Guidelines (NHMGs); however, their reasoning is somewhat different. In particular, the NHMGs highlight the role of vertical integration in facilitating collusion through the

[73] See also Crocioni (2012).

elimination of "disruptive buyers". For instance, the 1984 US NHMGs state that: "*The elimination by vertical merger of a particularly disruptive buyer in a downstream market may facilitate collusion in the upstream market.*" (Section 4.222)[74] This concern rests on the following intuition: if sales to a disruptive buyer are relatively important, then upstream firms might have more incentives to deviate in order to secure business with such a relevant buyer. A merger with such a buyer reduces rivalry, and thus facilitates collusion.

Still, this result can also be accommodated within our previous reasoning. Note that if "*sales to a particular buyer are sufficiently important*", such a buyer is necessarily a big one. Vertical integration with a big buyer enhances the outlets effects: the larger the integrated buyer, the smaller the fraction of the downstream market that the potential unintegrated upstream producers can capture if they deviate. Hence, a vertical merger with a big buyer facilitates collusion more than a vertical merger involving a relatively smaller retailer (Nocke and White (2010)).

4. Quantifying Coordinated Effects Case in Practice

4.1 Preliminary considerations: HHI, symmetry, and past collusion

The analysis of collusion and of the factors which facilitate it is the building block for the analysis of coordinated effects in mergers, and provides us with important hints on how to conduct such analysis in *practice*. Whenever an agency is facing a merger, it will have to make an analysis of the market, to gather hints as to whether the merger may raise unilateral effects, or coordinated effects, or whether it raises no danger of increased market power. When conducting such an analysis, some hints of whether coordinated effects may be relevant at all could be obtained by looking at very *simple indicators*.

In our opinion, the following will be especially important. First, in general tacit collusion is

[74] The 2008 EU NHMGs include similar concerns. See paragraph 90.

unlikely to arise unless after the merger there will be two or three firms with a very important share of the market (say, more than 70%), and there will be considerable symmetry among them. This consideration is only partially aligned with what is probably considered the main indicator for anticompetitive mergers, that is, the Herfindahl-Hirschman Index (HHI) of industrial concentration.[75] Given that the HHI is the sum of the squared market shares, the index is the higher - other things being equal - the fewer the firms in the industry. However, the HHI decreases with symmetry. Therefore, we suggest that an agency should not only look at whether the industry is concentrated, but also - for the purpose of deciding whether to look into coordinated effects - if market shares (and capacities) are sufficiently symmetric across the main players.

Second, a motivated suspicion of strengthening of coordinated effects should arise whenever one discovers that the industry has a past history of collusion (for instance, cartels have been investigated following suspicious conduct, or successfully prosecuted, perhaps also in similar or adjacent markets), when firms have developed a web of relationships (joint ventures, purchasing and/or distribution agreements, cross-directorates etc.), when they have established a system of exchange of information (or other price schemes which allow to improve monitoring), or when suspiciously parallel price movements have taken place over time (in this respect, we shall explain in Section 4.2 that there are a number of relative simple collusive 'markers' or 'screens' one may want to look at).

In all such cases, a coordinated effects investigation would be justified. In such an investigation (which we would expect not to occur with high frequency), the agency should study the market more in depth, looking in particular at the factors analyzed above, and

[75]See Coate (2005) for an empirical investigation of what are the main factors behind the FTC decisions to challenge a merger. HHI levels and changes are definitely one of the variables with most explanatory power.

possibly by relying on a variety of sources of information, such as customer surveys, interviews with current and prospective rivals, with distributors, internal documents from the merging parties, and - if resources and data permit - an empirical analysis of past prices.

Neven and de la Mano (2009) provide an interesting and detailed account of all the steps that the European Commission took to gather information about the market in the case of the merger between ABF and GBI. This included *in situ* visits to and interviews with rivals, distributors, customers; visits to an industry fair; a customer survey; and analysis of past data.

Coate (2005) analyses past investigations of the FTC, and finds that information which was regarded as very important included "hot" documents (i.e., internal documents found at the merger parties' premises which show that they forecasted the merger to increase prices), customer surveys, and event analyses - that is, analyses of past data and conduct in the industry which may be informative. An example could be the entry into the industry of a firm which then behaved as a maverick, behaving in a different way than incumbents; a merger involving such a firm would likely raise suspicion of pro-collusive effects. Similarly, observing that a merger between two firms in the industry increased prices, may indicate the likelihood that another merger would result in similar adverse effects on competition.

In particular, during the investigation, one should really try to understand to what extent a collusive outcome may be sustained in the industry: is the market transparent enough on the suppliers' side for monitoring of deviations to be timely?, and is there a credible and efficient punishment mechanism? The usefulness of resorting to these questions is illustrated in the merger case review in Section 6.

4.2 Screening for coordinated effects

The EU HMGs state that evidence of past coordination is particularly important when assessing the coordinated effects of mergers, particularly so if the characteristics of the relevant market have not changed significantly or are unlikely to change in the near future. Evidence of coordination in similar markets is equally relevant (paragraph 43). In line with this, the 2010 US HMGs state that "*conditions are conducive to coordinated interaction if firms representing a substantial share in the relevant market appear to have previously engaged in express collusion affecting the relevant market....Failed previous attempts at collusion in the relevant market suggest that successful collusion was difficult pre-merger but not so difficult as to deter attempts, and a merger may tend to make success more likely*." The view that firms that colluded in the past will try to do so again is supported by empirical evidence showing that cartel break down tends to be followed by attempts to reestablish cartels (Levenstein and Suslow (2002).

Economic analysis can play a major role in screening, i.e., identifying those industries in which cartel formation and tacit collusion are more likely. Screening is the first step in the process of detecting cartels, and it may or may not end up in prosecution. Indeed, it is a useful tool in that it picks those industries where antitrust authorities should devote more efforts in looking for collusive evidence (be it hard evidence, or competing explanations for observed behavior). Similar tools and indicators as the ones used for screening can also be useful for identifying those industries in which a merger would facilitate cartel formation or tacit collusion.[76]

There are two main approaches for screening: the structural and the behavioral approach. The structural approach checks whether those factors that facilitate collusion, as

[76] Further, when a merger involves many local markets, simple screening may be useful to detect in which markets there may be coordinated effects concerns.

reviewed in the previous section, are present in a given market; hence, it answers the question: how likely is it that collusion *will form*? In contrast, the behavioral approach answers the question: how likely is it that collusion *has formed*? In other words, it checks whether observed behavior is consistent with collusive behavior and whether there are competing theories that could also explain the observed patterns.

An industry for which there is past evidence of collusion, or even attempts to sustain collusion, should be more vulnerable to collusion in the future too. In this case, a merger would tend to facilitate collusion even more.

In order to check whether this is the case, behavioral collusive markers could prove useful.[77] Collusive markers involve looking at data of certain variables, mainly prices and market shares to see whether their pattern is consistent with either tacit or explicit collusion.

Since the ultimate aim of colluding firms is to raise prices, unusually high prices might provide some hint of collusion. The problem is that it is not always possible to construct the correct contra-factual, i.e., the price that would have prevailed in a competitive environment. For this reason, one should compare industry prices with those of a control group with similar costs and characteristics. For instance, as reported in Abrantes-Metz and Bajari (2009), organized crime in New York created during the 80's a "concrete club" which led to prices which were 70% higher than in other large cities: even taking into account the higher New York prices, the comparison suggested suspiciously high prices.

