Study on Assessment Criteria for Distinguishing between Competitive and Dominant Oligopolies in Merger Control

Final Report

for the

European Commission Enterprise Directorate General

by

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EXECUTIVE SUMMARY

Introduction

This report is the main output of a project undertaken by Europe Economics for the Enterprise Directorate General of the European Commission (Commission). The purpose of this project was to develop criteria by reference to which the Commission should apply the European Council Merger Regulation (Merger Regulation) to mergers in oligopolistic markets.

The assessment of mergers in oligopolistic markets has become an increasing preoccupation of the Commission since confirmation by the Court of First Instance (CFI) in 1998 that the Merger Regulation can be applied to mergers which create or strengthen a position of collective dominance. Moreover there continues to be debate about the interpretation of collective dominance. This debate has been stimulated by the Commission's decision in the *Airtours/First Choice* case, a decision which Airtours has appealed to the CFI.

The uncertainties arise because oligopolistic markets can operate in ways that tend towards either competition or monopoly. It is important for merger control to be able to distinguish between them. This is inherently difficult. It is a predictive exercise, requiring a consideration of the likely change in behaviour of the firms in the market as a result of the change in the structure of that market brought about by the merger.

The Commission has set out a step-by-step approach to its assessment of mergers in oligopolistic markets. A key step in the process is a consideration of those factors and market characteristics which, in principle, could indicate the likelihood of coordinated conduct following a merger, with detrimental effects on consumer welfare (see Section 4.3 of the report) – the check-list approach. It is the coordinated action of oligopolists that underlies the legal concept of collective dominance. The coordination does not have to be explicitly collusive, and therefore illegal. A collusive outcome can be achieved by collusion of a more tacit kind. Indeed, this is the behaviour that will most usually give rise to collective dominance in the context of merger control.

The check-list approach to the assessment of oligopolistic mergers can also be found in the practice of the US anti-trust agencies (see the discussion in Section 5) and of other competition authorities, for example in Australia, Canada and Germany.

A check-list can be a helpful guide to the factors that should be taken into account. But these still need to be developed into a systematic analysis of how the market characteristics and the oligopolistic market structure created by a merger are likely to result in collusive rather than competitive behaviour. A check-list cannot be applied mechanically, merely "ticking off" what seems a sufficient number of the listed factors. A prime purpose of this project has been to develop the traditional check-list approach to the assessment of oligopolistic mergers.

Literature Review

Our starting point is a comprehensive review of the economics literature, particularly the game theory literature which focuses on the oligopoly "problem", namely how firms respond to the mutual interdependence of their actions in the market place. The first models of oligopoly

(Cournot, Stackelberg, Bertrand) did not take the possibility of collusion into account. These models are static, ie one-period games in which the oligopolists form expectations about their rivals' reactions. Based on these expectations, they unilaterally select an action that maximises their own profit. This rational profit-maximising behaviour, taking account of perceived interdependence between the oligopolists, cannot be labelled collusion. In static games, it is always profitable for firms to deviate from any collusive outcome. As no repeated interaction takes place through which a collusive equilibrium could be enforced, all firms will deviate and there cannot be collusion.

The assumption of the classic oligopoly models, that firms interact only once, seems quite unrealistic. In modelling oligopolistic interaction, it is more realistic to assume that firms meet in the market repeatedly. Repeated interaction has long been recognised as the prerequisite for collusion to be possible and is a development reflected in game theory.

Since the 1980s, game theory has become the main tool for modelling oligopoly behaviour. Game theory does not provide all the answers about oligopolistic behaviour including the exact circumstances under which collusion will occur. The main contribution of game theory is to provide a consistent frame of reference. The game theoretic methodology enforces a systematic approach to the analysis of oligopolies. By clearly stating the assumptions that underlie the game, the applicability of the models' conclusions becomes more transparent.

In particular, game theoretic models specify the number of players, the number and length of periods in the game, that is, the frequency of market interaction, the payoffs, the strategies available to players, the information available to players and the way in which players form beliefs about each other and each other's strategies.

Infinitely repeated games — so-called supergames – assume the players play the same game over and over and the history of play can then be incorporated into the strategies of players. Firms can observe all relevant information including the actions of all players at any time. This implies that cheating can be detected instantaneously and retaliation follows immediately thereafter. These models show that any equilibrium that is at least as good as the outcome of the one-shot game can be sustained.

The main conclusion from models that do not assume perfect information is that imperfect information tends to limit the extent to which firms can tacitly collude. Under uncertainty, mistakes are unavoidable and punishment phases, such as price wars, occur periodically. Full collusion cannot be sustained in this situation. Demand volatility makes tacit collusion less effective but not impossible.

Finite repeated games show the circumstances in which collusion is still possible despite game theory logic that cooperation will always be undermined by cheating in any game of finite length while further refinements are introduced by reputation games which include intangible variables such as perceptions of competitors' aggressiveness or willingness to cooperate.

Conditions necessary for coordinated conduct can be established from the theoretical literature. However, it is clear that there are no *sufficient* conditions for coordination. Collusive-type

behaviour can, and does, occur in a variety of market settings. It can also take various forms and can apply to varying degrees.

Necessary Conditions

We have identified a number of *necessary* conditions for coordinated conduct. We have then analysed how market characteristics commonly included in the traditional check-lists relate to these necessary conditions or criteria. These relationships are summarised in the table below and extensively analysed in Section 2 of the report.

Table 1
Conditions for Coordinated Conduct in Oligopolistic Markets

	Necessary Criteria	Factors that contribute to the necessary criteria
1	Very few firms	
2	Repeated interaction	no large and lumpy orders
3	Barriers to entry	
4	Capacity to reach a mutually acceptable equilibrium	homogeneous products market transparency symmetry stable demand conditions low buyer power
5	Ease of detection of cheating	homogeneous products market transparency symmetry stable demand conditions low buyer power
6	Enforceability of compliance	symmetry stable demand conditions (no fast growing high-tech market with short product cycles) no/short detection lags multi-market contact excess capacity

A more elaborate formulation of the factors tending to facilitate tacit collusion and of how they relate to the six necessary criteria and of the interrelationships between the various factors and necessary conditions will also be found in Section 2 of the Report.

Economic theory does not provide a clear ranking of the factors, but does offer guidance on which are essential and which play a secondary role. Thus it is an essential condition that there be

"very few" firms in the market if coordination is to be achieved and sustained though theory does not suggest any "magic number" at or below which there will always be a collusive outcome. Given the significance of high concentration, we can see advantages in the use of concentration data as an initial screen to identify problematic mergers as in the US Guidelines.

It is also an important, if obvious, point that a merger in an oligopolistic market will be of no concern if entry into that market is easy. The assessment of entry barriers should therefore be an early step in the examination of any merger in an apparently oligopolistic market.

Given a small number of firms and significant entry barriers, theory suggests that collusion will be highly likely in markets characterised by homogeneous products, stable demand and mature technology, and market transparency.

Facilitating practices and structural links between parties can also have a bearing on the likelihood of tacit collusion in contributing to the necessary criteria listed in Table 1.

Finally, we have elaborated a step-wise approach as set out in the diagram below. The diagram attempts to incorporate the various factors that theory has suggested are conducive to coordination in a logical and sequential way. This can be no substitute for a rigorous fact-intensive analysis of a particular case but, at the very least, this should help to give a clearer focus to any Commission investigation of possible coordinated behaviour.

**Figure 1
A Step-Wise Approach**

High Concentration/ Few Firms	NO →	Collusion unlikely

YES ↓

Barriers to Entry	NO →	Collusion unlikely

YES ↓

Repeated Interaction of "Patient Players"*	NO →	In theory, if players do not play repeated games, no cooperative outcome is possible. In practice, however, it seems unlikely that this criterion is not met.

YES ↓

Stable market conditions, in particular mature market with low innovation and low uncertainty	NO →	High uncertainty, innovation and growth makes stable collusion highly unlikely.

Further analysis only if other factors strongly suggest that there might be collusion after the merger, eg facilitating practices, history of collusion. |

YES ↓

Symmetry of firms plus high market transparency including homogeneous products	NO →	Different Combinations of

Symmetry	Market transparency	Product homogeneity
high/low	high/low	high/low

All low:
Low probability of tacit collusion in general, but check for division of markets or customers in differentiated products markets.

Some high/low:
It is not possible to establish a ranking of these criteria. The factors have to be weighed against each other to assess the probability of coordinated behaviour after the merger on a case-by-case basis.

Other factors such as multi-market contact or structural links may then need to be taken into account. These may increase the probability of collusion.

Ambiguous factors such as excess capacity have to be judged carefully in the context of the particular case.

YES ↓

High probability of coordinated behaviour

Check other factors only if they might counteract tacit collusion, in particular strong buyer power or maverick firms

* The term "patient players" refers to market participants who value profits in future periods enough such that the loss of these profits could serve as a punishment for deviating from the collusive equilibrium. See Section 2.3.1 for details.

Coordinated and Unilateral Effects

Section 3 of the report considers the distinction between coordinated and unilateral effects in merger analysis. It is the coordinated effects of a merger that are relevant when the issue is one of collective dominance. Unilateral effects become relevant when oligopolists do not behave in a coordinated or cooperative fashion but instead adjust their prices (or outputs) individually in the light of the new market structure brought about by the merger.

Analytically the coordinated and unilateral effects of a merger are distinct and mutually exclusive. A merger enables oligopolists to achieve a collusive equilibrium or it does not. In the former case the assessment is of coordinated effects, in the latter case it is unilateral effects that are relevant.

In practice, competition authorities may consider both coordinated effects and unilateral effects with respect to the same merger as our survey of United State's (US) experience in Section 5 reveals. The likeliest circumstance is where the analysis of unilateral effects, which can often be empirically based, would suggest that a significant increase in price is likely, even without coordination, and when the basis for a finding of coordination is more speculative. However, an alternative scenario is that a merger might lead first to unilateral effects, for example if the acquired firm is a maverick or the closest competitor of the acquirer, with coordinated effects emerging later should the remaining firms find it profitable to collude. But it is difficult to see, in the EU context, that there can be any question of collective dominance without a clear likelihood of coordinated effects of a merger. This suggests a gap in the Merger Regulation as far as the control of mergers in oligopolistic markets is concerned.

Empirical Review

Our review of a number of empirical studies gave some, if not robust, support for our analysis of the necessary conditions. But there are methodological problems with these studies. The larger part of our empirical review in Section 4 is of 23 merger cases in which the Commission has been concerned about the possibility of collective dominance. The check-list approach of the Commission in these cases is sensible, but it appeared to us that the Commission relied too heavily on going sequentially through the check-list of factors rather than mapping how the factors would influence the likelihood of coordinated behaviour. Of those cases we reviewed, *Exxon/Mobil* and *Airtours/First Choice* were the exception to this. In these cases, care was taken to assess a menu of factors in light of a set of conditions similar to those we identified.

Justifiably, the Commission appears to apply an initial screening based on numbers of firms and/or level of concentration in the market but has not been consistent in applying a test based on barriers to entry. We suggest that an assessment of the conditions of entry be a further screening test

US Experience

The substantive test in US merger control is whether or not competition would be "substantially lessened" by any merger proposal. This is less restrictive than the dominance test of the Merger Regulation even as the latter has been extended to apply to collective dominance. The

Horizontal Merger Guidelines distinguish between unilateral and coordinated effects. US anti-trust agencies have a check-list approach to assessing the likelihood of coordinated behaviour but this is not used mechanically – there has to be an analysis grounded in the facts of the case regarding how coordination would come about and be sustained. The agencies give considerable weight to any evidence of past collusion or coordinated conduct in the market or some closely similar market. Of late, greater emphasis has been placed on the analysis of unilateral effects (where the merger leads to a firm with a sizeable market share – of the order of at least 35 per cent) largely because these are easier to estimate econometrically and by simulation techniques than coordinated effects. It is therefore easier to establish evidence sufficient to satisfy a court in a case based on unilateral effects. While the US agencies acknowledge that analytically the concepts of unilateral and coordinated effects are distinct, they are prepared to "plead in the alternative" where they are positive that a merger will have harmful effects on consumers but are less certain how the harmful effects will manifest themselves.

Remedies

Section 6 of the report turns to the question of remedies, particularly remedies short of the prohibition of a merger. The Commission's recent Notice on remedies does not deal separately with remedies for mergers that create or strengthen a position of collective dominance. We do not find this surprising. In general, the same considerations apply to remedies for collective as for single firm dominance. Structural remedies are generally to be preferred to behavioural remedies, and the key requirements, if competition concerns are to be resolved, are that the assets to be divested provide the basis for a viable business, and that the purchaser of the assets is capable of running a competitive business independently of the merger parties.

However, the task of finding a purchaser who will restore the degree of competition to that prevailing before the merger is inevitably more difficult in collective dominance cases. Because it is not just the elimination of a competitor that causes the competition concern, creating a new competitor by divestment to replace the one that was lost through the merger might not be sufficient to restore the previous degree of competition. Divestment to one of the other oligopolists runs the risk that the purchaser will be content to coordinate his behaviour with the other oligopolists. Even if the divestment is to an outsider, there can be no guarantee that the purchaser will not seek to "join the club", especially if there are continuing relationships with the seller, for example through licensing or supply agreements. This suggests that the ideal is a purchaser with quite dissimilar characteristics and objectives to the established firms. But while this may reduce the risk of continuing coordination, it may, as the Federal Trade Commission's (FTC) divestiture study shows, increase the risk of failure of the divested business.

Remedies that are directed at coordinated behaviour itself are unlikely to be effective. It is impracticable to require firms not to take account of their interdependence after a merger. And the factors that are conducive to coordination will usually be beyond the reach of any remedy in a merger case, though it may be possible to loosen structural links or to strike down certain facilitating practices.

The conclusion has to be that, while the general problems associated with the choice and implementation of remedies apply to both forms of dominance, they will be more difficult to resolve with collective dominance.

1   INTRODUCTION

The purpose of this project is to develop criteria by reference to which the European Commission (Commission) should apply the European Council Merger Regulation (Merger Regulation)[1] to mergers in oligopolistic markets.

The Merger Regulation enables the European Commission to prohibit, or allow subject to conditions, a merger 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". A firm is in a dominant position if it is able to act to an appreciable extent independently of its competitors, customers and, ultimately, consumers.

At the outset, it was uncertain whether the Merger Regulation applied to mergers which created or strengthened not a dominant position of a single firm but rather a position of "collective dominance". This uncertainty was laid to rest by the European Court of Justice (ECJ) in its judgement in the *Kali und Salz* case.[2] A merger which creates or strengthens an oligopolistic market structure such that effective competition to, and between, the small number of firms comprising the oligopoly is impeded can also be prohibited.

Few would question the need for an effective merger control to deal with mergers which would reduce competition in an oligopolistic market. After all, many, perhaps most, markets in a developed economy will have oligopolistic characteristics. Yet this is a problematic part of any system of merger control.

Merger control involves predicting market behaviour as a result of changes brought about by a merger. The nub of the problem as far as mergers in oligopolistic markets are concerned is that there is no single way in which an oligopolist will behave: oligopolistic markets can operate in a competitive fashion or in ways that approximate to cartels and monopolies. However, it has become commonplace, drawing on both economic analysis and enforcement experience, to identify characteristics of markets and other factors which suggest that the outcome will be closer to the monopoly than to the competition end of the spectrum of possibilities. It is one of the purposes of the project to consider the appropriateness of this "check-list" approach.

This final report presents first the results of our survey of the relevant economics literature. The survey concentrates on game theory. This is because game theory provides a systematic approach to the essentials of the oligopoly problem — how firms might deal with the interdependence of their actions under various market conditions. In contrast to more institutional approaches to the study of oligopoly such as detailed case studies of industries, or to other theories such as those stressing the role of managerial and organisational considerations, game theory allows us to draw some conclusions directly relevant to the purpose of the study, namely whether necessary or sufficient conditions for a non-competitive outcome in an oligopoly can be identified.

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[1]   European Council Merger Regulation 4064/89 21 September 1990.
[2]   *French Republic v EC Commission* and *Societe des Potasses et de la Azote* (SCPA) and *Enterprise Ministere et Chimique (EMC) v EC Commission* Joined Cases C68/94 and C30/95 31 March 1998.

We have used these conclusions in the case review section of this report. We have surveyed a number of leading cases falling under the Merger Regulation where collective dominance was an issue. Rather than a case-by-case review, we have attempted to show how the factors which appeared to be relevant from our literature survey had been taken into account by the Commission in its own assessment of the case. This part of our work throws some light on the usefulness of the Commission's own check list which it uses in collective dominance cases.

This final report also includes some information on the approach of the United States (US) and (in Appendix 1) United Kingdom (UK) competition authorities to oligopolistic mergers. It is interesting to compare the US approach to that adopted by the Commission, particularly in light of our earlier review of relevant economics literature.

Remedies are reviewed in Section 6 of this final report. Structural and behavioural remedies are assessed and compared. The main purpose of the remedies section is to consider the appropriateness of remedies in cases of single dominance to mergers which create or strengthen a position of collective dominance.

The final section of this report draws some conclusions from our work.

1.1 Collective Dominance

As is evident from our case review, dominance and collective dominance are legal terms – they are rarely, if ever, referred to in economic literature. The European Court of Justice (ECJ) has defined dominance as:

> *"a position of economic strength enjoyed by an undertaking which enables it to…behave to an appreciable extent independently of its competitors, its customers and ultimately of the consumers".[3]*

Specifically, this definition refers to single dominance, or the dominance of one firm in a market

Collective or joint dominance is the dominance that several firms hold together in a market. In this case, the ECJ's definition of dominance is less suitable. That is, jointly dominant firms might be able to behave together independently of the other firms in the market but this does not accurately characterise the internal relationships among the dominant firms. Jointly dominant firms do not behave independently of each other as required by the traditional definition of dominance. Rather each is inherently conditioned by the behaviour of the other firms in the collectively dominant group.

We use the term collective dominance to refer to a position of economic strength held by a group of firms that enjoy to a significant degree a lack of competitive constraint. The absence of competitive response from rival firms may have different causes – structural factors might explain the lack of competitive response from the fringe to the dominant group, while coordination on the

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[3]   *Hoffman-la Roche v Commission* Case 85/76 ECR 1979 para 38.

relevant dimension of competition might explain the lack of response between the jointly dominant firms.

In the *Italian Flat Glass* case,[4] the Commission decided that anti-competitive agreements made by a number of Italian flat glass producers not only infringed (now) Article 81(1) of the Community Treaty but also amounted to the abuse of a position of collective dominance under (now) Article 82. On appeal, the Court of First Instance (CFI) held that the Commission had not established that the producers occupied a collective dominant position on the relevant market, but confirmed that the Article did apply to collective dominance:

> *"There is nothing in principle to prevent two or more independent economic entities from being, on a specific market, united by such economic links that, by virtue of that fact, together they hold a dominant position vis-à-vis the other operators on the same market. This could be the case, for example, where two or more independent undertakings jointly have, through agreements or licences, a technological lead affording them the power to behave to an appreciable extent independently of their competitors, their customers and ultimately of their consumers".[5]*

Initially it was presumed that the "economic links" necessary to establish collective dominance needed to be structural links such as licensing agreements or joint ventures, not links arising solely from the structure of the market. This limited the application of the concept to merger cases.

However, in 1992 the Commission challenged the *Nestle/Perrier*[6] merger on the grounds that it would strengthen a position of collective dominance in the market for mineral water. In this case, collective dominance was taken to mean the ability to behave collusively, or to be more specific, to behave in a tacitly collusive way. The criteria used to assess collective dominance involved a test of "whether the new market structure [would] make collusion easier".[7] It was stated that:

> *"the reduction from three to only two national suppliers would make anti-competitive parallel behaviour leading to collective abuses much easier".[8]*

Anti-competitive parallel behaviour in this case was likened to collusive behaviour as it was further pointed out that the two remaining firms, BSN and Nestle/Perrier, would have "a strong common interest and incentive to jointly maximise profits".[9]

Gencor/Lonrho was the first case where the Commission prohibited a merger on the grounds that it created or strengthened a position of collective dominance such that effective competition was impeded.[10] The CFI upheld this decision. The Commission reached its conclusion after setting

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4   *Societa Italiana Vetro* Joined Cases T68/89, T77/89 and T78/89.
5   Ibid para 358.
6   *Nestle/Perrier* Case No IV/M 190 22 July 91.
7   Winckler and Hansen (1993).
8   *Nestle/Perrier* supra note 6 para 120.
9   Ibid para 134.
10   *Gencor/Lonrho* Case No IV/M 619 24 April 96.

out a list of characteristics it thought facilitated collusion in a concentrated market and found that the market in question exhibited most of these characteristics. Furthermore, the market showed a history of collusive behaviour.

The decisions by the CFI and the Commission in this case reasserted the view taken by the ECJ in *Kali und Salz* that structural links are not necessary in order to conclude that a merger would lead to the threat of collective dominance. Wishing to clarify its past rulings, the CFI made it clear that:

> *"in its judgement in the 'Flat Glass' case [the CFI] did not lay down the existence of economic links as a requirement or restrict the notion of economic links to the structural links relied on by the applicant. The Commission is therefore entitled to understand that notion as including the relationship of interdependence which exists between the members of a tight oligopoly".*[11]

The decision of the CFI adds that this "interdependence" would, in an oligopolistic market with the appropriate characteristics, enable firms to "anticipate one another's behaviour" and to be "strongly encouraged to align their conduct in the market, in particular in such a way as to maximise their joint profit by restricting production with a view to increasing prices". It was further suggested that this behaviour would occur from an anticipation of coordinated actions and reactions:

> *"In such a context, each trader is aware that highly competitive action on its part designed to increase its market share (for example a price cut) would provoke identical action by the others, so that it would derive no benefit from its initiative. All the traders would thus be affected by the reduction in price levels. That conclusion is all the more pertinent with regard to the control of concentrations, whose objective is to prevent anti-competitive market structures from arising or from being strengthened. Those structures of an oligopolistic kind, in particular, cause prices to increase without having to enter into an agreement or resort to a concerted practice".*[12]

This extract suggests that in *Gencor/Lonrho* the concept of collective dominance was matched to the economic notion of tacit collusion in all but name. It was widely seen as a significant broadening of the reach of Community merger control.[13]

The tight match between the Commission's interpretation of collective dominance and the economic concept of tacit collusion was adhered to in subsequent cases. Of these, the *Price Waterhouse/Coopers* case stands out for the language and reasoning it shares with an economic analysis of tacit collusion.[14] In its discussion on the importance of the number of players, the Commission asserts that:

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[11]   *Gencor v Commission* T102/96 25 May 1999 para 270.
[12]   Ibid para 276.
[13]   See for example Korah (1999), Caffarra and Kuhn (1999) and Garcia (2000).
[14]   *Price Waterhouse/Coopers & Lybrand* Case IV/M1016 20 May 1998.

> *"From a general viewpoint, collective dominance involving more than three or four suppliers is unlikely simply because of the complexity of the interrelationships involved, and the consequent temptation to deviate; such a situation is unstable and untenable in the long term".*[15]

Although the Commission ultimately cleared the Price Waterhouse/Coopers merger, there soon followed the decision to prohibit the Airtours/First Choice merger. In the Commission's view the merger of Airtours and First Choice would have left three major vertically integrated operators in a collectively dominant position in the UK market for short haul package holidays. The Commission stressed that the high degree of interdependence of the decision-making of these firms, given other characteristics of the market, was likely to lead to anti-competitive behaviour, particularly in respect of capacity decisions for the coming season.

The decision has proved controversial[16] and has been appealed by Airtours. One of the issues that will be addressed by the CFI is whether the concept of collective dominance is to be equated to that of collusion, explicit or tacit. In its decision the Commission said:

> *"the Commission does not consider that it is necessary to show that the market participants as a result of the proposed merger would behave as if there were a cartel, with a tacit rather than explicit cartel agreement […]. In particular it is not necessary to show that there would be a strict punishment mechanism. What matters for collective dominance in the present case is whether the degree of interdependence between the oligopolists is such that it is rational for the oligopolists to restrict output, and in this sense reduce competition in such a way that a collective dominant position is created."*[17]

While the Commission has raised concerns about collective dominance in a number of subsequent cases, there have as yet been no further prohibition decisions.

1.2 Some Implications

The development of merger control in the European Union (EU) to embrace the concept of collective dominance has implications for other areas of competition law and policy. Article 81(1) prohibits any agreement or concerted practice the object or effect of which is to prevent, restrict or distort competition if inter-State trade is affected and if, given the case law, the effect is "appreciable". Clearly any collusive agreement or concerted practice will be unlawful.

Between them, the terms agreement and concerted practice cover a range of situations – written agreements, oral or so-called "gentlemen's" agreements, and less formal arrangements which have the requisite anti-competitive effect. In *Dyestuffs*, the ECJ defined a concerted practice as follows:

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[15]   Ibid.
[16]   See for instance Motta (1999).
[17]   *Airtours/First Choice* Case No IV/M 1524 22 September 1999 para 150.

> *"a form of coordination between undertakings which without having reached the stage where an agreement properly so-called has been concluded knowingly substitutes practical cooperation between them for the risks of competition."[18]*

This definition may beg the question what amounts to "practical cooperation" but the Courts have made clear in a number of judgements that it is not an unlawful concerted practice for a group of firms in a concentrated market to take account of each others' behaviour – to recognise their mutual interdependence – in making their price and other decisions. Therefore, tacit collusion as understood by economists, that is coordination arising from no more than the structure and other characteristics of a market, is not unlawful behaviour under Article 81(1).

However, two further issues arise. Coordination can be made easier or more successful by the adoption of various so-called facilitating practices. Examples include the announcement of price increases well in advance of the implementation date, information exchanges and the use of most-favoured customer clauses. Some could be unlawful in their own right, for example certain information exchanges, others may have an objective commercial justification, for example, advance notice to the trade of price increases. The fact is that there have been few challenges of practices that might be held to facilitate coordination under Article 81(1). No doubt this is largely because of the difficulty of obtaining evidence sufficient to show that they have been used to support an anti-competitive concerted practice.

A second issue is whether an unlawful agreement or concerted practice can be inferred from evidence that prices of apparently competing firms have changed in parallel – by the same/similar amounts at the same time or closely together. Not surprisingly, competition authorities will often suspect that parallel pricing is the result of collusion of some kind, but the ECJ has made clear, that "a parallelism of behaviour cannot by itself be identified with concerted practice".[19] There has to be some evidence of communication between the parties, or of situations where it can reasonably be assumed that communication took place, for example, documented evidence of attendance at meetings before a parallel increase in prices. Even then it has to be clear that there could be no other explanation of the observed price increases, in the circumstances of the market under consideration, than some form of contact or communication between the firms before an unlawful agreement or concerted practice can be inferred.

The legal position is therefore that tacit collusion as understood by economists will not be unlawful under Article 81(1). It may seem paradoxical then for a merger to be prohibited on no more ground than that it would lead to the firms in a concentrated market recognising their interdependence and coordinating their actions accordingly. Economists would have no difficulty with this. The effect of a merger which leads to, or strengthens, an oligopolistic market structure may lead, through tacit collusion, to higher prices and reduced consumer welfare unless there are more than offsetting cost efficiencies and potential gains from faster innovation. It therefore makes good sense to subject such mergers to close investigation. This is particularly so when it is difficult to identify tacit collusion ex-post and, if identified, to find a suitable and effective remedy for its adverse effects.

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[18] *ICI v Commission* Case 48/69 [1972] ECR 619 para 64 CMLR 557.
[19] Ibid.

An interesting question that can arise is how the authorities should act if the investigation of a merger reveals practices that facilitate coordination and involve other firms than the parties to the merger. If the likelihood of coordination and a tacitly collusive outcome of a merger could be prevented by taking action against facilitating practices under other competition rules such as Article 81(1), then arguably there would be no need to block the merger. This might be a particularly attractive course of action if the merger promised efficiency improvements that were otherwise unattainable. However, the evidence might not be strong enough to support an Article 81(1) case. And there would usually be other factors than the facilitating practice that would point to coordinated behaviour. There would then be every reason to block the merger.

A further question is whether, having established in the course of the merger investigation that the conditions are ripe for tacit collusion, the merger could be allowed and the market(s) concerned kept under surveilllance for any signs of unlawful anti-competitive conduct. The problem with this is that the competition authorities rarely have the resources for intensive ex-post monitoring. Even if the resources can be found, it would not be a sufficient response to the detrimental consequences of allowing the merger.