The fact that prices do not reflect costs might also be very informative. Indeed, theory suggests that in competitive environments prices tend to track costs of production. Bajari and Ye (1993) show that, in a first-price sealed-bid auction with private values,

[77] On collusive markers (or screens), see Harrington (2006b). For a less informal discussion, see Abrantes-Metz and Bajari (2009).

equilibrium bids are a function of costs when firms behave competitively. Instead, in an efficient cartel, firms would share their cost estimates, and then the lowest-cost firm would submit a serious bid while all other cartel members would either refrain from bidding or submit high "phony" bids.

Athey et al. (2004) analyze a model where firms' costs move over time and are private information.[78] Colluding firms exchange messages over their costs before setting prices. They thus face a trade-off between efficiency (optimally, the lowest cost firm should make the sale) and the price level: if they choose a high collusive price, even a high cost firm would have incentives to declare that it has a low cost. Hence, for firms to have incentives to report their true costs, the collusive price would have to be sufficiently low. However, this mechanism would be too costly in terms of foregone profits. The authors show that at the best collusive equilibrium, provided that firms are patient enough, collusion entails stable prices and stable market shares over time.[79]

In sum, these theoretical works suggest that if prices do not track costs, there might be collusion in the industry. This explains why, for instance, an antitrust authority might want to look at the evolution of prices and costs over time. For instance, in the DS Smith/Linpac Containers merger case, the UK Competition Commission looked at the time series of DsSmith's unit prices and costs - and since changes in prices followed quite closely changes in costs, it concluded that it did not offer evidence of collusion (buyers claimed that there was collusion in the industry).

Related to the abovementioned theoretical results that collusion would involve

[78] More precisely, firms' costs are independent and identically distributed (*iid*) over time, meaning that the cost realizations have the same probability of occurring in every period, regardless of the previous periods' realizations.

[79] At a more general and intuitive level, one could say that price rigidity can also reflect that fact that agreeing to adapt to changing market conditions is difficult and costly (e.g. communication leaves traces that authorities can use to detect cartels).

greater price stability, Abrantes-Metz et al. (2005) have developed a screen or collusive marker based on price volatility. The analysis of a cartel in procurement auctions for food supply to military agencies in the US, revealed that prices in frozen perch were much less volatile (and less responsive to costs) during the life of the cartel than when the cartel broke down.

At the other extreme, abrupt increases in prices which are not justified by cost or demand shocks may indicate that the industry is colluding. However, as Harrington (2006b) warns, cartels are aware that unusual price changes would attract unwanted attention, and accordingly often adopt progressive price increase policies.

Similarly, abrupt price decreases might also uncover the presence of a cartel. The occurrence of price wars (i.e., periods of intense rivalry followed by the return to a stable path of higher prices) as explained in Section 3.3.3, is a necessary component of collusion in markets in which transparency is low: price wars are used as a disciplining device to avoid deviations.[80] Price wars could also be indicative of failed attempts to collude. In contrast, the absence of price wars should not be considered as conclusive evidence of competitive behavior, given that price wars are costly and the most successful cartels are characterized by price stability.

Collusive price patterns also translate into distinctive output patterns. Indeed, quantity markers shed light on whether collusion took place or not by looking at the evolution of market shares. Under collusion, firms' market shares tend to be stable.[81] Also, the birth and the death of a cartel might give rise to abrupt changes in market shares and

[80] See Porter (1983) and Ellison (1994) for seminal empirical analysis of price wars and collusion in the Joint Executive Committee that operated in the US at the end of the 19th century. Fabra and Toro (2006) empirically analyze price wars in the Spanish electricity market and show that they are consistent with collusion among electricity producers.

[81] If the market under scrutiny is a procurement auction, bid rotation might appear at first sight as resulting in negative correlation in firms' output levels. However, bid rotation would typically be constructed so as to guarantee stable market shares overall.

thus be indicative of a change in behavior from competition to collusion or vice-versa.

It is important to note that evidence consistent with collusion does not *prove* that collusion indeed took place, and the analysis should be careful enough to exclude any alternative plausible explanation of the observed behavior. Indeed, a sudden price reduction may not be due to the triggering of a price war in a Green and Porter-like cartel, but may be due to a demand or cost shock. For instance, in the *Woodpulp* case, it turned out that the alternating phases or high and low prices were caused by exogenous events such as shocks in the North American market, which affected imports to Europe, and Swedish changes in the policy of subsiding stocks (see Motta (2004)).

In any case, we should bear in mind that in a coordinated effects case, the purpose is not to prove that a cartel was in place, but rather that there it is likely that the merger is creating or strengthening collusion. Therefore, price and market share data which are consistent with collusive behavior should be taken as very serious evidence that collusion is likely to already exist in the industry.

While enforcement focuses on assessing the effects of mergers before they occur, there is surprisingly little work on the ex-post evaluation of mergers.[82] Behavioral screening could also play an important role in this area, thus providing a useful tool for improving enforcement practice. More specifically, screening in ex post merger evaluation could focus on whether observed behavior has changed before and after the merger, and whether the observed changes could potentially be explained by any sort of collusive agreement in the ex-post merger market. Furthermore, this exercise could provide valuable insights as to the analysis of coordinated effects in prospective merger cases, as it would help identify those types of mergers more likely to facilitate collusion.

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[82] For a recent paper on the ex-post evaluation of a merger between book retailers in the UK, see Argentesi *et al* (2012). Nevertheless, this merger did not raise concerns over coordinated effects.

4.3 Other approaches

Unfortunately, there have been few attempts to develop practical tools to measure the magnitude of coordinated effects.[83] The state of economic analysis in this area is still limited, and there is no consensus yet on how this issue should be approached from a quantitative perspective. However, for completeness, we report here two recent attempts to contribute to the measurement of coordinated effects.

4.3.1 Coordinated Price Pressure Index

Price leadership is one way through which firms can achieve coordination without explicit communication. In other words, as it has been reported in some cases, one firm takes the lead in raising prices and the other firms match the price increase; failure to do so implies reversion to competitive pricing. Still, firms have to solve a coordination problem: namely, who will be the leader (Lu and Wright (2010) and Harrington (2012)).

Accordingly, it might be useful to quantify the incentives for a firm to take the lead in initiating collusion and how a merger impacts on such incentives. This is the approach followed by Moresi et al. (2011), who develop an index - referred to as the *Coordinated Price Pressure Index* (CPPI) - which is the largest price increase that a firm would be willing to initiate and its rival would be willing to match. A high CPPI indicates high chances that firms achieve collusive outcomes through price leadership.

In merger analysis, one would need to compute the Delta CPPI, which is the increase in the CPPI that results from a merger. If the CPPI significantly increases from the pre- to

[83] This is in contrast with the analysis of unilateral effects, for which a number of simple tests now exist to assess the effect of a merger on the pricing behavior of the merging firms. See Oxera (2011) for a review of such tools.

the post-merger market structure, the merger can be expected to lead to coordinated effects.

For the sake of simplicity, the construction of the CPPI rests on strong assumptions. For instance, it does not look at the incentives to initiate a price increase in a fully dynamic model among all the firms in the industry, but instead focuses on two firms' incentives to raise and match the price increase in a single round. If firms are asymmetric, the CPPI can differ depending on the identity of the leader, and caution calls to take the lowest value of the resulting CPPI.

The data needed to compute the CPPI include sales volumes, own price elasticities, diversion ratios,[84] profit margins and the discount factor.[85] Moresi et al. (2011) provide the exact formula to compute the CPPI, as well as several examples that illustrate how it can be computed.[86] For instance, consider two firms that compete by choosing prices; they have equal sales, and charge a margin of 40%. Their products are such that the diversion ratio between them is 25%, and the discount factor is 80%. The maximum price increase that each firm is willing to undertake is 10%, while the highest price increase that each firm is willing to match is 10.7%. Hence, the CPPI is 10%. Suppose that one of these two firms proposes to merge with another one. If the CPPI increases to 15%, then the Delta CPPI would be 5%; in other words, the merger would facilitate collusion through price-leadership by increasing in 5% the maximum price increase that firms are willing to lead and to match.