In our view, there is little doubt that action should be taken under the merger control provisions where it is established that tacit collusion is likely, however widespread the coordination. In fact, many of the mergers that fall within the Merger Regulation have effects in concentrated markets. What needs to be emphasised is that it is important that the assessment of any merger that appears to raise the risk of tacit collusion, or of more successful tacit collusion, should be rigorous. This means rigorous in its analysis of the effects of the merger on competition and rigorous in the factual foundations of the analysis.

1.3   Use of Terms

The terms used in discussions of whether collective dominance is likely to emerge from a merger need to be clearly defined and understood. For the purposes of elucidating the discussion which follows, we have set out below the way in which terms are used in our report and the key distinctions we have drawn between them.

When assessing a merger, it is useful to think of its effects in terms of whether they are unilateral or coordinated effects (see Section 3). The terms "unilateral effects" and "coordinated effects" seem to have been first clearly elucidated in the US Merger Guidelines (see Section 6) but the terms – which are economic rather than legal – have been adopted in other jurisdictions, including that of the EU. Unilateral effects refer to the overall detrimental welfare effects of a merger resulting from the changes or adjustments in prices and output of firms acting individually and independently. Coordinated effects, on the other hand, refer to the reduction in welfare caused when a merger enables collusion to emerge in the market. If collective dominance has been created or strengthened by a merger, the merger has produced coordinated effects.

It makes sense to equate the legal concept of collective dominance with the economic concept of collusion. Collusion refers to a form of coordination between firms (see Section 2) while collectively dominant firms are best thought of as those firms that enjoy to an appreciable extent a lack of competitive constraint. The only way for a group of firms to act

independently of competitive response is if they coordinate or collude. In other words, collectively dominant firms must be colluding, explicitly or tacitly. The terms collusion and collective dominance are, therefore, used synonymously in this report.

Collusion need not be explicit and unlawful. Tacit collusion is a form of collusion that does not amount to an agreement or concerted practice and therefore falls short of explicit collusion. A precondition for explicit collusion to exist is communication between the parties, either to create an agreement or to arrange a concerted practice. Though such agreements are not enforceable, firms often attempt to communicate with each other in order to agree on how to collude and to devise a mechanism to enforce such collusive behaviour. In the language of economics, these contacts serve the main purpose of "focalising" a potential collusive "equilibrium". Thus the difference between explicit and tacit collusion is the lack of a formal procedure to communicate and settle on a particular collusive arrangement, not a difference in the outcome of the behaviour.

The diagram below represents the taxonomy of legal and economic terms used in this report (terms used in this report are boxed).

Figure 1.1
Taxonomy of Economic and Legal Terms Used in this Report
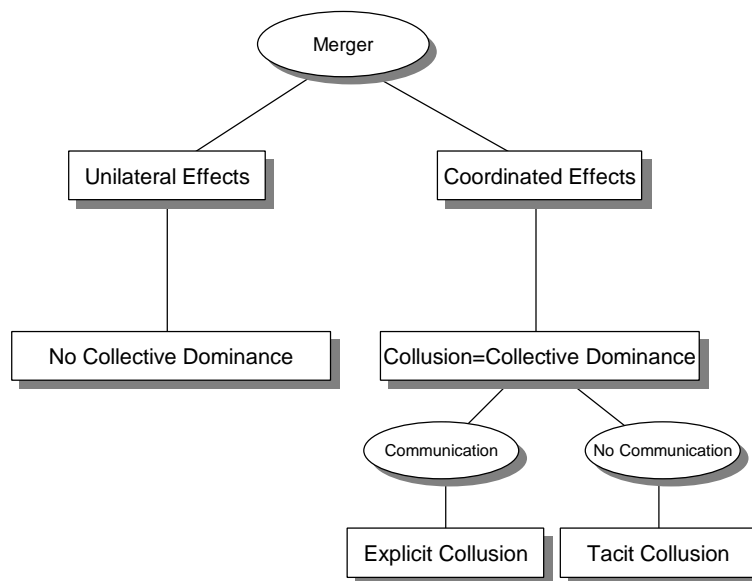
2 LITERATURE REVIEW

2.1 Introduction

Oligopoly, from the Greek words "oligos" meaning few and "polein" meaning to sell, is defined as a market situation in which the control over the supply of a commodity is held by a small number of producers.[20] In microeconomic textbooks, oligopoly is also referred to as "imperfect competition".[21] The phrase "competition among the few" was used by Fellner (1949) and others to describe oligopoly. For the practitioner of anti-trust law the question remains how many are few and what constitutes competition among the few.

An alternative definition of oligopoly is based on the notion that in an oligopolistic market shared by a few firms, the actions of one firm affect the other firms in the market. A rather complex definition is provided by Kantzenbach et al (1989,1995). The term oligopoly is applied to a group of firms "if the variation of a behavioural parameter by one of a group of competing firms leads to a perceptible change in selling conditions for the other competing firms (known as oligopolistic or parametric interdependence), thus causing them…to respond by changing their own market behaviour." This definition acknowledges that there naturally is a certain degree of interdependence between oligopolists.

The aim of this literature review is to survey the economic literature on oligopolistic behaviour that could be helpful in order to establish a clear distinction between competitive oligopolies and those oligopolies that might constitute collective dominance or a "dominant oligopoly". Before tackling this task, the economics terminology we use has to be clarified. Economic literature does not talk about dominant versus competitive oligopolies or about "effective" competition, only about collusive and non-collusive behaviour. Therefore, in the following review, competitive oligopolies will be referred to as non-collusive oligopolies.

Then by symmetry, dominant oligopolies are oligopolies that exhibit collusion, either tacit (implicit) or explicit. Coordination or coordinated behaviour will be used synonymously with collusion (see previous section). As explicit collusion in the form of cartels with binding contracts is generally illegal, any contracts to collude are not enforceable and explicit agreements have to be concealed in order to avoid detection. Thus, concealed explicit agreements are similar in nature to, and for the observer indistinguishable from, tacit agreements.

Of course oligopoly is, by definition, not perfect competition. There are only a few firms in the market, which cannot be price takers because of their mutual interdependence. The firms' market interaction tends to result in pricing above marginal cost. Dynamic considerations aside, there is always a welfare loss associated with positive price-cost margins. Decreasing the number of firms through a merger can potentially increase this welfare loss even without any coordinated behaviour of the remaining firms. This, however, is a unilateral effect of a merger and will be discussed in Section 3.

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[20]   Collins Concise Dictionary 3rd Edition Glasgow 1995.
[21]   See for example Estrin and Laidler (1995) and Kreps (1990).

Using tacit collusion as an equivalent criterion for dominance when reviewing the economic literature is largely consistent with the interpretation of Community law as discussed in the previous section.

Using this terminology, the review aims to provide a structured overview of economic models that allow conclusions to be drawn about what constitutes collusive and non-collusive behaviour in oligopoly. Furthermore, the review serves to highlight the circumstances that facilitate collusive behaviour as they follow from economic theory.

Surveys of this literature are found in Rees (1993), Kanzenbach (1995) and Ross and Baziliauskas (2000). More detailed reviews are provided by Scherer (1990) and Phlips (1995). A very detailed but more technical treatment of the relevant models can be found in Tirole (1988), Kreps (1990), Fudenberg and Tirole (1991) and Church and Ware (2000).

2.2 Classic Oligopoly Theory

Long before the first formal models of oligopoly were developed, Adam Smith (1776) recognised the problem of collusion in this type of market. In a famous statement he said, "people of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."

The first models of oligopoly, however, do not take the possibility of collusion into account. The models are static, ie one-period games in which firms meet once and never again. The three main models of classical oligopoly theory are summarised below. The next section deals with the implications of the static nature of these games. Sections 2.2.3 through 2.3.4 review repeated game models, which allow some conclusions about potential anti-competitive behaviour of oligopolists to be drawn.

2.2.1 A brief overview of the classic models

The following section gives a brief overview of the classic oligopoly models at a non-technical level.[22]

Probably the best-known oligopoly model is that of Cournot, which was introduced in 1838. In the Cournot oligopoly model, firms select the quantities they will produce to maximise their individual profits. The firms do so without collusion or cooperation, but taking into account the quantities they expect their rivals to produce and the depressing effect on price of expanding total output. In particular, when making their output decision, firms take their rivals' output as given, assuming that their output will not change in response to their own output decision. The outcome of the model is a price between the competitive price and the monopoly price, with the equilibrium price approaching the competitive level as the number of firms goes to infinity.

The quantities in the Cournot model are termed "strategic substitutes", meaning that an anticipated expansion of output by one firm is met by a contraction of output by the other firms.

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[22] Two other traditional models, the "kinked demand curve" model and the Edgworth model, are not discussed here. For a review see Tirole (1988) pp240 and 211, respectively.

Thus, in the absence of large efficiency gains, a merger in the Cournot framework leads to a reduction of combined output by the merged firms, which is partly offset by an increase in the remaining firms' output.

Another model in which firms choose outputs to maximise profit was proposed by Stackelberg (1934). In contrast to the Cournot model, one firm is the leader and chooses its output first and firmly commits to producing it. The other firms in the oligopoly – the followers – choose their output taking the leader's decision as given. As in the Cournot model, mergers (either between two followers or the leader and a follower) will typically result in the contraction of the merging firms' output followed by the expansion of the output of non-merging firms.

Bertrand (1883) introduced a simple model of price competition in which firms produce a homogeneous product and are able to supply the entire demand they face. Consumers buy from the firm with the lowest price. At equilibrium, all firms sell the product at marginal cost or, if their costs differ, only the low cost firm produces at a price just below the high cost firm's cost. This rather counter-intuitive outcome is in stark contrast with the Cournot result and is referred to as the Bertrand paradox.[23]

By relaxing the assumptions of the Bertrand model and making it more realistic, there are three main approaches to solving the paradox. Firms can have capacity constraints or sufficiently increasing marginal cost such that they are not able to satisfy the entire market demand. Alternatively, firms can produce products that are differentiated in product or geographical space. In that case, price is not the only determinant of the consumers' buying decisions.

A third refinement to the model that alters the Bertrand outcome is to question the temporal dimension of the game. Both firms charging the same price above marginal cost is not an equilibrium in the original Bertrand game because each firm has the incentive to lower its price by a small amount and capture the entire market. The assumption is that the other firm cannot react and therefore loses all customers. In reality, however, it is likely that the other firm can observe and match the price reduction. Given this, it is not certain that the price cut would be profitable for the firm initiating it. The next two sections further explore the issue of single versus repeated interaction.

2.2.2 The single-period game as a non-collusive benchmark for oligopolistic competition

In the oligopoly models described above, firms choose their actions to maximise their individual profit. The industry profit under these forms of oligopolistic competition is lower than the monopoly profit. Therefore, firms could do better by colluding, that is, by explicitly or tacitly agreeing to restrict output or raise price beyond the outcome of the single-period oligopoly models. The maximum profit an individual firm could attain under collusion is its share of the monopoly profit.

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[23] For a detailed treatment of the Bertrand paradox and the ways to solve it see Tirole (1988) p210 ff.

Collusion implies joint profit maximisation and is the rational choice for the group of firms. However, the collusive outcome is not a Nash equilibrium of a single-period game. A set of actions is a Nash equilibrium if, given the actions of its rivals, a firm cannot increase its own profit by choosing an action other than its equilibrium action.[24] In a static game, an individual firm can increase its profit by producing more output/charging a lower price given that all other firms adhere to the collusive strategies. This deviation from the collusive outcome, also called "cheating" or "chiselling", allows the firm to earn a profit that is higher than its share under the collusive outcome.

In static games, cheating is always the individual rational decision for every firm. As no repeated interaction takes place through which a collusive equilibrium could be enforced, all firms will deviate and the one-stage Nash equilibrium is the only stable outcome of the game. In other words, there cannot be collusion in static games.

The three classic oligopoly models Cournot, Bertrand, and Stackelberg were not developed through game theoretic methodology. However, when applying this methodology, the Nash equilibrium outcomes are identical to those traditionally derived.

These models are one-period games in which the oligopolists form expectations about their rivals' reactions. Based on these expectations, they unilaterally select an action that maximises their own profit. This rational profit-maximising behaviour, which is taking account of perceived interdependence between the oligopolists, cannot be labelled collusion.[25]

Rees (1993) states that in the case of firms behaving as in these three models, "a charge of collusion could not be made to stick" because the firms act non-cooperatively and non-collusively. The firms arrive at the equilibrium through independent rational evaluation of the situation.

Similarly, Phlips (1995) argues that the competitive Nash equilibrium of a single shot game is the best anti-trust policy can hope for in oligopolistic markets. Therefore, "the competitive Nash equilibrium…defines the lower limit to which active competition should reduce industry prices or the upper limit to which active competition should push industry production."[26] The upper price limit is the monopoly outcome.

The welfare outcomes of these one-shot games are very different. In a Bertrand game with homogeneous goods and in the absence of capacity constraints the outcome is equal to the competitive outcome. Adding differentiated goods or capacity constraints will raise the market price above marginal costs. In the quantity setting Cournot and Stackelberg games, outputs are always lower and prices are higher than in perfect competition. Nevertheless, the outcome in welfare terms is better than the monopoly outcome.

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[24] Tirole (1988) p206.
[25] See Dick and Knight (1998) for a practitioner's argument along those lines.
[26] Phlips (1995) p11.

2.2.3   Early arguments against static models

The assumption of the classic oligopoly models, that firms interact only once, seems quite unrealistic. Chamberlin (1929, 1933) introduces the concept of tacit collusion, arguing that with repeated interaction, oligopolists recognise their interdependence and act to maximize joint profit. Referring to a small number of identical firms producing a homogeneous product, Chamberlin states:

> *"If each seeks his maximum profit rationally and intelligently, he will realize that when there are only two or a few sellers his own move has a considerable effect upon his competitors, and that this makes it idle to suppose that they will accept without retaliation the losses he forces upon them. Since the result of a cut by any one is inevitably to decrease his own profit, no one will cut, and although the sellers are entirely independent, the equilibrium result is the same as though there were a monopolistic agreement between them".*[27]

Chamberlin also recognises that certain factors can hinder tacit collusion. As the collusive outcome is enforced by the threat of retaliation, it has to be possible to detect a deviation before being able to retaliate. Several authors have further elaborated on the conditions under which Chamberlinian tacit collusion is likely.

In his classic article "A Theory of Oligopoly" Stigler (1964) argues, "a satisfactory theory of oligopoly cannot begin with assumptions concerning the way in which each firm views its interdependence with its rivals." Stigler criticises traditional formulations of oligopoly theory in which, due to the absence of uncertainties, collusion seems inescapable. He recognises factors that hinder collusion such as unobservable price and demand shocks as they relate to the ability of firms to detect cheating on a collusive agreement. Stigler develops a theory of oligopoly that focuses on the role of buyers for the stability of collusion.

He points out that for buyers with small purchases relative to the overall sales of a seller, cheating on price-fixing agreements is not very likely. For a firm to gain from cheating, a large number of the small buyers have to learn about the price reduction and switch to the deviator. However, there is no way to spread the news of the lower price to buyers without rivals learning about the deviation from the agreement. Hence, oligopolists will tend to adhere to the collusive price when selling to small buyers even if they cut prices for large buyers.

Stigler's second hypothesis is that collusion will be more effective against buyers who report correctly and fully the prices tendered to them (eg the government) as this makes secret price-cutting impossible. Third, Stigler argues that collusion is severely limited when the significant buyers constantly change identity.

Stigler's analysis highlights the role of the size or market shares of firms in detecting cheating and policing an agreement. The larger the portion of sales accounted for by a non-cheating firm, the more likely it is to detect cheating. The smaller the cheating firm, the easier it is to get away with

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[27]   Chamberlin (1933) p48.

cheating because the small diversion of sales can be attributed to random demand fluctuations. Stigler concludes that his theory is applicable to non-price competition. Collusion on non-price variables is possible and likely if non-price competition is detectable, for example if competition leaves visible traces as in advertising, product quality and servicing.

2.3   Game Theory Models of Oligopoly

In the real world, a wide variety of oligopoly behaviour is observable. Firms continually devise new competitive strategies as well as strategies to lessen competition among them. Traditional economic theory and anti-trust law has developed conventional wisdom on the set of factors that facilitate or hinder collusion. Since the 1980s, game theory has become the main tool for modelling oligopoly behaviour. Game theory is neither radically rewriting this list of factors nor providing all the answers about oligopolistic behaviour including the exact circumstances under which collusion will occur. The main contribution of game theory to anti-trust policy is to provide a consistent frame of reference. The game theoretic methodology enforces a systematic approach to the analysis of oligopolies. By clearly stating the assumptions that underlie the game, the applicability of the models' conclusions becomes more transparent.

In particular, game theoretic models specify:

- the number of players;

- the number and length of periods in the game, that is, the frequency of market interaction;

- the payoffs;

- the strategies available to players;

- the information available to players; and

- the way in which players form beliefs about each other and each other's strategies.

In modelling oligopolistic interaction, it is realistic to assume that firms meet in the market repeatedly. Repeated interaction has long been recognised as the prerequisite for collusion to be possible. The following four sections review various game-theoretic models relating to the possibility and likelihood of tacit collusion.

Even though some of the game theoretic models are at a very abstract level, they have clear implications for oligopolistic interaction. From these models it is possible to extract necessary criteria for tacit collusion. Furthermore, the abstract nature of the models makes these criteria valid for several forms of collusion, other than price collusion, that firms might wish to choose.

2.3.1   Infinitely repeated games with perfect information

Initial formalisations of repeated interaction were based on the assumption of infinitely repeated games – so-called supergames. The players play the same game over and over and the history of play can now be incorporated into the strategies of players. The most general result of

supergame theory is the folk theorem.[28] In non-technical terms, the folk theorem states that if players are patient enough, any equilibrium that is at least as good as the outcome of the one-shot game can be sustained.

The mechanism underlying the folk theorem is to enforce cooperation by the threat of switching to the non-cooperative equilibrium forever if one player cheats on the agreement. In an infinitely repeated game, any one-period gain from cheating is outweighed by the losses from punishment into the infinite future.

Several authors have addressed problems associated with the folk theorem and developed refined formulations of the theorem. Friedman (1971) was the first to focus on the punishment mechanism underlying the folk theorem. In order to enforce cooperation with a threat, the threatened punishment has to be a Nash equilibrium in the period after a player has deviated. Otherwise the players would have an incentive to deviate and the punishment could never occur. The threat could therefore not prevent cheating. To solve this problem, Friedman's version of the folk theorem states that there has to be a Nash equilibrium of a one-period game to which the game would revert in case of a deviation.

More general versions of the folk theorem were provided by Aumann and Shapely (1976), Rubinstein (1979) and Fudenberg and Maskin (1986).

The theory of supergames in this literature is developed at a very general and abstract level. Nevertheless, the above games share several common features, which are relevant to the analysis of oligopolistic markets:

- Non-collusive benchmark: one-period Nash equilibrium of the game between players (ie un-coordinated profit-maximising behaviour of firms in the oligopoly).

- Collusive outcome: payoffs above Nash equilibrium level (ie anything from slightly above Nash equilibrium to the perfect cartel outcome in which the firms produce the monopoly output/charge the monopoly price).

- Assumptions: patient players (either no or little discounting of the future) that repeat the same game into the infinite future. Perfect information (ie all moves by the players can be detected instantaneously without error).

The mechanisms by which the collusive outcome is enforced vary in detail between the different models. However, they follow the same idea of punishing a deviator by playing strategies that result in a lower payoff for the deviator in order to wipe out any gains from cheating. For example, in Friedman's model, the players revert to the one-period Nash equilibrium forever after cheating has occurred. This is an example of a so-called trigger strategy, in which cooperation terminates after a single deviation. Because cheating can be detected immediately and punishment outweighs the gains from cheating, no player will ever cheat and the punishment will never be

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[28]   The theorem has been part of the oral tradition of game theory or "folk wisdom" long before it was recorded in print.

observed. In the case of a Cournot duopoly, the firms would start by producing the monopoly output and any deviation would trigger a switch to the Cournot outcome forever after.

In another example – an infinitely repeated Bertrand game with N price-setting firms producing homogeneous products – it can be shown that collusion is possible by threatening to revert to the Nash equilibrium with price equal to marginal cost for all periods after a deviation was observed. Let d be the discount factor, that is, the value of one monetary unit one period into the future compared to the same amount now. Denote by $\Pi(p)$ the collusive industry profit at price p, where p can range from just above the competitive level up to the monopoly price. If firms collude, an individual firm can earn $\dfrac{\Pi(p)}{N}$ every period. For a collusive equilibrium to be stable such that an individual firm does not find it rational to deviate, the discounted sum of these profits has to be larger than the profit the firm can make by cheating, that is, undercutting the price slightly. The maximum profit the firm can make by cheating is $\Pi(p)$, as the firms will price at marginal cost after cheating has occurred. Hence, when deciding whether or not to cheat, a firm weighs the gains from cheating against the stream of collusive profits lost due to the reversion to the competitive Nash equilibrium with zero profits. For a collusive equilibrium to be stable, it is necessary that the former outweigh the latter, or in formal terms that $\dfrac{\Pi(p)}{N}(d+d^2+...) \geq \Pi(p)\left(1-\dfrac{1}{N}\right)$. This implies that any price between the marginal cost and the monopoly price can be sustained as an equilibrium if and only if $d \geq \dfrac{N-1}{N}$. Hence, in the duopoly case the discount factor to sustain collusion has to be larger then 0.5. With more firms in the market the necessary discount factor increases thus making collusion less likely.

Note that the term $\Pi(p)\left(1-\dfrac{1}{N}\right)$ represents the gain from cheating. It follows that the incentives to cheat are higher the larger the collusive industry profit $\Pi(p)$ (the maximum achievable is the monopoly profit) and the larger the number of firms in the market.

To illustrate why the discount factor d is generally less than one, Cabral (2000b) provides an equation for the discount factor based on the per period interest rate (r): $d=1/(1+r)$. Taking into account the probability that the industry ceases to exist in the next period (h), the possibility that the industry grows by a factor (g) and the frequency with which firms change prices per period (f), so that: $d \equiv \dfrac{1}{1+r/f}h(1+g)$.[29] In combination with the previous result on the minimum discount factor to sustain collusion, this equation shows that collusive pricing is more likely to be an equilibrium the greater the frequency with which firms interact and the greater the probability of continuation and growth of the industry.

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[29]   Cabral (2000b) p130.

The above results were based on trigger strategies in which firms threatened to revert to non-cooperative play forever after a deviation has occurred. The enforcement method can be modified such that punishments are harsher and punishment periods shorter. Abreu (1986) introduces a simple carrot-and-stick strategy with "optimal penal codes" as the enforcement mechanism. When one firm deviates it receives the harshest possible punishment but after a pre-specified punishment period the players return to cooperation. If a firm fails to carry out the punishment, it will also be punished. In a game of this set-up it is always better to be the punisher than the punished and in equilibrium no firm deviates from the agreement.

The preceding discussion shows that collusive equilibria are only sustainable under the threat of retaliation after cheating has occurred. In a collusive equilibrium with perfect information, these threats are never carried out because all players find it optimal not to deviate. But how credible are the threats? Suppose a firm undercuts the others in one period and is to be punished in the next. The firms then expect no profit in the next period and therefore have an incentive to "renegotiate" to achieve an equilibrium in which all firms are better off.[30]

The possibility of renegotiation undermines the strength of the punishment, thus decreasing the incentive not to undercut. Several authors have developed models that account for the possibility of renegotiation and established the concept of renegotiation-proof equilibria. Among them are Aghion, Dewatripont, and Rey (1994), Benoit and Krishna (1993), Bergin and MacLoed (1993) and Farrell and Maskin (1989).

Church and Ware (2000) point out that the effect of renegotiation on the credibility of punishment strategies depends on the cost of renegotiation. The higher the cost, the less the credibility problem. McCutcheon (1997) argues that one effect of anti-trust laws is to raise the cost of renegotiation, thereby making collusion easier to sustain.

2.3.2 Infinitely repeated games with imperfect information

So far it has been assumed that firms could observe all relevant information including the actions of all players at any time. This implied that cheating could be detected instantaneously and retaliation would follow immediately thereafter. What happens to the models of collusive behaviour in the more realistic case that information is not perfect?

As Stigler (1964) already noted, fluctuations in demand are a main problem for firms wishing to collude. If the output or price of each firm is not observable, random demand fluctuations make it difficult for the non-cheating firms to determine whether cheating has occurred or not. For example, a non-cheating firm could tell that its sales or revenues are reduced but would not know if this was due to another firm cheating or to a decrease in demand. Similarly, in a situation with an observable market price, firms might not know whether a drop in price was caused by a firm producing more output or a reduction in demand.

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[30] This renegotiation does not necessarily imply that the firms actually get together and communicate, but the possibility to communicate might make renegotiation easier. The concept of "renegotiation-proofness" in this context should not be confused with a similar term used in contract theory. Here, the original "negotiations" on an equilibrium are not binding and serve only to coordinate expectations. See Fudenberg and Tirole (1991) Section 5.4 for a detailed treatment of this issue.

Green and Porter (1984) address the latter case in the first formal model building partly on the arguments of Stigler (1964). They present an infinitely repeated game with discounting in which N firms are producing a homogeneous good and choose their output Cournot-fashion. There is a random disturbance term in the demand function. Firms can observe the market price and it is a function of the output of all firms and the random term. Firms set a "trigger" price such that if the equilibrium price falls below this price, firms go into a "reversionary" punishment period of a pre-specified duration. Adding firms to the market implies that each firm's effect on the market price is reduced. Thus it is more willing to chisel and collusion decreases.

Abreu, Pearce and Stacchetti (1986) build on the Green and Porter model using techniques from dynamic programming and optimisation theory. They show the structure of symmetric equilibria that give the oligopolists the highest possible expected profits and limit the number of possible equilibria. Alternative approaches to oligopoly games with imperfect information can be found in Fudenberg and Maskin (1986) and Matsushima (2000). Matsushima uses a signalling model and shows that implicit collusion can be sustained by Nash equilibria even if monitoring is truly imperfect and private.

The main conclusion from these models is that imperfect information tends to limit the extent to which firms can tacitly collude. Under uncertainty, mistakes are unavoidable and punishment phases, such as price wars, occur periodically. Full collusion cannot be sustained in this situation.[31] Firms would have to keep charging the monopoly price even when making small profits, since low profits are possible due to unfavourable demand conditions. If a firm, however, believes that its rivals will continue charging the monopoly price even if profits are low, it has the incentive to secretly undercut these firms, expecting not to be punished. Therefore, demand volatility makes tacit collusion less effective but not impossible.

2.3.3 Finitely repeated games

One game-theoretic argument that initially seemed to wipe out the folk theorem's implications for collusion is linked to the assumption about the duration of the game. Selten (1978) introduces the problem with his famous "chain-store paradox". He shows that, given the logic of game theory, no cooperation is possible as soon as the game is finite. If the game has a final period, we know that firms will cheat, as there cannot be retaliation in the future. Knowing this, firms will also cheat in the period before the last and so on until the first period. With this so-called backward induction argument, the game unravels from the back and firms will never cooperate.

This outcome seems so counterintuitive that Selten even called his result a paradox. Several authors have since shown ways to solve the paradox and establish the results similar to the folk theorem for finite games. One approach is to introduce uncertainty into the game. Kreps, Milgrom, Roberts and Wilson (1982) and Radner (1980) developed incomplete information arguments. Players might not know how long exactly the game will last and the probability of a next period might be enough to allow for cooperation. Alternatively, there could be a very small probability that a player is acting irrationally, which can break the backward-induction argument and result in collusive outcomes.

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[31]   See Tirole (1988) p252.

Benoit and Krishna (1985) show that in games with several Nash equilibria, cooperation is possible even with a finite horizon. Basu (1992) goes yet another route to explain collusion in a finitely repeated oligopoly game without sacrificing the assumption of full rationality. Basu's approach, using a model similar to that of Saloner (1987), divides the Cournot game in each period into two stages. He assumes that production takes some time and that oligopolists can observe whether their competitors are planning to produce a lot or a little and adjust their production plans accordingly.

A variety of theoretical arguments have been developed to show that cooperative outcomes are sustainable under sensible assumptions. Cooperation is a robust result, which was also confirmed in the experimental game-theoretic literature. Even without changing the assumptions, experiments in which students played finitely repeated games showed that there is often cooperation in the beginning of the game even under perfect information.[32] This higher-than-expected incidence of cooperation might be due to so-called reputation effects.

2.3.4 Reputation games

In reputation games, the history of play matters not only through its effect on the tangible variables (price, quantity), but also through its effect on intangible variables such as the beliefs about players. By observing previous play, players use this information to form conjectures about the other players' types and their possible future behaviour. Thus, players who value future returns relatively highly can aim to build up a reputation, for example for cooperative or particularly aggressive behaviour. The basic idea is that players do not have complete information about each other, for instance firms may not know their rivals' cost parameters, demand expectations or the degree of their rationality.[33] As firms know their rivals do not have this information, they each have an incentive to influence their rivals' beliefs about them.