In sum, this approach allows to quantify one of the possible coordinated effects of a merger. The downside is that it requires data, which might not always be available to the

[84] The diversion ratio measures how much of the displaced demand for product A switches to product B when the price of A goes up.

[85] These ingredients are also used to compute indexes for the assessment of unilateral effects in merger cases, e.g. the gross upward pricing pressure index (GUPPI).

[86] They also apply to the merger between AT&T and T-Mobile.

competition authorities. Furthermore, the index is developed for the case of price competition for differentiated products, and it is not clear whether it would be applicable to other contexts in which firms compete by e.g. choosing quantities. Last, an important question remains unanswered: how big of a Delta CPPI do we require in order to ban a merger on the basis of coordinated effects?

4.3.2 Incremental payoffs from collusion

Kovacic et al. (2006) advocate for an alternative analysis. They argue that quantifying the incremental payoffs from post-merger collusion among subsets of firms in the post-merger market would provide valuable information as to whether coordinated effects are more or less likely. This is grounded in the assumption that the probability of coordination will be greater the higher the payoff from doing so; but otherwise, their analysis does not require a direct quantification of the likelihood of post-merger coordination. Their approach requires to select a model of competition, and to calibrate it using pre-merger data.

They provide an example of a market in which two out of four firms decide to merge. Under the assumption of differentiated products price competition, they compute equilibrium profits pre-merger, post-merger under no collusion, and post-merger under collusion among different subsets of firms. They find, under a specific set of parameter values, that collusion after the merger would be more than three times more profitable than collusion before the merger. Evidence showing that the payoffs from incremental collusion increase substantially after the merger, would indicate a strong likelihood of coordinated effects.

It is not fully clear to us how this approach can be readily applied in real cases. First, results can be sensitive to the assumptions made in the calibration, and second, what is a big incremental payoff from collusion, and what is a small one?

5. Coordinated Effects in European Merger Policy

In this Section, we briefly report on the use of coordinated effects in European merger control. First, we shall explain that for reasons related to the test adopted by the European Merger Regulation first introduced in 1989, the European Commission used quite extensively the concept of joint dominance (which is closely related to the one of coordinated effects), leading to many mergers being challenged on the basis of this concept. For this reason, the case law on coordinated effects is much richer than in most other jurisdictions. Second, we shall briefly mention *Airtours*, a landmark judgment which led the European Commission to reconsider the test used in the Merger Regulation, and changed the way (and the frequency) in which the analysis of coordinated effects of mergers was carried out.

The European Merger Regulation of 1989: the dominance test

When merger control was finally introduced in the late Eighties, the criterion to authorize or prohibit mergers in Europe was based on the concept of *dominance*, that is, the power to behave to an appreciable extent independently of its competitors, its customers and ultimately of the consumers.[87] In practice, for a finding of dominance a firm must enjoy a very high degree of market power, and it is widely accepted that it is unlikely that a firm with less than 40% of the relevant market would be found dominant.

[87] See *Hoffmann-La Roche*, where the European Court of Justice first defined this concept thus: The dominant position [...] relates to a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by affording it the power to behave to an appreciable extent independently of its competitors, its customers and ultimately of the consumers. Such a position does not preclude some competition, which it does where there is a monopoly or quasi-monopoly but enables the undertaking which profits by it, if not to determine, at least to have an appreciable influence on the conditions under which that competition will develop, and in any case to act largely in disregard of it so long as such conduct does not operate to its detriment.

The Merger Regulation used to state that a concentration which creates or strengthens a dominant position as a result of which effective competition would be significantly impeded in the Common Market or in a substantial part of it shall be declared incompatible with the Common Market.[88] In other words, only mergers which created or reinforced a dominant position could be prohibited by the European Commission. This introduced a test which is different from the "substantial lessening of competition" test used in US law and more aligned with economic analysis.[89]

To see why the two tests may well lead to different outcomes when applied to the same merger, consider a situation where two or more firms with sizeable market shares would coexist in an industry after a merger, but none of them has enough market power to be considered dominant, and suppose it is also very unlikely that they would collude. For instance, imagine that a firm has 50%, the two merging firms would have a share of 45% after the merger, while the remaining market is fragmented among smaller firms. In such a situation, economic theory clearly indicates that the merger might well be detrimental because of unilateral effects (suppose for instance that the enhanced market power is not outweighed by efficiency gains), but it would be very hard to argue that the merger would create or reinforce a dominant position, since the merging firms would face a stronger competitor. Hence, the Commission could not prohibit such a merger, as under the Merger Regulation 4064/89 the finding of a dominant position was a necessary condition for prohibiting a merger.

Joint dominance

[88] Merger Regulation 4064/89, article 2(3). Note that the legal term "concentration" stands for merger (or takeover).

[89] For a discussion, See Motta (2004)'s Chapter 5.

Soon, the European Commission realized that there were mergers which did not appear to be "good" (because they reduced competition, and were likely to raise prices) but which could not be prohibited because they did not create or reinforce a *single-firm*'s dominant position. However, the Commission could still prohibit such a merger if it could argue that it created or reinforced a *joint* dominant position. Loosely speaking, joint dominance refers to a situation where a (presumably small) group of firms in the market are able to coordinate their actions and set prices above the competitive level. However, what exactly joint dominance was, and how it could be proved to exist (or to likely occur after a merger), became the object of a series of merger cases in the EU.

The first case where the Commission challenged a merger on joint dominance grounds was *Nestlé/Perrier*, a merger in the French mineral water industry (see Section 6). This was a case where all the elements pointed to high likelihood of coordination (probably pre-existing the merger) among the main firms, but the Commission eventually allowed the merger under some remedies, probably with a view to establish a precedent that would not be challenged in court.

After Nestlé/Perrier it was uncertain for a while whether the Community Courts would uphold the Commission's argument that a merger may be prohibited because of *joint* dominance.

In *France v. Commission* - a 1998 judgment - the European Court of Justice accepted the concept of joint dominance, but then quashed the decision that the Commission had taken in *Kali+Salz/MdK/Treuhand* on the merit, and seemed to indicate that some sort of structural links (correlative factors) among firms was needed to prove joint dominance. Although it was unclear what exactly and how strong such structural links should be, this judgment seemed to set a very high standard to prove joint dominance.

However, in *Gencor v. Commission* the Court of First Instance (CFI) reaffirmed the principle that the European Commission can block mergers if they create joint dominance

but seemed to accept a broader (and more economics-aligned) interpretation of the concept, and argued that there is no need for oligopolists to have some structural links in order to prove that collective dominance exists.

The Court stated that "*the concentration would have had the direct and immediate effect of creating the condition in which abuses where not only possible but economically rational, given that the concentration would have significantly impeded effective competition in the market by giving rise to a lasting alteration to the structure of the markets concerned.*" (paragraph 94 of Judgment). The judgment seemed to pay less attention to structural links between the firms and more attention to the structure of the market, referring in particular to the fact that the merger would have rendered the position between the two main producers extremely symmetric, both in terms of reserves of world platinum production and in terms of costs of production.

The Commission was then ready to use the higher degree of freedom left by the CFI judgment, and started to increasingly rely on the concept of joint dominance, applying it to cases where it was not straightforward that the merger would have created or reinforced collusion. Arguably, though, joint dominance was the only tool available to the Commission to prohibit anticompetitive mergers which it could have not otherwise stopped.