Building a reputation for friendly behaviour can help to sustain collusion. In a repeated game, firms can send costly signals to convey information. These signals are credible because they are costly. For example, a firm might charge a price above its own profit maximising price in the first period in order to signal that it might be a high cost firm or that it prefers high prices with the aim of reaping the benefits later.[34] Firms might use signalling to convince their rivals that they prefer playing a tit-for-tat strategy, which says they will start with cooperation and then adopt the strategy their rival(s) chose in the previous period. In an experimental study, Axelrod (1980) showed that the tit-for-tat strategy could support cooperation and higher payoffs than the rational strategy of non-cooperation in finitely repeated games.

Similarly, firms could build up a reputation for aggressive behaviour in order to deter entry. Kreps and Wilson (1982) and Fudenberg and Levine (1989) have analysed reputation effects that can lead to entry deterrence. In the context of tacit collusion, we can see reputation building as a

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[32] See Kreps (1990).
[33] Generally, full rationality is assumed, but under incomplete information there might be a small but positive probability that a player makes a 'mistake', eg fails to identify the optimal strategy, or that the player is plainly crazy, eg hates entrants and fights any attempt to enter his market.
[34] See Tirole (1988) p257.

means to overcome obstacles to cooperation in cases where cheating seems the rational choice or where successful cooperation is threatened by entry.

2.3.5 A word of caution

In the previous sections it was shown that game theory could be helpful to explain coordinated behaviour between competing firms and establish conditions under which cooperation may occur. Yet, before summarising the findings up to this point, a few notes of caution need to be made about the practical usefulness of the results.

As described in Section 2.2.1, each of the classic models yields a specific equilibrium outcome. Testable hypotheses can be developed from the predictions of these models. This appealing property arises because the models are based on ad hoc assumptions about the rivals' conjectures, which, as Kreps (1990) critically points out, is equal to assuming which equilibrium pertains. When moving away from these ad hoc assumptions, we encounter the main weakness of the game theoretic approach. Kreps calls this "the twin problems of too many equilibria and the selection of one of them."[35] Tirole (1988) notes that supergame theory is in a sense too successful in explaining tacit collusion and calls the multiplicity of equilibria "an embarrassment of riches".[36]

Although several attempts have been made to limit theoretically the number of equilibria, game theory is still not predictive in the sense that it could explain how firms under certain conditions coordinate on a particular equilibrium. Game theory can help to pin down conditions that are necessary for collusive behaviour to be sustainable. It can also explain with theoretical rigour how certain market characteristics might support these conditions. It cannot, however, predict whether or not firms will indeed coordinate on a collusive equilibrium once those conditions are met. There is always a possibility that firms, for various reasons, fail to coordinate on a collusive outcome even under conditions that are favourable to collusion. Therefore, game theoretic analysis cannot provide sufficient conditions for collusion.

2.4 Necessary Criteria to Implement and Sustain a Tacit Collusion Mechanism

From the review of the theoretical models we see that in order to tacitly collude, firms have to coordinate on a collusive equilibrium (determine collusive prices, quantities, market shares, R&D level etc) and the equilibrium, in the absence of enforceable contracts, has to be stable such that firms do not deviate from it. For stability of a particular collusive equilibrium, the individual firms need to find it rational to comply. The decision to comply or to cheat depends on the gains from cheating relative to the losses from cheating. At any given cooperative outcome, firms can determine the expected gains from cheating and compare them to the expected losses from cheating, that is, the losses from punishment multiplied by the probability of detection. The cooperative outcome is stable if the losses from cheating outweigh the gains from cheating. Otherwise, firms will cheat which implies that the initial focal point was not an equilibrium. Given

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[35] Kreps (1990) p529.
[36] Tirole (1988) p253.

the market conditions including the detectability of cheating and the available punishment mechanism, this particular collusive price would be too high, so a mutually acceptable and less collusive equilibrium has to be found.

Keeping in mind the limitations of the theoretical models pointed out in the previous section, it is possible to derive necessary conditions to implement and sustain a tacit collusion mechanism (referred to as necessary criteria hereafter) as they flow from economic theory. The following six conditions need to be fulfilled for a tacitly collusive agreement to emerge and remain stable over time. These are theoretical criteria only and some are at a very abstract level.

1. **Very few firms**

2. **Repeated interaction**

3. **Barriers to entry/exit**

4. **Capacity to reach a mutually acceptable equilibrium (Coordination)**

5. **Ease of detection of cheating (Monitoring)**

6. **Enforceability of compliance**

The following paragraphs briefly summarise how these criteria relate to economic theory. The next step has to be to determine which real-world market characteristics feed into the necessary criteria listed above. Section 2.5 provides an analysis of specific market characteristics most commonly associated with anti-competitive behaviour.

2.4.1 Very few firms

A small number of firms enhances the capacity of firms to reach a tacit understanding and to maintain it over time. In order to collude tacitly, firms have to coordinate on a specific equilibrium, which becomes more difficult as the number of firms increases. The probability that firms have divergent preferences regarding the choice of the collusive equilibrium also increases with the number of firms.

Most importantly, a highly concentrated market is necessary to provide the oligopolistic interdependence that forms the basis of tacit collusion. The gains from collusion are lower the more firms there are in the market because the individual firm gets a lower share of the collusive profit. The gains from cheating are also higher as the firm can capture a larger share of the market by undercutting the other firms. Together, this implies that the incentive to collude and to honour any collusive understanding decreases with the number of firms in the market.

In addition to this incentive argument, there is also an argument on the problem of monitoring related to the number of firms. The more firms there are, the less the impact of an individual firm's action on the aggregate market parameters. Hence, if a firm believes its actions are not

noticeable, it will be likely to deviate from the agreement because it can increase its profit by chiselling.

The more firms there are in the market, the harder it will be to determine the identity of the deviator once it becomes clear that cheating has occurred. Punishment strategies that specifically target the deviator (for example the carrot-and-stick method of Abreu) become harder to apply. From these considerations it becomes clear that a small number of firms is an important determinant of the incentives for collusion as well as the basis for the three necessary conditions of coordination, monitoring, and enforcement.

It has to be acknowledged that collusive behaviour is sometimes observable in markets that are not highly concentrated. However, in less concentrated industries it might only be possible to maintain collusion through explicit agreements or facilitating devices which reinforce coordination, for example information exchanges. Membership of trade or professional associations can be a mechanism for collusion in less concentrated markets.

2.4.2   Repeated interaction

As explained earlier, repeated interaction is required for collusion to be feasible. If the market is such that firms interact on a single occasion only, any effort to reach a tacit understanding to collude would be meaningless because firms have an incentive to cheat and all firms know that. Therefore it is necessary that firms expect to stay in the market and to interact again with each other. Furthermore, firms must be interested in future profits, not only short-term gains.

Repeated interaction is also important for coordination. By setting choice variables such as price, quantity or advertising levels in subsequent periods, firms can find out what triggers an aggressive reaction by rivals and what is met with cooperation. Using this trial-and-error method, firms can arrive at a collusive equilibrium without any communication.

Monitoring and enforcement also rely on repeated interaction. Interaction needs to be relatively frequent in order to avoid detection lags in which firms could cheat without being punished. This also implies that transactions should be in the form of many frequent and small orders instead of large and lumpy orders. Infrequent interaction in the form of large and lumpy orders increases the incentive to cheat by providing a larger gain from cheating as well as by reducing the effectiveness of monitoring and enforcement.

2.4.3   Barriers to entry/exit

In the game-theoretic models described above, the number of players is pre-specified, games are defined and conclusions are drawn. In repeated games, it is assumed that the same game is repeated over and over, keeping the number of players constant. In reputation games, some models specifically address entry with the decisions of the incumbent and the potential entrant modelled explicitly. In both scenarios it is clear that costless entry changes the game such that collusion becomes unprofitable.

The basic idea is that without any barriers to entry (and technically also to exit), there is always the threat of "hit-and-run" competition. As soon as positive profits can be made in the industry,

firms will enter, reap the profit and possibly retreat from the market. If they can exit the market as easily as they entered, no threat of future losses can keep them from entering and undercutting the incumbent firms. The worst possible outcome for the entrant would be to make zero profits, which is as good as staying out.

This idea has been formalised by Baumol, Panzar and Willig (1982) as the contestable market hypothesis. If markets are perfectly contestable the threat of entry keeps the prices at the competitive level even with only a few firms in the market. While real-world markets will rarely be perfectly contestable, the ease or otherwise of entry to, and exit from, a market is central to the analysis of oligopolists' behaviour.

It is useful to group entry barriers into three broad categories – legal, structural and strategic barriers to entry.[37] The first two can be considered exogenous barriers whereas the latter can be seen as endogenous. However, there can be an overlap between the categories, for example in cases where firms use legal and structural barriers strategically to deter entry.

Legal barriers to entry may consist of industry specific regulations such as approval of pharmaceutical products, environmental regulations or firm specific protection through patents. Incumbents could use these barriers strategically to deter entry. An example is so-called ring-fencing, the protection of an innovation with a wide range of patents covering potential alternatives to the product. Structural barriers include high sunk costs, economies of scale and scope, restricted access to necessary resources and technical barriers to entry. Again, these can consciously be used in combination with strategic behaviour to deter entry.

Strategic entry barriers are those that are consciously created by incumbents with the aim to strengthen their position in the market. Examples are long-term contracts with buyers and suppliers, exclusive dealing contracts and establishment of proprietary technical access systems. Furthermore, one could argue that predatory behaviour or the threat of predatory behaviour can successfully act as an entry deterrent.

The nature and role of entry barriers is an extensive topic in itself and a detailed elaboration on this would exceed the scope of this paper. A comprehensive analysis, including a review of the relevant literature and a methodology for the assessment of entry conditions, can be found in the report produced by London Economics (1994) for the UK Office of Fair Trading (OFT) called "Barriers to Entry and Exit in UK Competition Policy".[38] The German merger guidelines of 2000 place a large emphasis on barriers to entry and discuss the various forms in some detail.

The potential of so-called fringe firms to put competitive pressure on the large firms in the oligopoly is related to contestability theory and barriers to entry. When barriers to entry exist so that entry is unlikely, fringe firms that already operate in the market might be able to apply competitive pressure on the larger incumbents. Fringe firms do not make the market more contestable in the sense of hit-and-run competition, but attempts to collude might be destabilised if one or several fringe firms are capable of expansion. However, it would be misleading to think

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[37] This categorisation has for example been used in the German Merger Guidelines Bundeskartellamt 2000.
[38] Available from the Office of Fair Trading PO Box 366 Hayes VB3 1XB.

that the existence of a fringe would make up for the existence of significant barriers to entry. First, the same features that act as barriers to entry may also act as barriers to expansion so that fringe firms would not be able to destabilise any coordinated behaviour by raising their output. Second, even if a firm is able to expand, the barriers to entry could allow the colluding firms to retaliate successfully against the expanding firm or to include the firm into the colluding group. It thus seems unlikely that the presence of fringe firms reduces the importance of entry barriers.

Potential entry and the role of fringe firms will be discussed further in Section 2.5.2.

2.4.4 Capacity to reach a mutually acceptable equilibrium (Coordination)

As pointed out earlier, many collusive equilibria are possible. Firms need to be able to coordinate on a specific equilibrium without being detected by anti-trust authorities. They need to implicitly determine how they are going to collude, which requires the existence of one or more mutually acceptable collusive equilibria and a tacit coordination on one of them.

Problems with the existence of the equilibrium may arise if firms have very different preferences regarding the level of price, quantity etc. Coordination problems can arise if firms are not able to monitor each other's behaviour well enough. They might not be able to read or interpret the signals their rivals send in a way that allows them to determine their own appropriate cooperative reaction. So-called "focal points", as discussed in Scherer (1990), can help firms to coordinate on one out of many possible equilibria. A focal point is an outcome out of the many possible equilibria that stands out as self-evident. Alternatively, an equilibrium can be arrived at by trial-and error method as discussed in the previous section. Section 2.5 describes the problems of existence of and coordination on a particular equilibrium in more detail and relates specific market criteria to coordination issues.

In addition to coordination problems, the question of the level/degree of collusion attainable in a given market is relevant for the potential effects of coordination. It follows from theory that there are multiple possible collusive equilibria for firms to choose from but not all collusive outcomes are equilibria. As discussed in Section 2.3.1, the incentives to cheat are different for each coordinated outcome. In the described case of homogeneous products and symmetric firms, the incentive to cheat depends on the number of firms and on the collusive profit attainable in the market. The collusive profit will, ceteris paribus, be higher the lower the price elasticity in the market, that is, the more restricted the substitution possibilities on the demand side.[39] This implies a higher incentive to collude for the group of firms as a whole as well as a lower incentive to cheat for the individual firm. Hence, in markets with a high elasticity of demand, collusion is less likely and/or less severe (ie only a less restrictive coordinated outcome is sustainable).[40]

2.4.5 Ability to detect cheating (Monitoring)

Once reached, a collusive equilibrium can only be sustained over time through the threat of punishing any deviations. But, as Stigler (1964) emphasises, for the threat of retaliation to be

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[39] A detailed treatment of the role of demand elasticities in merger control can be found in Kantzenbach et al (1995).
[40] Note that the value of the demand elasticity depends on the market definition, which also determines the number of firms/concentration in the market.

effective, a deviation has to be detectable. Game theoretic models often assume detectability (as in Section 2.3.1) or they specifically model this issue (Section 2.3.2). The latter models formally show how cooperation beaks down when cheating cannot be detected. In real-world markets this means that the relevant variables have to be observable (price, market shares etc) or that firms have to be able to deduce from their own sales and profits whether the other firm(s) is(are) cheating. More detail is provided in Section 2.5.

2.4.6 Enforceability of compliance

Compliance with tacit understandings to collude always has to be enforced through the threat of punishment. Otherwise, firms would deviate in pursuit of higher short-run profits at the expense of their rivals. For enforcement to be effective, firms must be able to detect a deviation (as discussed above) and have the means and willingness to punish the deviation.

Game theoretic models offer a variety of punishment strategies or mechanisms but the main objective of all is to wipe out any short-term gains a deviator might reap by cheating. The closer the time of detection and punishment is to the time of the initial deviation, the lower the gains from cheating and the easier it is to enforce cooperation. In practice, firms usually have the means to punish, for example by flooding the market, initiating a price war or generally competing more aggressively. The problem tends to be the credibility of the threat. If it hurts the retaliating firms as much or even more than the deviator to go through with the punishment, the threat is not credible and cannot deter deviation.

The following table summarises the necessary criteria for tacit collusion that were derived from the theory.

Table 2.1
Necessary Criteria to Implement and Sustain a Tacit Collusion Mechanism

	Criterion	Comment
1	**Very few firms**	"Fewness" is the basis of interdependence. It is essential for the firms' incentive to collude, for the capacity to coordinate on a collusive equilibrium, and for detection and punishment of a deviation.
2	**Repeated interaction**	Firms need expect to stay in the market and interact repeatedly with each other in order for collusion to be sustainable. This also implies that transactions should be many and frequent without large and lumpy orders.
3	**Barriers to entry**	If entry (including imports from other geographical markets) is easy and/or small fringe firms can rapidly expand their output, collusion is not sustainable.
4	**Capacity to reach a mutually acceptable equilibrium**	Firms need to be able to determine how they are going to collude, ie find a collusive equilibrium without being detected by anti-trust authorities. This does not require any kind of formal agreement – a mutual understanding of what the collusive outcome should be is sufficient.
5	**Ease of detection of cheating**	Since for each firm there is always an incentive to deviate from the collusive outcome, cheating needs to be detectable. The relevant market variables have to be observable or firms have to be able to deduce from their own sales and profits whether or not the other firm(s) is(are) cheating
6	**Enforceability of compliance**	In order to deter cheating and sustain the collusive outcome, firms must have the means and willingness to punish a deviation, for example by initiating a price war. The threat of punishment has to be credible for effective enforcement.

From the above table, criteria 1, 2 and 3 are relatively straightforward and do not require much interpretation. However, criteria 4, 5 and 6 are abstract concepts that cannot simply be established by observation or by measuring a single variable. Considerable interpretation and analysis of facts is needed to determine whether firms can reach a tacit agreement, will be able to detect cheating and to punish the deviator.

The following section deals with this interpretation problem. It discusses structural market characteristics and factors that tend to facilitate collusion as they relate to the necessary criteria outlined above.[41] For each of these market characteristics, literature is reviewed that focuses on

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[41] These factors should not be confused with the so-called facilitating practices, such as most favoured customer clauses or resale price maintenance. While the former are beyond the firms' control as they are either present or absent in a market, the latter refer to practices that the firms themselves can initiate to make conditions more favourable to collusion. Anti-trust authorities can prohibit facilitating practices but usually have little control over the factors in a market that facilitate collusion. Facilitating practices will be reviewed in Section 2.6.

the effects of the characteristics on the likelihood of collusion in oligopoly. Section 2.8 summarises the findings.

2.5 Market Characteristics in Oligopoly and Tacit Collusion

There is a wide consensus in the economic literature and in anti-trust experience about the factors that are most relevant to potentially facilitate collusion. The market characteristics recognised as affecting the likelihood of collusion are homogeneity of products, symmetry of firms, stability of demand conditions/degree of uncertainty in the market, the size and frequency of orders, market transparency, length of detection lags, multi-market contact, capacity utilisation and buyer power. Section 2.5.1 provides an outline of how market characteristics relate to the necessary conditions and the subsequent sections review these characteristics in greater detail.

2.5.1 The necessary criteria linked to market characteristics — an overview

The market characteristics influence, individually or jointly, the likelihood of collusion through their effect on the six necessary criteria. The three basic conditions – **small number of firms**, **repeated interaction** and **barriers to entry** – provide the necessary framework for the firms to establish a tacit collusion mechanism consisting of coordination, monitoring and enforcement. The existence and the extent of these three components of the collusion mechanism depend on the specific market conditions under which the firms operate.

For firms to **reach a mutually acceptable equilibrium**, it is necessary that there exist terms to which all firms are willing to agree implicitly. Symmetry of firms with respect to cost conditions, size, degree of vertical integration and general strategy makes it more likely that firms can agree on a particular collusive outcome. Although firm asymmetry can make it very difficult to coordinate on price, other forms of collusion such as dividing the market are still feasible.

Given the existence of multiple mutually acceptable equilibria, being able to coordinate on one of them is facilitated by market transparency, in particular product homogeneity, and by stable demand conditions. Stable demand and low uncertainty are important for all forms of collusion. In a changing and unpredictable environment, the most desirable equilibrium for the individual firms keeps changing and it is difficult to determine which "rules" to follow in order to coordinate. In growing markets where constant innovation is vital for the long-term success of firms, it might be impossible to find a mutually acceptable equilibrium (for example by coordinating and restricting expansion or R&D activities) due to first-mover advantages for each firm.

Buyer power can undermine coordination if buyers are able to secretly negotiate the terms of contracts. Buyers may also disrupt the "repeated interaction" condition by offering large and long-term supply contracts.

It is necessary that firms have some means to detect and punish cheating in order to deter deviations. The more transparent the market is, the easier it will be to **detect a deviation**. Product homogeneity is an important contributor to high market transparency as it makes products and prices more readily comparable. Large buyers that negotiate prices secretly can reduce the detectability of deviations and encourage cheating. In addition to price transparency, the detection of cheating becomes easier if output and capacities are observable.

Symmetry of firms tends to assist detectability even in situations of lower market transparency. When firms have similar cost structures and strategies, it becomes easier to infer a deviation from changes in the firm's own sales and profit levels. However, if demand conditions are unstable and the market is characterised be a high degree of uncertainty, detection of deviations becomes increasingly difficult if not impossible.

To **enforce compliance** with a cooperative outcome, it has to be possible to punish cheating after it has been detected without significant time lags. As discussed earlier, there are numerous punishment mechanisms, one of which can be the return to the competitive equilibrium. Again, stable demand conditions, in particular low growth and no substantial product innovations, are important to ensure that punishment is a credible threat able to enforce compliance. For example in fast growing high-tech industries with short product cycles market conditions change so quickly that a punishment strategy based on the initial conditions is not credible or feasible. Nevertheless, the general threat of aggressive market behaviour might be sufficient to enforce compliance.

Symmetry of firms implies a similar capacity to punish deviations, which tends to make a cooperative outcome more stable. Multi-market contact and excess capacity increase the retaliatory power of firms.

So far, the market characteristics have been discussed in their direct relation to the necessary criteria without an examination of interactions or possible ambiguous effects from any particular factor. Table 2.2 summarises these direct relationships between necessary conditions and contributing factors.

Table 2.2
Conditions for Coordinated Conduct in Oligopolistic Markets

	Necessary Criteria	Factors that contribute to the necessary criteria
1	Very few firms	
2	Repeated interaction	no large and lumpy orders
3	Barriers to entry	
4	Capacity to reach a mutually acceptable equilibrium	homogeneous products market transparency symmetry stable demand conditions low buyer power
5	Ease of detection of cheating	homogeneous products market transparency symmetry stable demand conditions low buyer power
6	Enforceability of compliance	symmetry stable demand conditions (no fast growing high-tech market with short product cycles) no/short detection lags multi-market contact excess capacity

The following sections look at each of the market characteristics separately in order to analyse their effects in more detail and review some of relevant literature.

2.5.2 Potential entry and the role of the competitive fringe

The possibility of market entry determines the very nature of the game oligopolists will play. If the number of players can change significantly, cooperation is less likely. As discussed earlier, perfectly contestable markets as described by Baumol, Panzar and Willig (1982) make collusion basically unprofitable. However, markets are rarely perfectly contestable as there tend to be entry barriers of various forms. Some important examples are sunk costs, economies of scale and government regulation.

Entry does not need to come from complete newcomers. It may be that firms that already operate in the market in another location or are producing a close substitute will expand into the market in question if this appears to be profitable. Furthermore, tacit collusion in a market may induce a large buyer to vertically integrate and enter the supply market. Of particular interest are small firms that already operate in the market, the so-called fringe players. These firms are individually so small that they do not have a significant effect on market parameters.

Nevertheless they can play an important role in determining whether or not collusion is sustainable.

Usually, fringe firms are small because they face capacity constraints, cost disadvantages or are serving niche markets. They act as price takers and follow the price of the leading firms. They sell all the output they can produce. The extensive literature of leader-follower models along the lines of Stackelberg (1934) will not be reviewed here.[42] The importance of the fringe to the leading firms is the fact that they will increase output as the price rises. If cooperation in the market leads to permanently elevated prices in the market, the fringe firms have the incentive to expand their capacity in order to capture more of the profitable market.

If fringe firms can expand relatively easily, they can exert a strong competitive pressure on the big firms. However, if market conditions are such that only one or two fringe firms reach the scale needed to effectively compete with the leading firms, it might be profitable for the former fringe firms to join the tacitly colluding group.

In his well-known article "A Simple Model of Imperfect Competition Where Four Are Few and Six Are Many" Selten (1973) introduces a cartel versus fringe model. For collusion to be sustainable, there must be internal and external stability. Internal stability requires that, given the number of firms in the cartel and in the fringe, the members of the cartel must prefer to remain in the cartel. Similarly, external stability requires the fringe firms to be better off in the fringe.

In Selten's model with symmetric firms, a complete cartel will be formed with four or fewer. With more than four firms, a partial cartel may be formed, with some firms remaining in the fringe. Selten computes the probability that a complete or partial cartel is formed. He finds that with four firms, the probability is 100 per cent, with five firms it is 22 per cent and with six firms only 1 per cent. Despite Selten's rather restrictive assumption, his results confirm that increasing the number of firms beyond a very low number strongly decreases the probability of collusion.

Cramton and Palfrey (1991) come to similar results as Selten (1973). Martin (1993) extends Selten's model to repeated games and Shaffer (1995) derives conditions under which the behaviour of the fringe and the cartel emerge endogenously. All these authors confirm the result that a perfect cartel can only be formed with four or fewer firms. Further contributions in this area have been made by Rothschild (1990), Friedman and Thisse (1994) and Prokop (1999).

2.5.3   The similarity of the firms

The degree of symmetry between firms is an important factor feeding into the three necessary criteria of coordination, monitoring and enforcement. Many economic models assume symmetry for analytic convenience. The most appealing property of the assumption of symmetric firms is the symmetric equilibria resulting from the analysis. Several authors such as Cramton and Palfrey (1991), Verboven (1997) and Rothschild (1999) have addressed the issue of asymmetric firms explicitly and found that asymmetries make (tacit) collusion substantially more difficult but

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[42]   A good introduction to the topic can be found in chapter six of Scherer et al (1990).

not impossible. In general, firm heterogeneity refers to firms having differing cost structures but this could be extended to other firm parameters.

Coordination on a particular equilibrium becomes difficult when firms' costs differ significantly. Firms then prefer different prices, that is, the low cost firm prefers a lower price and a higher output than the high cost firm. Side payments can help in solving the problem. In theory, the low cost firm could just pay the high cost firm to shut down. However, it is unlikely that overt side payments are legal under anti-trust law. Nevertheless, firms might be able to find ways to disguise these side payments. The incentives to cheat also differ between firms if their cost structures differ. All these problems are exacerbated the more firms there are in the market.

Even if a mutually acceptable equilibrium exists, it might be difficult to coordinate tacitly on it without any explicit sharing of information. The process of reaching the collusive equilibrium is easier for similar firms simply because a symmetric equilibrium tends to be a more obvious focal point.

A similar argument can be made for monitoring. Kreps (1990) points out that firms need to have an implicit "rule" to follow. In a situation with symmetric firms, they can check that all firms behave similarly, which makes it easier to detect cheating. However, what do firms look for and which rule should they follow when firms are asymmetric? When a firm that is part of an implicit agreement is faced with a decrease in its profit, it has to decide whether this is due to (a) something completely outside the control of the firm's rivals, (b) an "honest mistake" by its rivals concerning the nature of the tacit agreement, or (c) chiselling by its rivals. Stigler (1964) and Green and Porter (1984) discuss (a) versus (c) but in real life (b) versus (c) is at least as important.[43]

Finally, firm homogeneity facilitates the enforcement of compliance. Similar firms have similar retaliatory power and can punish cheating more easily.

In general it can be said that firm heterogeneity is a market characteristic that strongly restrains firms' ability to achieve and sustain a collusive outcome over time, in particular without any facilitating practices. It should be noted, however, that the presence of one highly efficient firm (or a small group of similar and efficient firms) along with several less efficient firms could contribute to the stability of an agreement. In that case, the low cost firm(s) could take on the role of the leader(s) with the remaining firms as followers.[44] This situation would be covered by the dominant firm literature, which is not explicitly reviewed in this survey.

2.5.4 Product homogeneity/heterogeneity

Product homogeneity is often cited as one of the crucial market characteristics necessary for, and indicative of, collusion. Along with the symmetry of firms, the nature of the product is relevant for the three necessary criteria of coordination, monitoring and enforcement. Coordination on a particular collusive equilibrium is facilitated by product homogeneity. Price readily serves as the

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[43] Kreps (1990) p529.
[44] See Ross and Baziliauskas (2000) pp399-400.

means to collude. It also becomes easier to find a focal point without any communication between firms.

If products are differentiated and firms produce a large number of products, it can be argued that firms will have difficulties determining a complete schedule of collusive prices for these products. Other strategic parameters such as product quality, service etc become means of deviating from the collusive equilibrium in order to capture a larger market share. However, as Ross and Baziliauskas (2000) point out, it is important not to exaggerate the importance of this factor. In a situation where coming to an understanding on price might be difficult due to a large number of differentiated products, firms might choose to cooperate in other ways, for example by allocating markets or customers between them.

Product homogeneity makes markets more transparent by reducing the parameters that need to be observed. Therefore, detection of any deviation tends to be easier. However, once a tacitly collusive equilibrium has been arrived at, product homogeneity can be shown to have an ambiguous effect on the stability of collusion: Ross (1992), Deneckere (1992), Lambertini (1995), Albæk and Lambertini (1998). The ambiguity arises because product homogeneity increases the gain from cheating by allowing the cheating firm to capture a large share of the market by undercutting its rivals. On the other hand, homogeneous products increase the effect of punishment, thus reducing the incentive to cheat.

Finally, it should be pointed out that even if product heterogeneity reduces the likelihood and/or the effectiveness of cooperation, product differentiation is likely to reduce competition between firms. It can be the very idea of product differentiation to avoid fierce competition in a product market. The more firms differentiate their products, the more freedom they have independently to make pricing decisions. The extreme case of product heterogeneity is (local) monopoly.