***Airtours*, and the new Regulation**

The *Airtours* judgment of the Court of First Instance (followed immediately by other two judgments, *Schneider/Legrand* and *Tetralaval/Sidel,* in which the CFI also annulled merger prohibition decisions of the Commission) is very important because it led to a change in EU merger policy.

In *Airtours*, the Commission had extended the concept of joint dominance to an industry whose features were not unambiguously conducive to collusion (see Section 6). The CFI went very carefully through the economic analysis of the Commission, and annulled

the Decision. Its judgment contains a number of remarkable points.

First, the CFI clarifies the standards of proof required by a merger prohibition: it is not enough for the Commission to argue that after the merger it is *possible* that firms will collude, it should motivate and explain that the collusive outcome will be very *likely* to arise. Similarly, in Tetralaval/Sidel - where however the issue was whether the merger would have led to anticompetitive tying - the Court stressed that the standard of proof cannot consist in showing the *mere possibility* that a certain outcome can occur, but requires strong arguments and evidence that such an outcome would be *plausible*.

Second, this judgment makes it clear that joint dominance is not a multi-purpose concept, but has to do with the pro-collusive effects of a merger, as economic analysis would have done it. In particular, the Court spells out three conditions for tacit coordination to be sustainable: (i) sufficient market transparency (for firms to monitor each other and see whether there are deviations); (ii) the existence of an incentive not to depart from the common policy, i.e., the existence of a credible mechanism of retaliation if deviations occur; (iii) current and prospective rivals, as well as consumers, must not jeopardize coordination (in other words, neither entry is easy nor buyer power is very high). These are the same conditions that any economic textbook would indicate as those which allow for a collusive outcome to arise. Therefore, the judgment clarifies once and for all that the concept of joint dominance used by the European judges is the same as the one used in economic analysis.

Finally, in this and the following judgments the CFI heavily criticized the economic analysis carried out by the Commission, persuading Commissioner Mario Monti that the use of economics and economists at DG-Competition should be enhanced, and to create the Chief Economist's Office.

After *Airtours*, it was clear that the Commission could not rely too much on the joint dominance concept to prohibit mergers that it regarded to raise anticompetitive concerns

but which did not create or strengthen a single-firm dominant position. This pushed it to adopt a new Merger Regulation (entered into effects in May 2004) with a new test for the assessment of merger control: the Commission will prohibit mergers that *would* significantly impede effective competition*, in the common market or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position*.

In part not to lose the case-law, in part to accommodate the objections of some member states (the dominance test still applies in some national laws), a reference to `dominance' is kept, but the `test' *de facto* is modified from a dominance test to a `substantial lessening of competition' test.

The Horizontal Merger Guidelines

The Horizontal Merger Guidelines (HMGs) issued in 2004 by the Commission follow the conditions for coordinated effects as set out by the CFI in *Airtours* and subsequently confirmed by the Court of Justice in *Impala*, and which are to a large extent consistent with what economic analysis suggests (see our own Section 3.2 above).

"*Coordination is more likely to emerge in markets where it is relatively simple to reach a common understanding on the terms of coordination. In addition, three conditions are necessary for coordination to be sustainable. First, the coordinating firms must be able to monitor to a sufficient degree whether the terms of coordination are being adhered to. Second, discipline requires that there is some form of credible deterrent mechanism that can be activated if deviation is detected. Third, the reactions of outsiders, such as current and future competitors not participating in the coordination, as well as customers, should not be able to jeopardize the results expected from the coordination*." (paragraph 41)

In other words, the Commission identifies the ability to reach some sort of common understanding (on prices, on capacities, on terms of sales, on how to divide markets, and so on) as a precondition for coordinated effects, followed by the three cumulative conditions

for the sustainability of the collusion, namely (i) a mechanism or circumstances that allow monitoring of each other's actions, (ii) the ability and credibility of a mechanism which allows to punish deviations, and (iii) the inability of customers to command lower prices and of existing or prospective rivals to react, thus making it unlikely to reach the collusive outcome.[90]

The HMGs also clarify that the merger may raise coordinated effects concerns in two ways: (i) by increasing the likelihood that firms will tacitly or explicitly coordinate their behavior *after* the merger (e.g., because the merger reduces the number of existing competitors, increases the symmetry of the main firms aligning their incentives to collude, or removing a maverick firm which in the past had prevented or threatened collusion); or (ii) by making coordination which already existed before the mergers easier, more stable or more effective.

Finally, the HMGs also point out that efficiency gains could well have a procompetitive effect not only in unilateral effects but also in coordinated effects cases: "*In the context of coordinated effects, efficiencies may increase the merged entity's incentive to increase production and reduce prices, and thereby reduce its incentive to coordinate its market behavior with other firms in the market. Efficiencies may therefore lead to a lower risk of coordinated effects in the relevant market.*" (paragraph 82).

To the extent that the Commission follows the HMGs, and it applies the analysis not in a mechanical way (prior to Airtours, one could get the impression that most of the analysis had consisted in a listing of the main facilitating factors without really trying to uncover the real working of the market and the degree to which collusive outcomes may be

[90] In general, economic theory suggests that there are two important aspects of collusion, namely enforcement and coordination. In merger analysis, though, it is enforcement that should be the focus of the analysis, whereas in anticompetitive agreements and cartels (or conspiracies, in US law), the focus is on coordination.

plausible and sustainable), coordinated effects in EU competition policy will be aligned to the teachings of economic analysis.

An indication that the Commission does a good job in this respect comes from the recent ABF/GBI case (2008), the first time that a merger was challenged under the new Merger Regulation (see Section 6 for a discussion).

6. Cases

In this Section, we briefly review the main cases of coordinated effects (joint dominance) analyzed by the European Commission. We focus on one particular jurisdiction and antitrust agency for several reasons. First, it is in Europe that, for the reasons delineated above, there has been a large number of coordinated effects cases;[91] second, the (however short) description of the cases allows to bring out how the analysis has evolved over time, and offers some teachings on how it should be carried out both from the legal and (especially) from the economic point of view.

6.1 Nestlé/Perrier

The first case where the Commission used joint dominance was in *Nestlé/Perrier* (1992), a merger in the French mineral water industry. Under the terms of the proposed merger, Nestlé would buy Perrier but sell Volvo (one of Perrier's sources) to BSN, another rival.

Nestlé, BSN and Perrier owned several sources, and accounted for slightly more than 80% of the market in value. The exact individual market shares were kept confidential in the Commission Decision, but Motta (2004) estimates that Nestlé and Perrier (minus Volvo) would have a market share of around 40-50%, but BSN (after acquiring Volvo) a

[91]The Commission challenged seven merger cases on the basis of coordinated effects alone since 1992, of which six before the CFI's judgments in 2002.

share in excess of 30%. Since Volvo was also the source with the largest capacity in the market, it would seem difficult to argue that the operation involving the merger of Nestlé/Perrier and the transfer of Volvo to BSN would have created single firm dominance: Nestlé/Perrier could not behave independently of BSN.

The European Commission turned then to the issue of whether the merger would lead to joint dominance. It could hardly found a stronger case.

First, the industry was highly concentrated, exhibited a lot of symmetry among the main players, and it was characterized by short information lags and frequent transactions.

Second, market transparency was extremely high in this industry, not only because the three main firms supply the same customers, from which there is a considerable feedback; but also because the "Chamber syndical des beaux minerals" distributed data on monthly sales quantities broken down by brand of the other suppliers.

Third, entry was very difficult because of regulatory barriers, and buyers' power was weak.

Not surprisingly, the history of the industry does not suggest that fierce competition takes place,[92] and even the fact that the agreement between Nestlé and BSN to divide up Perrier was triggered by an initial bid for Perrier by an outsider which eventually lost the takeover battle, strongly suggests that BSN and Nestlé had reached a cozy *modus Vivendi*.