Häckner (1996) provides a result that supports the idea that product differentiation can lead to higher prices in the case of tacit collusion. Häckner studies a horizontally differentiated duopoly with collusion enforced by the punishment mechanism proposed by Abreu (1986). The optimal punishment has a simple two-phase structure. After a period of intense price war, firms return to the collusive outcome. The best collusive price is shown to be lower, the more substitutable the products.

2.5.5 Market transparency

The term "market transparency" is widely used and recognised as a factor that facilitates tacit collusion.[45] Due to its importance for the practitioner, market transparency is discussed in this section as one of the market characteristics. It could be argued, however, that it is not a criterion in its own right but rather a combination of various other factors; in a sense it might be a sort of supra-characteristic.

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[45] Møllgaard and Overgaard (2001), however, note that transparent markets decrease the costs for consumers to search for the best deal. This may make consumers switch suppliers more easily, potentially increasing the incentives to cheat as well as the severity of punishment.

Market transparency can, inter alia, refer to the transparency of price, production, capacity, R&D and advertisement levels. Other factors in the market such as product homogeneity, demand stability, number and conduct of buyers, size and frequency of purchases and the nature of competition in general feed into these different forms of transparency to varying extents. Transparency can be increased exogenously through government action such as the introduction of the Euro or regulations about the publication of prices.[46] Furthermore, firms can take actions to increase transparency through a variety of pricing systems, standardisation, and the publication of price and production data.

The importance of transparency of prices, output or other relevant parameters for the feasibility of tacit collusion depends, in combination with the other market characteristics, on the form of collusion. Like the other factors, transparency can facilitate collusion by making it more likely that the necessary conditions, in particular the ability to coordinate and the ability to detect cheating, are met.

Market transparency can make it easier for firms to coordinate on a particular collusive equilibrium by making market parameters and firms actions more observable. Readily identifiable focal points are helpful for coordination but not necessary. Using a trial-and-error approach instead of obvious focal points to coordinate on an equilibrium is consistent with the concept of tacit collusion.

As pointed out before, in order to enforce compliance with any tacit understanding, firms have to be able to detect deviations. This does not require perfect information in the sense that all market parameters have to be perfectly observable. However, firms have to have some means of observing at least the relevant aggregate market variables, or preferably relevant firm level variables. Stigler (1964), Green and Porter (1984) and others explored this issue theoretically.

If firms aim to mainly coordinate on price, ideally they should be able to observe actual prices. Even though list prices may be observable, firms have the incentive to give secret price cuts to large customers to attract more business. Furthermore, firms could cheat on the tacit agreement by offering increased product quality or services, which would not be captured by perfectly observable prices.

As an alternative to monitoring prices, firms might be able to police a tacit understanding as long as they can observe the flow of customers between firms reasonably well. Stigler (1964) points out that the ability to track customers' purchases and monitor market shares could be a very good substitute for information on prices.

2.5.6 Demand stability

In Section 2.3.2 on imperfect information, the problems associated with demand volatility were emphasised. If firms cannot observe prices charged or quantities produced by their rivals in addition to changes in demand, they are likely to have difficulties inferring compliance or non-compliance from the available information.

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[46] See for example the case of the Danish cement industry studied in Albaek et al (1997).

In Green and Porter's (1984) model, a downturn in demand might be misinterpreted as the cheating of a member of the cooperating group, thus causing the initiation of a punishment phase. In this framework, price wars are more likely to occur during recessions. If demand movements are predictable and common knowledge, the negative effect on the stability of tacit collusion can be alleviated.

Rotemberg and Saloner (1986) develop an alternative model in which tacitly colluding oligopolists behave more competitively in periods of high demand. In their theoretical model they show that price wars are more likely in booms. This is due to an increased incentive to cheat when demand is strong combined with a less effective punishment in the future when demand has returned to a normal level. The authors also provide some empirical evidence in support of their argument.

Several other authors such as Haltiwanger and Harrington (1991) and Fershtman and Pakes (2000) have addressed the issue of business cycles and collusive behaviour. In a model allowing for firm heterogeneity, investment, entry and exit, Fershtman and Pakes find that only collusive industries generate price wars, which is in agreement with previous work on the topic.

In addition to demand volatility due to business cycles, rapid and unpredictable demand growth in newly developing markets also severely limits firms' ability to coordinate and restrict competition. With growing demand, the incentive to gain a large market share in the early phases of market development in order to secure potentially large profits in the future is likely to outweigh the incentives to collude. It may, however, be profitable for firms to cooperate and/or collude in R&D in an effort to control the race for future markets. This point will be elaborated further in a separate section on economic links.

2.5.7 Cost conditions and production capacity

The traditional view on the relationship between the shape of the marginal cost curve, capacity utilisation and the likelihood of collusion is that increasing marginal costs and capacity constraints facilitate collusion. The argument is that firms have a lower incentive and capability to cheat if they cannot easily expand their output. Consequently, an industry with excess capacity should find it hard to sustain tacit collusion because of a strong inventive to cheat.

Later work suggests some qualifications of this view. When looking at the enforcement potential, it can be claimed that excess capacity can facilitate collusion. Firms that can easily expand output are capable of swift and hard retaliation against any deviator. Shapiro (1989) goes so far as to argue that the more the possibility of competitive behaviour, the more likely is collusion to be sustainable.

In order to take a more systematic approach to the issue, Osborne and Pitchik (1987) develop a two-stage model in which firms first invest in capacity and then explicitly collude and bargain over quotas in the production stage. In the model of Davidson and Deneckere (1990), investment in capacity is followed by tacit collusion and an infinitely repeated pricing game. The authors' results

indicate a positive correlation between the effectiveness of collusion and the level of industry and excess capacity.[47]

2.5.8 Multi-market contact

Long before the dawn of game theory, Edwards (1955) conjectured that multiplicity of contact across products or space might also facilitate collusion. In this view, multi-market contact allows for mutual forbearance. The basis for this form of collusion and the firms' approach can be summarised as: "I will not compete hard in your market if you do not compete hard in my market."

Bernheim and Whinston (1990) apply game-theoretic methodology to show how multi-market contact can make collusion more stable. It appears that the incentive to cheat is larger with multiple markets, as more can be gained if cheating occurs simultaneously in all markets. However, punishment is also more severe. The gains from cheating in one market can more easily be wiped out by punishment in all markets. When contemplating a deviation, firms might fear the possibility of general warfare.

The basic idea illustrated in Bernheim and Whinston's work is that firms can in a sense pool the sustainability criteria over several markets. They can transfer slack in the sustainability condition from one market to another. Recalling the importance of the discount factor discussed in Section 2.3.1, one can imagine a market in which the discount factor is well above the minimum value required for stable collusion whereas in another market the discount factor is too low to sustain collusion. Then, if the firms operate in both markets, collusion can be extended to both markets. In general, multi-market contact has the potential to mitigate problems hindering collusive behaviour in just one market if firms also meet in another market that is more conducive to collusion.

2.5.9 Buyer power

Buyer power is generally recognised as a countervailing force to destabilise collusion among a small group of sellers. The possible negative effect of large buyers on the stability of collusion has already been touched on in previous sections. Stigler (1964) pointed out that the presence of large buyers could make secret price-cutting easier and more profitable. Thus, firms would tend to cheat, making the market more competitive.

Powerful and concentrated buyers might be able to induce competition among their suppliers by providing a sufficient incentive for a member of the oligopoly to deviate from coordinated behaviour. For example, if an order from a single buyer is important enough, each member of the oligopoly will be under strong pressure to make a competitive offer before any other oligopolist does.

However, buyers being large does not necessarily imply that they have buyer power. As Ross and Baziliauskas (2000) point out, large buyers can only have countervailing power in a market if they have alternatives not available to small buyers. For example, powerful buyers could be able

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[47] See Church and Ware (2000) pp345-6 for a more detailed review and the summary of some empirical evidence.

to induce entry into the market by sponsoring a new entrant or by committing to a certain volume of purchases from the new firm once entry has occurred. Large buyers may also use the threat of vertical integration upstream to counteract collusive behaviour of suppliers.

The strategic position of highly concentrated buyers that allows buyers to exercise competitive pressure on suppliers has been taken into account by the Commission in several cases.[48] In *Knorr-Bremse/Allied Signal*[49], buyers were truck manufacturers with the technical capability to design, develop and produce or subcontract production of the components supplied by the merging parties. Moreover, truck manufacturers were in the process of reducing the number of suppliers.

A situation where large buyers concentrate their orders on a low number of suppliers, giving the buyers strong leverage if confronted with at least three realistic alternative sources of supply was taken into account in *Pilkington/SIV*[50]. In this case, the tendency to single sourcing by car manufacturers for each piece of glass, the importance of each single order by a major car manufacturer and their technical capability to monitor their supplier's manufacturing costs was judged to confer a strong countervailing purchasing power to the demand side. In *SNECMA/TI*[51] buyer power was considered a leading factor excluding oligopolistic dominance by suppliers of landing gears for aircraft, since the three main constructors of aircraft accounted for over three quarters of the world market, had a non-transparent procurement policy and a preference for long term contracts, thus probably involving large quantities in each negotiation.

Table 2.3 summarises the factors that can facilitate collusion which were presented in this section. These factors are not necessary for their own sake, but they feed into one or several of the necessary criteria. This is not an exhaustive list — factors are substitutable and in a tight oligopoly may be replaced by other industry-specific mechanisms.

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[48] The following case examples are taken from Briones-Alonso (1995).
[49] *Allied Signal/Knorr Bremse* Case No IV/M 0337 15 October 1993.
[50] *Pilkington/SIV* Case No IV/M 0358 21 December 1993.
[51] *Snecma/TC* Case No 368 17 January 1994.

Table 2.3
Summary of Factors Tending to Give Rise to the Necessary Conditions for Tacit Collusion

Factor	Relation to Necessary Criteria
symmetric firms	4: easier to find focal point, symmetric equilibrium.
	5: similar cost structures make it easier for firms to distinguish cheating from other behaviour.
	6: similar retaliatory power.
homogeneous products	4: easier to find a focal point.
	5: makes market more transparent, easier to detect cheating.
	6: ambiguous effect because it increases the gain from cheating but also increases the effect of punishment.
market transparency	5: transparency makes it easier to detect cheating.
stable demand conditions • no growth/mature market • no demand shocks	2: makes it more likely that firms play the same game in every period. Changes in the nature of the game tend to destabilise tacit collusion.
	5: changes in a firm's profit/sales more likely to indicate cheating, firms cannot blame it on demand shifts.
excess capacity	6: ambiguous effect: if firms have excess capacity they can gain more from cheating but if their rivals have excess capacity they can easily punish the deviator.
multi-market contact	6: higher retaliatory potential, firms can transfer slack in the sustainability condition from one market to another.
low buyer power	4: if buyer power is substantial, buyers can play suppliers against each other if there are no good communication and enforcement mechanisms.
	5: many small buyers can help to detect price cuts, making policing the agreement easier.
no large and lumpy orders	5: very large and infrequent orders increase the incentive to cheat.
	6: reduces the incidence of detection and punishment lags.

2.6   Facilitating Practices and Structural Links

There are various practices and business strategies firms might adopt which are likely to contribute towards the six conditions discussed in Section 2.4 being met and which would therefore enhance the likelihood of tacit collusion. Joining a trade association that disseminates information, adopting a retail price maintenance policy or launching a joint-venture with a

competitor are three examples of such behaviour. For the purposes of this study it is useful to group these practices and strategies under two, rather loose, headings: facilitating practices and structural links.

Facilitating practices refer to schemes adopted by firms, either individually or industry-wide, that increase the likelihood of collusion by helping firms to come to an agreement, increasing the probability of detecting a deviator, increasing the severity of punishment or decreasing the time lag before a punishment is applied. In short, such practices increase the likelihood that firms will reach, monitor and maintain an implicit agreement. Whilst these practices bring the possibility of reaching and sustaining a coordinated equilibrium closer, the behaviour of the firms remains non-cooperative. Examples of these practices are the exchange of information through a trade association, the adoption of simplifying price formulae or the standardisation of products.

As with facilitating practices, the establishment of structural links between competitors tend to foster the ability of the partnering firms to collude. Contrary to facilitating practices, structural links tie two or more firms through formal agreements and they introduce an element of cooperative behaviour as the objective function of each partnering firm will partly reflect the welfare of its partners. By reducing the number of independent decision makers, structural links are likely to increase the ability of firms to come to an agreement, to monitor and to punish any deviations more quickly and more severely. Examples of structural links include cross-shareholding, third party interest in competing firms, cross-licensing agreements and strategic alliances.

Here we will briefly review some examples of both facilitating practices and of structural links, and highlight the route through which these influence the likelihood of collusion. We will then consider how the presence of such practices and links influences the approach we suggested in Section 2.5 should be followed by a competition authority when assessing the impact a merger might have on the likelihood of tacit collusion.

2.6.1 Facilitating practices[52]

Facilitating practices can make it easier for firms to reach a tacit understanding by stimulating the contact between them and/or by creating focal points. They can also aid the detection of cheating, increase the severity of punishment, or decrease the response time for punishment.

2.6.1.1 *Public speeches and other "cheap talk"*

Firms may make use of public speeches to let competition know what they see, for example, as reasonable future prices or what their plans for expansion are. These are, for the most part, costless, non-binding and non-verifiable messages but they are likely to affect the listener's beliefs. Such cheap talk allows each firm to gain a feeling of what its competitors perceive to be acceptable behaviour and can therefore make coordinated outcomes more focal (see for example Farrell and Rabin (1996)).

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[52] For a broader overview see Ross and Baziliauskas (2000) and Church and Ware (2000).

2.6.1.2   Geographic pricing formula

When buyers and sellers are dispersed geographically and transportation costs are a significant part of total costs, it might be particularly hard for sellers to reach a coordinated outcome. To match the delivered price paid by a buyer, a seller would have to be aware of both the mill price and the transportation costs of rivals. Furthermore, a rival's delivered price would be different to each geographically dispersed customer so that a firm would need to match its rival's prices across the board.

A pricing scheme where the announced price includes transportation cost can help circumvent this problem. The basing-point system is an example of this type of pricing scheme. Under such a scheme, suppliers identify basing points so that the price to a buyer is given by the mill price at the nearest basing point plus the relevant transportation costs. If all firms use the same basing points and share the same transportation cost schedule, the price faced by a buyer will be the same for all the sellers. This removes price rivalry amongst suppliers and reduces the complexity involved in determining what the delivered price to a customer should be.