Compute, Jenny and Rey (2002) argued on the basis of a detailed theoretical and empirical analysis that the transfer of Volvo was an essential part of the transaction: absent the transfer of Volvo to BSN, Nestlé/Perrier would have had a much larger total capacity than BSN, which might have reduced the sustainability of collusion in the industry.

The EC concluded that the proposed merger (with the transfer of Volvo to BSN),

[92]The ex-works prices (before rebates and VAT) of the five major still mineral waters of the three national suppliers have constantly increased in a parallel way since at least 1987 [...] Whoever first increased its prices was always followed by the other two suppliers. There was no price decrease during the whole period considered. (Nestlé/Perrier: paragraph 59)

would have led to a joint dominant position by Nestlé/Perrier and BSN. However, the transaction was allowed under the condition that Nestlé sold to a third party some brands which accounted for a capacity of around 25% of the market (but much smaller market share). This was probably a very lenient decision, but arguably the Commission was hoping that in this way it could set a precedent of using joint dominance in merger control unlikely to be challenged in courts.

6.2 Kali+Salz

In 1993 the Commission approved the merger - subject to certain conditions - between Kali und Salz ("K+S"), a subsidiary of BASF, and Mitteldeutsche Kali ("MdK"), owned the Treuhandanstalt, a public-law institution entrusted with the task of restructuring the firms of the former German Democratic Republic.

Since the Commission thought the merger would have created a joint dominant position between the merging firms and SCPA - a French company - in the Community market for potash salt-based products (together they would have held about 60% of the market, but remaining rivals were highly fragmented), it imposed two conditions aimed at reducing links between the two firms. First, K+S and MdK would withdraw from the Kali-Export GmbH export cartel in which K+S and SCPA worked together. Second, K+S and MdK would set up their own distribution network in the Community, in particular in France, and they would terminate the current cooperation with SCPA as distribution partner on the French market.

The Commission's decision was appealed by the French government and by SCPA, and the European Court of Justice annulled the decision. The Court found that the existing structural links between K+S and SCPA were not as strong as claimed by the Commission, and that it had not been shown that the remaining rivals would have not exercised

sufficient competitive constraints to K+S/MdK and SCPA.

6.3 Gencor/Lonrho

Gencor was the owner of Implats, and Lonrho (LPD) the owner of Eastplats/Westplats. The company resulting from the merger and Amplats - the only remaining large supplier - would have controlled some 90% of the reserves of platinum in the world. Each of them would have had some 35% of output, all the other producers being highly fragmented (but after Russia had exhausted its stock, the output would have increased).

The merger also raised symmetry between the two players, since according to the Commission it will result in a new company with an operating cost structure of mines which is similar to Amplats, even though "[...] *important differences still can exist due to differences in ore quality, different mix of ore mined, different costs in processing and refining operations and differences of costs in administration*." (paragraph 182 of the Decision).[93] The Commission whose view was upheld by the Court, maintained that "[t]*he greater similarity of the cost structure of Amplats and Implats/LPD means that the combined Implats/LPD and Amplats, to a greater extent, are likely to be affected and act in the same way on market developments, for example in their production decisions. A price increase would for example have a similar effect on the profitability of the two companies. The two South African players would therefore have a higher degree of common interest in the way the market should develop, and this would increase the likelihood of anti-competitive parallel behavior following the merger, e.g. restrictions of output.*" (paragraph 184).

[93]The Commission did not believe that the merger would have resulted in considerable synergies, as claimed by the parties, and argued that "the synergies outlined could even be negative, since the differences in organizational cultures which exist between Implats and LPD will make integration difficult and could therefore be very costly." (paragraph 183)

6.4 Airtours/First Choice

In *Airtours/First Choice* (2000), the Commission blocked a merger which it claimed it would have resulted in three firms, Airtours/First Choice, Thomas Cook, and Thomson be jointly dominant in the UK short-haul package holiday market.

The decision was pushing forward the use of joint dominance not only because the merger would have left three firms in the market (previously, the Commission had challenged three-to-two mergers), but also because it would not have led to coordination in prices, but allegedly in capacities. Let us first review the Commission's arguments, and then the Court's judgment.

The Commission decision

The UK Mergers and Monopolies Commission (MMC) had extensively reviewed the industry in 1997. The MMC found that the industry had low barriers to entry and high volatility of market shares, suggesting that leadership was not persistent and market positions not entrenched.[94]

However, the Commission argued that after 1997 the industry structure had changed and did not exhibit the same degree of openness as before: a number of acquisitions had resulted in four large operators (those mentioned in footnote above) which were vertically integrated both upstream into charter airlines and downstream into retail distribution, and a large number of unintegrated small players operating in niche markets.

In the package tour industry, firms' take key decisions at two different stages. In the

[94] In 1992, Thomson had 24% of the market, Airtours 11%, First Choice 6% and Thomas Cook 4%. In 1998, Thomson had 30.7%, Airtours 19.4%, First Choice 15% and Thomas Cook 20.4% of the market.

planning stage, a firm decides overall capacity (seats in charter flights, rooms in hotels) for the following 12-18 months. In the *selling stage*, firms compete under a capacity constraint, and have a strong incentive to fill capacity, since a package holiday loses all its value unless it is sold before its departure date. Hence, one should expect firms to reduce prices considerably as the departure dates are approaching.

Collusion at the selling stage is therefore unthinkable, as the temptation to deviate from any collusive price would be strong, and a punishment within selling period would not be credible, due to the capacity constraint. Furthermore, specific package holidays would differ in terms of destination, type of hotel, additional services and so on: high product heterogeneity would make it very difficult for firms to coordinate on collusive prices.

The Commission, however, argued that firms would have colluded in the planning stage, setting low levels of capacity to raise their profits above the competitive level. Accordingly, a deviation would amount to a firm setting a high level of capacity in the planning season; and a punishment to choosing deliberately high levels of capacity for one or more periods.

Colluding on capacity is generally unlikely, because in most industries capacity choice will bind firms for a long period of time, making punishments too costly and untimely. However, in an industry where capacity decisions are reviewed periodically, collusion on capacities would, in principle, be possible.[95]

The Commission then argued that the features of the industry were making collusion (on capacities) likely. The industry was highly concentrated and symmetric, as the three major operators remaining after the merger would have had similar cost and would all be

[95] See for instance a paper by Staiger and Wolak (1992), which show that collusion might arise in a model, which reproduces the key features of the package tour industry. Staiger, R.W. and Wolak, F.A. 1992. Collusive Pricing with Capacity Constraints in the Presence of Demand Uncertainty., Rand Journal of Economics, 23(2), pp. 203-219.

vertically integrated.[96]

Controversially, (see below) the Commission also claimed that the market exhibited considerable transparency of firms' capacity decisions,[97] and that supply substitution was limited and barriers to entry high (both because of the high degree of vertical integration).

The CFI judgment

First of all, the Court of First Instance stated that for tacit coordination to be sustainable, three conditions must simultaneously occur: 1. There must be sufficient market transparency (firms should be able to monitor each other to identify possible deviations). 2. Firms must have an incentive not to depart from the common policy, i.e., there must be a credible mechanism of retaliation if deviations occur. 3. Current and prospective rivals, as well as consumers, must not jeopardize coordination.

By so doing, the CFI clarified once and for all that the concept of joint dominance corresponds to the concept of collusion in economic analysis. On the basis of these conditions, the CFI then proceeded to see whether in the case at hand they were satisfied. Analyzing the industry, the judge found that: (a) the industry structure had not significantly changed since the MMC report, with high volatility of market shares not conducive to collusion; (b) market demand was very volatile, making collusion less likely; (c) the market was not transparent, since *overall capacity* was difficult to `measure' and observe, as it was made of hundreds of separate decisions (routes, destinations, hotels) often going in different directions.

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[96] Mistakenly (see Section 3.3.2 above), the Commission also argued that *volatility of demand makes the market more conducive to oligopolistic dominance* (paragraph 97).

[97] Supposedly because there exist few independent charter operators, because the large integrated operators often trade with each other available seat capacity, and because major planned changes in capacity seats though purchase of planes are unlikely to be kept hidden. See paragraph 105.

Even if it were possible and meaningful to estimate total capacity levels, the Judge argued that it would be difficult to monitor each other's capacity decisions, because: (i) hotels were unlikely to be means of monitoring, as they usually rely on tour operators from different countries; (ii) purchase of airline seats by tour operators was minor and came at a late stage of planning period; and (iii) decisions about investments to increase capacities were observed with delays.

Therefore, *transparency* (the first condition identified above) was low during planning period, making collusion on capacities unlikely.

The Judge then turned to the second condition, and found that no *credible punishment mechanism* existed. In particular, he found that increasing capacity in the selling season would not be a likely deterrent of deviations, for three reasons: (i) firms have an innate tendency to be cautious in their capacity decisions; (ii) since deviations are not detected timely, reactions would take time; and (iii) late-added package holidays would be of poor quality (inconvenient flight times, poor-quality accommodation). Hence, increasing capacity in the following season would be a poor retaliatory measure.

Finally, coming to the third condition, the judge found that the Commission had underestimated the reaction of competitors and consumers: (i) Small tour operators would increase their capacity if the majors tried to raise price, as he found that they would have adequate access to airline seats (charters, scheduled, low-cost) and to the distribution, both via internet and the traditional channel (40% of the distribution would in any case be independent agencies); (ii) there were important continental European operators which would have entered the market; (iii) consumers would compare offers carefully before buying, and long-haul foreign package holidays were increasingly attractive and starting to compete with short-haul holidays.

He then concluded that the Commission decision had been vitiated by a series of manifest errors of assessment of joint dominance, and annulled the decision.

6.5 The 'music mergers': *EMI/Time Warner* and *Sony/BMG* (v. Impala)

The European Commission reviewed two mergers in the recorded music industry within very few years of distance, *EMI/Time Warner* (2000), and *Sony/BMG* (2004). In both cases, assessment of joint dominance was critical.

The proposed merger between EMI and Time Warner was investigated by the European Commission which after a stage-two investigation, issued a statement of objections in which it argued that the merger would have created or strengthened a collective dominant position among the remaining four majors, EMI/Time Warner, Universal, Sony and BMG, which accounted for about 80% of the EU recorded music market. After failing to persuade the Commission to accept some divestments as remedies, the merger was withdrawn.[98] (For this reason, the Commission did not issue any decision, so there is no public document detailing the Commission's findings.)

Four years later, Sony and BMG (Bertelsmann Music Group) announced their intention to merge into a joint venture their worldwide recorded music businesses (except Sony's activities in Japan). Before discussing the substance of the case, and for reasons we shall explain below, let us describe the timeline of the case. The merger was notified on 9 January 2004, a second phase investigation was started on 12 February 2004, the statement of objections, provisionally concluding that the merger was incompatible with the common market, dated of 24 May 2004, oral hearings were held on 14-15 June, and the Commission decided that the merger was approved on 19 July 2004. Impala (Independent Music Publishers and Labels Association) appealed the decision, and in 2006 the Court of First Instance annulled the decision, claiming that it was vitiated by inadequate reasoning and a manifest error of assessment. In July 2008, the Court of Justice concluded that the CFI had

[98]The statement of objections was issued early September, and the final ruling on the merger was due in mid October. A few days before the decision, the parties withdrew the notification.

erred and referred the case back to it.[99]

From the dates above, we stress two points. First, the Commission took this decision under the old Merger Regulation (the new one entered into effect on May 2004, so it did not apply to mergers notified previously), but after the *Airtours* judgment, which had pointed out the need for more economic analysis and a higher standard of proof in joint dominance cases. Second, in merger cases - where a strict time limit exists - the statement of objections comes very shortly before the final decision, and it is remarkable that the Commission changed its mind in few weeks, especially considering that the industry had already been scrutinized at length in the previous EMI/Time Warner case among others.

Let us now discuss the substantive issues of the case. The Commission defined the market as the market for recorded music at the national level, and proceeded to analyze the industry in different countries. Nonetheless, the features of the national markets are virtually identical. On average, Sony and BMG together would have had roughly 20-25% of the market, Universal 25-30%, Warner 10-15%, and EMI 15-20%, implying that the four post-merger majors would have 80-85% of the market. (The exact figures are non public, but the CFI at paragraph 257 says the five majors hold, depending on the country, between 72% and 93% of the market.)

The majors were worldwide vertically integrated companies (active in all stages of the business, from talent--scouting and signing up of artists to distribution) with significant financial strength (crucial in a sector where sunk costs - from the signing of artists to promotion) and a large diversified portfolio (important to diversify risk, also taking into account that very few albums would account for most of the revenues).

[99]Meanwhile, the Commission had approved the merger once again in October 2007 after a new investigation which focused mostly on transparency, and found that pricing of the majors had increased in sophistication and differentiation. Impala appealed this decision as well, but after Bertelsmann sold out to Sony its share of the joint venture, the appeal was withdrawn, and the CFI did not need to take a second judgment on the case.

In principle, the market is characterized by a high heterogeneity of the products, classical music being for instance very different from rock music, with great differentiation existing within the same genre and even within the records of the same authors. However, the CDs were typically organized in very few price categories which were of easy comparability, and most importantly a few albums accounted for most of the revenue of the majors. Thus, the Commission - to see whether the market was *already* characterized by joint dominance - compared the prices and discounted prices of the top 100 albums for each major, representing some 70-80% of their total music sales.

The Commission found that both list prices ("PPDs", or Published Prices to Dealers) and discounts were to a large extent aligned, and that PPDs could have been used as focal points, even though this was not sufficient to conclude joint dominance existed before the merger.

The Commission then looked at whether the markets for recorded music were characterized by features facilitating collective dominance, moving therefore towards a speculative (what would happen after the merger) analysis. Ultimately, the case hinges on the Commission's finding of *market transparency*: as we know, a critical element for collusion is the ability to monitor rivals' actions, and opacity in price decisions would entail inability (or *untimeliness*) of punishments.

The Commission found that in practice the firms may focus attention on a few titles among the hundreds on sale (the top 20 titles accounting for between 30 and 60% of yearly sales of Sony and BMG); also, discounts matter, but "*a large part of the majors' sales of recorded music is channeled to a limited number of customers.*" (paragraph 112). Further, the companies had set up a system of weekly reports on retailers and wholesalers, to be able to promptly negotiate promotional support and campaign discounts, also on a weekly basis. (paragraph 113)

As for the possibility of retaliations after a deviation, the Commission indicates a

series of ways in which retaliations could take place: "*In case of a persistent deviation by one major, the other majors could therefore exclude the deviator from the conclusion of new joint ventures, or they could refuse to license their songs for the deviator's compilations, or they could even terminate some of the existing joint ventures*." (paragraph 117).

However, despite the identification of the possible monitoring channels and the credibility of punishment mechanisms, the Commission concluded that it did not have sufficient evidence to establish that the merger would create or strengthen a collective dominant position.

The CFI was (understandably) puzzled by a conclusion that did not seem to flow from the analysis:

"*This fundamental U-turn in the Commission's position may indeed appear surprising, particularly in view of the late stage at which it was made. In effect, as may be seen from the case-file and from the oral argument before the Court, throughout the administrative procedure the Commission considered, on the basis of all the information which it had received, during an investigation lasting five months, both from the various operators on the market and from the parties to the concentration, that the market was sufficiently transparent to allow tacit collusion on prices, and that it was only in the wake of the arguments submitted by the parties to the concentration, assisted by their economic adviser, at the hearing on 15 and 16 June 2004 that, without carrying out any fresh market investigations, it adopted the opposite position and, on 1 July 2004, sent the draft decision to the Advisory Committee.*" (paragraph 283)

The CFI argues that the text of the Decision seems conducive to a different conclusion on the degree to which the market is transparent (and hence, on the likelihood of reaching collusion: "*Next, it appears that, apart from the two extracts mentioned above, all the factors set out at recitals 111 to 113 of the Decision, far from demonstrating the*

opacity of the market, show, on the contrary, that the market was transparent." (paragraph 290)).

In particular, the CFI argues that:"*the few assertions relating to campaign discounts contained in the section of the Decision dealing with the examination of the coordination of prices in the large countries, in so far as they are imprecise, unsupported, and indeed contradicted by other observations in the Decision, cannot demonstrate the opacity of the market or even of campaign discounts. Those assertions are confined, moreover, to indicating that campaign discounts are less transparent than file discounts, but do not explain how they would be relevant for the transparency of the market and do not make it possible to understand how they in themselves might compensate for all the other factors of transparency of the market identified in the Decision and thus eliminate the transparency necessary for the existence of a collective dominant position*." (paragraph 320)

The Court then goes on analyzing various aspects related to market transparency, including the possibility that the Commission may have changed its conclusions due to the availability of new and convincing information emerged at the very last stage of the investigation, but it concludes:

"*It follows, moreover, from an examination of the retailers' responses submitted by the Commission on the eve of the hearing that those responses do not support the conclusions which the Commission drew from them. Numerous responses reveal that the discounts were transparent or that the majors were aware of them. (paragraph 386)*

It follows from the foregoing that the Commission's assessment of the retailers' responses is vitiated by a manifest error." (paragraph 387)

Apart from wondering what made the Commission change its decisions in such a short spell of time (we speculate that there may have been different positions within the institution, and that for some reasons at the last minute a more conservative attitude prevailed), the case raises issues about the standard of proof that must be satisfied either

to clear or to prohibit mergers on the basis of coordinated effects.

Eventually, the Court of Justice overturned the judgment of the CFI. Indeed, it admitted that "[i]*n the present case, it is true that a certain imbalance in the contested decision between the presentation of the elements tending to plead in favour of there being sufficient transparency and the presentation of the impact of the campaign discounts, which plead, according to the Commission, against such transparency, may appear unfortunate.*" (paragraph 179). Nevertheless, it found that the Commission was justified by "*the short space of time between the reply to the statement of objections and hearing before the Commission, on the one hand, and the end of the formal proceedings, on the other.*" (paragraph 179), and that "*the degree of precision of the statement of the reasons for a decision must be weighed against practical realities and the time and technical facilities available for making the decision.*" (paragraph 169).

Overall, the European Court of Justice's judgment seems to recognize the difficulty of a coordinated effects analysis which by its nature must be prospective, very differently from a cartel case where evidence must be hard and uncontroverted (see e.g., paragraph 122). Provided that the most important tenets of the analysis and the main line of reasoning are provided, the Commission would satisfy its duties. This is probably a sensible conclusion: merger control, requiring a forward looking approach by its nature, it is difficult to imagine cases in which there is no room for discretion, even though admittedly the Commission's arguments in this case were certainly ambiguous.

In passing, the Court of Justice also confirmed the criteria for joint dominance set out in Airtours, and that "[i]*n applying those criteria, it is necessary to avoid a mechanical approach involving the separate verification of each of those criteria taken in isolation, while taking no account of the overall economic mechanism of a hypothetical tacit coordination*." (paragraph 125).

6.6 ABF/GBI: application of the European Guidelines

The ABF/GBI merger (2008) was the first merger challenged (but eventually approved subject to sizeable remedies) by the European Commission on the basis of coordinated effects since Airtours. In this case, the Commission had the chance to apply its own Merger Guidelines, which in turn were modeled after the Airtours judgment (later affirmed by the European Court of Justice).

It is interesting not only because it is illustrative of the way in which EU merger control is enforced, but also because it shows the importance of a careful analysis of the industry and how differences in some features of the market may lead to very different outcomes of the investigation (notably, differences in the distribution sector in Spain and Portugal relative to France led to an assessment of coordinated effects in the former but not in the latter).

The case consisted in the acquisition of GBI's yeast[100] operations in Continental Europe[101] by Associated British Foods (ABF), and the Commission's investigated the merger upon referral from the Spanish, Portuguese and French authorities. Accordingly, the relevant markets were defined as those for compressed, dry and liquid yeast in each of these three countries. We shall focus on compressed yeast, which is the most important.

The Commission's assessment, following the case law and the HMGs, hinges on three steps. First, it analyses the basic features of the market, to see whether they are conducive to coordination. Second, it studies whether any coordinated outcome would be sustainable. This step itself requires - in the light of Airtours - to show that (i) the market is

[100]Yeast is an essential ingredient in the production of bread and bakery products. It is perishable and even when refrigerated it lasts only for three-four weeks.

[101]GBI's yeast business in the UK and South America were sold to Lesaffre, and approved (subject to remedies) in a prior merger investigation.

sufficiently transparent to allow monitoring of deviations, (ii) there exists a credible mechanism to punish them, and (iii) it is unlikely that outsiders (be they customers or entrants) may prevent tacit or explicit collusion. Third, it must show that the merger either strengthens coordination (if it already exists) or makes it more likely. We discuss these three steps in the following subsections.

6.6.1 Market features make coordination likely

The decision mentions a number of features of the market which are likely to be conducive to coordinated behavior. There is a high degree of concentration, with ABF and GBI combined market share being around 70-80% in Portugal, 40-50% in Spain and 30-40% in France, while Lesaffre's shares were respectively 20-30%, 40-50%, and 60-70%. The market is also characterized by frequent interaction- in Spain and Portugal, buyers are mostly small artisan bakers who cannot afford refrigerated storage and order yeast with a weekly or bi-weekly frequency; products are homogenous, although in France Lesaffre seems to enjoy a higher quality status: demand is stable or declining; it is unlikely that new technologies may break the market equilibrium; in Spain and Portugal (but not in France, where bakery is no longer artisanal, and distribution is in the hands of centralized groups), there is small buyer power; there exist barriers to entry and expansion as production has becoming increasingly concentrated in fewer plants, witnessing economies of scale; and multi-market contacts across Europe exist among all the main players.

The analysis of past price and output data also revealed significant market share stability and price parallelism even when production was hit by input cost increases. As the Commission puts it: "*Such supply shocks can, in some circumstances, disrupt any efforts to tacitly coordinate conduct, particularly to the extent that they may affect some players more than others. However,* [...], *given common technology and climatic conditions of the plants of ABF, GBI and Lesaffre serving the Spanish market, increased input costs can be*

expected to affect all three players in a similar manner" (paragraph 224). Interestingly, but not surprisingly, internal documents revealed that firms were fully aware of their symmetry in this respect, and that therefore their interests in price increases were perfectly aligned.

6.6.2 Sustainability of coordination

Although the `checklist' of the factors which may facilitate collusion is a useful step in the investigation, the crucial step is then to understand how likely it would be that deviations may be monitored and punished.

(i) In this case, the distribution sector plays a fundamental role in determining the degree of *transparency* of the market. The Commission found that the Spanish and Portuguese markets were characterized by very strong and stable relationships between distributors and clients, and between distributors and producers. In many cases, distributors had developed very strong personal relationships with their clients over time, due to frequent visits by distributors. Also, distributors were *de facto* or *de jure* exclusive dealers, enjoying exclusive territorial protection from the producers. Furthermore, distributors used to report information on market developments to producers, who would in turn report information back to them as part of the distribution agreement.[102]

On the contrary, distribution in France was in the hands of concentrated and centralized groups which bought from several suppliers and served industrial buyers.

The Commission stressed how the simple organization of the distribution sector in Spain and Portugal allowed suppliers to efficiently monitor the market,[103] whereas in France such

[102] Although bakers had a primary distributor/supplier, they also developed some relations, and minor purchases, from a secondary source. Yeast being indispensable, this was a way for bakers to ensure themselves against possible shortages or failures in primary sourcing. In turn, this link with another distributor/supplier allowed bakers to switch supplier in case the primary increased prices. But in turn, this would mean that the primary distributor/supplier may be informed of possible 'deviations' by rivals.

[103] The role of a stable demand in increasing transparency of the market is clearly explained in the following

transparency could not be achieved.

(ii) As for the capacity to deter deviations through *credible punishments*, the Commission found that "*all three players- GBI, ABF and Lesaffre - currently hold excess capacity in their plants serving Spain, sufficient to initiate a long-lasting price war in the event of any of them deviating from coordinated interaction.*" (paragraph 242). If necessary, they could have also used capacity in plants located elsewhere.[104] Furthermore, retaliation would have been timely given that the high frequency of market transactions, and its threat would have been enhanced by the existence of multi-market contacts.

(iii) As for the *reactions of outsiders*, the third of the conditions stressed by Airtours, the Commission found that the fragmented competitors as well as importers were facing high barriers to entry and expansion; that there was limited countervailing buyer power of distributors that, as we have seen, were linked by exclusive deals to producers and bakers, who were mostly small artisans.

6.6.3 Coordinated effects of the merger

Lastly, "*the Commission must further show, on the basis of a prospective analysis, the extent to which the "alteration in the* [relevant market] *structure that the transaction would entail* [*Airtours, paragraph 61*] *significantly impedes effective competition by making coordination easier, more stable or more effective for the three firms concerned either by making the*

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excerpt from the Decision: "*In the context of frequent deliveries,* [monitoring deviations] *is simply verified by observing significant decrease in volumes with respect to the previous year for a given territory. Indeed when market demand is relatively stable, as is the case in Spain, inferring deviations from collusive conduct is easier and requires less market data than when the market demand fluctuates significantly and unpredictably*." (para 232)

[104]"*Shifting volumes from one geographic market to the other, though likely uneconomical on a permanent basis given the opportunity cost of lost sales, allows the three producers to reinforce the threat of significantly expanding sales without necessarily holding excessive idle capacity*." (paragraph 242).

coordination more robust or by permitting firms to coordinate on even higher prices." (paragraph 273). In this respect, it found the following:

(i) The merger increased transparency by reducing the number of players, facilitating the detection of deviations and retaliations (when only two firms exists, there is no risk of free-riding in the punishment efforts, nor possibility to make mistakes on the identity of the deviators).

(ii) GBI exhibited differences relative to ABF and Lesaffre. First, GBI served Spain and Portugal from its Italian plant, which also served other markets. This means that demand and supply shocks affecting other markets may had an incidence on the Iberian markets. After the merger, ABF/GBI would reorganize production relying on local plants, thereby removing this possible source of misalignments facing shocks.

Second, it had made a number of improvements in production and packaging. However, under the terms of the merger agreements, GBI's patents would be shared by ABF and Lesaffre, which by doing so "*(a) eliminate GBI as a source of potentially destabilizing innovation and (b) ensure neither of the two coordinating firms inherits the competitive advantage that may eventually derive from IP rights.*" (paragraph 301).

Third, it was not present in the market for liquid yeast, mostly used to supply industrial bakers. In case of growth of this market relative to compressed yeast, this may have been a further source of misalignment of incentives.

In general, after the merger ABF/GBI and Lesaffre would be highly symmetric in terms of production costs, capacities,[105] and market shares (both of them would have 40-50%), thereby facilitating tacit collusive outcomes.[106]

[105]After the merger "*both Lesaffre and ABF would have almost identical spare capacities [...] in the Iberian Peninsula*." (paragraph 297)

[106]Symmetry would instead be absent post-merger from the French market, largely dominated by Lesaffre.

6.7 The remedies

On the basis of the abovementioned analysis, the Commission concluded that the merger would have been created or strengthened coordinated effects in Spain and Portugal, but not, as we saw, in France. Still, the transaction was cleared subject to the remedies proposed by the parties. An initial remedy consisted in the divestment of GBI's sales and distribution activities in Spain and Portugal, but did not include a production plant (it only included an agreement to supply the buyer for three years with yeast produced at GBI's Italian plant), but it was not accepted because the lack of a production plant would have not made the buyer a serious competitor. Ultimately, the accepted remedy consisted in offering, on top of sales and distribution assets, either a UK plant or the plant located in Portugal.[107]

7. Summary and Conclusions

Mergers lead to coordinated effects when they increase the likelihood that firms will reach (tacit or explicit) collusive outcomes in the post-merger market. Therefore, a careful assessment of coordinated effects is necessary in order to prevent anti-competitive mergers from taking place.

In Section 3, we reviewed the main factors that, from an economic point of view, should be analyzed in a coordinated effects analysis. The main questions to be addressed are whether collusion would be sustainable after the merger, and how the merger

[107]The latter turned out to be implemented: Lallemand, a German competitor with limited presence in Spain and Portugal, bought GBI's sales and distribution business as well as the Portuguese plant (see Neven and de la Mano (2009)).

contributes to the sustainability of collusion. Certain supply factors - such as a small number of symmetric firms, barriers to entry, or multi-market contact - and demand factors - such as demand stability and the existence of regular and frequent orders - contribute to facilitating collusion. Also, price transparency on the sellers' side facilitates collusion by allowing firms to monitor each other, just as some pricing or commercial policies that firms might adopt with that purpose (e.g. basing point pricing, RPM, etc.). Communication about past conduct also contributes to monitoring - particularly so when it involves disaggregated, individualized, and recent data - while communication about future conduct makes it easier for firms to reach an agreement. Corporate and governance structure might add additional sources of concern, as when competitors hold cross-ownership and firms share common directorships.

A merger that takes place in a market already conducive to collusion, is likely to enhance collusion and thus raise concerns over coordinated effects. The incidence of some mergers on the likelihood of collusion might be stronger than others: particularly worrisome are those that increase symmetry in markets in which there are already few competitors. The assessment of coordinated effects in vertical merger cases points out that vertical integration should raise more concerns when it involves relatively large buyers in markets in which producers have little information regarding retail markets.

From an applied perspective, the quantification of coordinated effects in merger cases is an area in economics that is not yet fully developed. As we discuss in Section 4.2, some simple indicators or "collusive markers" - involving price or market share data - may allow the antitrust authority to identify whether the industry has a past history of collusion, a finding that would raise motivated suspicions of coordinated effects.

The description of the European merger policy and the merger case review contained in Sections 5 and 6 provide useful hints that can guide the assessment of coordinated effects in future mergers cases. The reviewed cases highlight the importance of

identifying those mechanisms available to firms for monitoring compliance and to credibly punishing deviators in order to make collusion sustainable. It also stresses that the assessment of coordinated effects requires detailed knowledge of the industry, as well as a careful analysis of the past performance and interaction among firms in the market.

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