Benson, Greenhut and Norman (1990) note that basing-point pricing also makes it easier for deviators to be punished. When all firms adopt such a pricing scheme, a deviation by a single player will affect the business of all the others. This contrasts with a scenario where firms collude over mill prices alone, so that only the neighbouring firms are affected by a deviator's decision to undercut.

2.6.1.3   Multi-product formula pricing

When firms produce identical product lines, firms may find it easier to collude by agreeing on the price of one product and on a formula that relates that price to the price of all other products. Church and Ware (2000) give the example of cardboard box manufacturers agreeing on a price per cubic foot and selling the array of boxes manufactured at this rate. By agreeing to follow such a formula, firms need only come to an understanding on a single price rather than on a menu of prices.

2.6.1.4   Standardisation

The ability to establish a focal point is likely to be greatly enhanced if firms speak a common language. A standardisation of accounting categories and/or products generally makes it easier for firms to reach an implicit agreement over a number of parameters, prices being the more clear candidate.

2.6.1.5   Exchange of information

The ability to reach and to sustain a collusive outcome is enhanced the better a firm's information on the actions of the remaining firms in the market. Exchange of information on costs or demand makes it easier for firms to define the set of agreements that would be acceptable to its rivals. In addition, information on the prices and output of competitors allows for an easier detection of deviating behaviour.

Firms can stimulate the exchange of information by, for example, adopting an open price policy whereby its list prices are published or by working through a trade association to collect and disseminate information. A trade association can further foster the stability of a collusive arrangement by threatening expulsion for any deviant.

2.6.1.6 Meeting competition clauses

In a contract between a buyer and seller, a "meeting competition clause" (MCC) ensures the buyer that he will not be paying a price above that asked by other competing sellers. Where such clauses are included, they will typically state that the seller is committed to meet the price of its competitors or, that in the absence of such commitment, the buyer is released from the obligation to purchase.

Salop (1986) notes that an MCC can facilitate collusion in two ways. First, it encourages customers to monitor and report the pricing behaviour of a firm's competitors. Buyers are converted into monitors of coordinated interaction (see OECD (1999) p28). Second, MCCs lower the incentive of firms to undercut their prices as they know that their rivals are contractually obliged to lower their own prices. In essence, MCCs appear as a means of formally laying out the punishment levelled against any deviant.

2.6.1.7 Most-favoured nation (or -customer) clauses

A most-favoured customer clause (MFC) in a contract obliges the seller to set the buyer a price that is no higher than that charged to any other customer. When this clause is applied retroactively, so that present customers are assured that they will also benefit from future price reductions, then the conditions for a collusive agreement to be sustained are reinforced due to two effects. First, such a clause lowers the incentive for firms to lower prices in the future as they would have to face the cost of reimbursing prior customers. This provides a signal to competition that it is unlikely to price aggressively. Second, as with the MCC, it gives the incentive to customers to monitor a firm's competitors for secret price cuts.

If enough firms adopt MFC clauses then there will be sufficient confidence in the stability of high prices and the competitiveness in the market as a whole will be reduced. However, adoption of such a clause unilaterally is risky as the adopting firm would be unable to match selective price cuts by a rival unencumbered by a MFC clause and would have to adopt a general price cut.

2.6.1.8 Resale price maintenance

In general, resale price maintenance (RPM) refers to the ability of the seller to control the price charged downstream. Failure by the downstream firm to abide by this RPM, results in the risk of terminating the supply relationship. RPM can stimulate collusion either upstream or downstream. Under RPM secret wholesale price cuts do not benefit the manufacturer as they do not affect retail price or quantity sold. Therefore, manufacturers need only monitor the more readily observable retail prices to determine whether a member has cheated. In addition, collusion is facilitated downstream as any retailer that undercuts can be punished by the supplier withdrawing its business.

Although facilitating practices will generally contribute to more than one of the six necessary conditions, it is helpful to group them according to the main route through which they facilitate collusion as shown in the table below.

Table 2.4
Influence of Facilitating Practices on Likelihood of Collusion

Facilitating Practice	Main Route to Facilitate Collusion
Cheap talk Geographic Pricing Formula Multi-product pricing formula Standardisation	Helping to reach an understanding
Exchange of Information Meeting competition clauses	Helping to detect deviations
Most-favoured nation clauses Resale price maintenance	Helping to punish deviations

2.6.2 Structural links

Structural links were defined earlier as those formal agreements leading firms to cooperate in some field of their activity, which fall short of an actual merger. These links lead firms to cooperate to the extent that they introduce some overlap in the objective functions of the firms concerned. Examples of structural links include: partial cross shareholding, inter-locking directorships, partial ownership by a third party, cross-licensing, cooperative R&D agreements, joint ventures, shared ownership of suppliers or distribution channels and strategic alliances.

Partial ownership arrangements and inter-locking directorships shift the decision-making process of firms to somewhere between fully independent entities and a single merged firm. If Firm A has partial ownership of Firm B, Firm A will internalise to some degree the effects that its own actions will have on the welfare of its rival. On the other hand, Firm A may exercise its voting power within Firm B to ensure that it does not compete aggressively with it. Either way, just cross-ownership reduces the incentives of firms to compete aggressively and shifts their behaviour closer to that of joint-profit maximisation. Reynolds and Snapp (1986) formalise this intuition and show that in the case of quantity competition, cross-ownership will lead the firms towards the joint-profit maximisation outcome.

There has been considerable interest in the interaction between R&D cooperation and the degree of competition at the market level. Martin (1993) shows that the scope for collusion is increased when firms cooperate in R&D, as the breakdown of the R&D agreement is taken into account as a possible punishment for any deviant behaviour in the product market. Cabral (2000a) revisits the interaction between cooperation in the R&D stage with competition in the product market, but sets off from different assumptions. In particular, contrary to Martin (1995), Cabral assumes that the effort put into the R&D programme cannot be contracted upon. Not surprisingly, the results derived by Cabral contrast with those of Martin (1995). First, R&D cooperation may actually lead

to lower prices, as at higher prices there might be an incentive to deviate and consequently end the joint R&D effort. Second, prices may increase if the firms agree to slow down their pace of R&D expenditure delay thereby maintaining the breakdown of their joint venture as a sufficiently credible punishment for cheating.

Besides the changes in the strategic behaviour of firms brought about by the creation of structural links, such agreements also make firms "more similar and transparent to rivals" (OECD (1999) p29) and allow them to come into closer contact with each other. This adds to the level of transparency in the market and is likely to stimulate the ability of firms to come to an understanding of what an acceptable collusive outcome might be.

2.6.3 The effect of explicit forms of coordinated behaviour on the importance of the necessary criteria

The adoption of facilitating practices or the existence of structural links between competing firms does not do away with the need for the six necessary conditions to be met in order for tacit collusion to take place. Instead, such forms of explicit coordination should be interpreted as a vehicle through which these conditions are more likely to be met. In particular, the ability to reach, monitor and enforce an agreement will be greater when firms across the market adopt any one of the facilitating practices or when structural links exist between them.

2.7 Interaction and Relative Importance of the Market Characteristics for Tacit Collusion

In the previous sections, several market characteristics have been discussed with an emphasis on their relationship to the necessary criteria for tacit collusion. It has been pointed out that in addition to the relationship between facilitating factors and any one of the necessary criteria, there are interactions between the factors. In order to assess the probability of coordinated behaviour after a merger, it is necessary to take into account these relationships in their entirety instead of looking at each factor independently. The following section summarises the interactions of factors as they were laid out in previous sections. Section 2.7.2 discusses whether or not it is possible to rank the factors according to their importance and offers a simple step-wise model as a guide to assessing the likelihood of collusion.

2.7.1 Interaction of criteria and their effect on the likelihood of tacit collusion

The possibility of raising industry profit above the competitive level gives firms the incentive to coordinate on a collusive outcome. Each individual firm has an incentive to deviate from this collusive outcome because the firm can increase its immediate profit above the collusive level by cheating, given that the other firms adhere to the collusive strategies. If deviations could not be detected and punished, all firms would cheat and collusion would not be possible. Therefore, to reach a stable, ie self-enforcing collusive equilibrium, firms need to be able to coordinate on a mutually acceptable equilibrium and be able to detect and punish cheating. In such an equilibrium, the expected gains from cheating are lower than the expected losses from cheating (the probability of detection times the expected loss from punishment).

For such a tacit collusion mechanism to be feasible, a few firms have to operate in a highly concentrated market that is protected by barriers to entry. The firms need to be patient players in the sense that they place sufficient value on future profits. They need to interact frequently and repeatedly to ensure that tacit collusion is sustainable.

Figure 2.1 provides a simplified representation of the interaction of factors and necessary criteria. The six necessary criteria are shown in the centre of the diagram. The iterative process through which a self-enforcing equilibrium can be found — relating the incentives to collude to the incentives to cheat at various possible collusive outcomes — is illustrated on the left.

The figure also contains a summary of the market characteristics that feed into the necessary criteria. Red arrows represent facilitating and green arrows countervailing effects. Stability of demand conditions and low uncertainty as well as symmetry of firms have unambiguously positive effects on the sustainability of tacit collusion. Both factors feed into all three necessary criteria. Stability and symmetry contribute to market transparency, which is also positively affected by product homogeneity. A high market transparency makes it more likely that all three necessary conditions are met. Facilitating practices such as information exchanges contribute to the transparency of the market. In addition, the presence of many small buyers in combination with frequent and small transactions adds to the degree of price transparency. Standardisation can make the product market more transparent, either directly through available information about standards used and/or indirectly through the increase of product homogeneity. Homogeneity of products, multi-market contact and excess capacity all contribute positively to the enforceability of compliance by increasing the retaliatory power of firms.

Product homogeneity and excess capacity do not unambiguously increase the potential for tacit collusion. Both factors also increase the gains from cheating, thus making it harder to reach an equilibrium and decreasing the highest attainable collusive price. Buyer power and maverick firms may destabilise a collusive equilibrium. Maverick firms can be seen as an extreme case of dissimilarity of firms in which one firm is so different from the other firms that it is unwilling to accept the terms of coordination, disrupting the firms' ability to coordinate on an equilibrium.

High concentration / few firms
Barriers to entry
Repeated interaction of patient players

lar equilibrium

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Capacity to reach a mutually acceptable equilibrium

Stability of demand conditions / low uncertainty

Symmetry of firms

Facilitating practices

+

Profit from compliance

Market transparency

Many small buyers, frequ small transactions

ains
ting

Possibility / ease of detection of cheating

Homogeneity of products

Standardisat

> <

+

ss from
g

Probability of detection x loss from punishment

Multi-market contact

Enforceability of compliance

Excess capacity

m

Buyer power

Maverick firms

Facilitating effect
Countervailing effect

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2.7.2 Ranking of criteria - Is it possible and reasonable to attach a relative importance to the criteria?

Given the multitude of factors influencing the likelihood of tacit collusion, it would be very useful for merger control to assign a relative importance to these factors. Such a ranking would make the process of assessing a merger more transparent. It would also potentially reduce the length of the investigation by the anti-trust authority — where the most relevant factors are not present, the authority would be able to conclude that the merger would be very unlikely to lead to collusive behaviour.

However, it seems to be generally agreed that it is very difficult if not impossible to rank the factors. For example, reviewing the Commission's decisions under the Merger Regulation, Briones-Alonso (1995) notes, "I do not think it is possible to judge in abstract which factors have a definitive importance and which factors are just complementary to the analysis of a market. Much will depend on the key competitive forces at play in the relevant market."[53] The Organisation for Economic Cooperation and Development (OECD) (1999) round-table report on oligopoly states that "none of the factors considered individually can conclusively establish a high probability of coordinated interaction".[54] Similarly, in the US Merger Guidelines it is laid out that "[w]hether a merger is likely to diminish competition by enabling firms more likely, more successfully or more completely to engage in coordinated interaction depends on whether market conditions, *on the whole*, are conducive to reaching terms of coordination and detecting and punishing deviations from those terms".[55]

Likewise, economic literature does not provide a clear ranking of the factors. Theoretical models draw conclusions about a subset of factors by holding all others constant. Therefore no conclusion about the relative importance of several factors can be drawn from one model. Nevertheless, economic theory can offer some guidance on which factors are essential and which play a secondary role. As illustrated in the previous sections, a high market concentration and barriers to entry are pre-requisites for a tacit collusion mechanism to be feasible, thus giving these factors a key role.

This is consistent with the view expressed in the OECD (1999) oligopoly roundtable paper, which states that "two factors probably could be used to construct safe-harbours. In specific, where either the leading firms' market shares or barriers to entry/expansion in the market are sufficiently low, co-ordinated interaction is highly unlikely to exist or at least to last".[56]

Although the German Merger Guidelines stress that all relevant factors and their interactions in the market have to be analysed, they also attribute a central role to concentration and entry barriers. Given the presence of these factors, it is suggested that the combination of certain other factors such as product homogeneity, market transparency and a mature market results in a high

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[53] Briones-Alonso (1995) para 62.
[54] OECD (1999) Section 3.
[55] US Merger Guidelines 1997 Section 2.1 emphasis added.
[56] OECD (1999) Section 3.

probability of collusive behaviour. Other factors should then only be checked if they have a countervailing effect.[57]

Based on the economic literature, market stability and a low degree of uncertainty could be singled out as very important factors next to the necessary criteria of concentration and entry barriers. In the presence of high growth markets with high volatility and uncertainty, firms' ability to coordinate on, monitor and enforce a collusive outcome are severely impeded. There are no readily available means for firms to overcome this difficulty, making collusion unlikely or not likely to last.

On the other hand, consider a market where concentration is high, entry barriers are significant and demand is stable. The competition authority should proceed to assess the degree of transparency in the market and the similarity of firms following the merger. If the market is found to be highly transparent and the firms have similar incentives, then the authority would be correct to conclude that all necessary criteria are most probably met and collusive behaviour is feasible and likely. In such a situation it seems reasonable to only check for factors that might suggest that, despite the favourable conditions, tacit collusion may not arise. Those factors could be strong buyer power or the presence of maverick firms.

If, however, firms are very dissimilar and the market is not transparent, tacit collusion is quite unlikely but might still be possible in particular forms of collusion that do not depend on collusive pricing, such as a division of markets or customers in differentiated product markets. Even though collusion appears unlikely, further analysis should rule out any other factors or circumstances in the market that could suggest collusion after the merger.
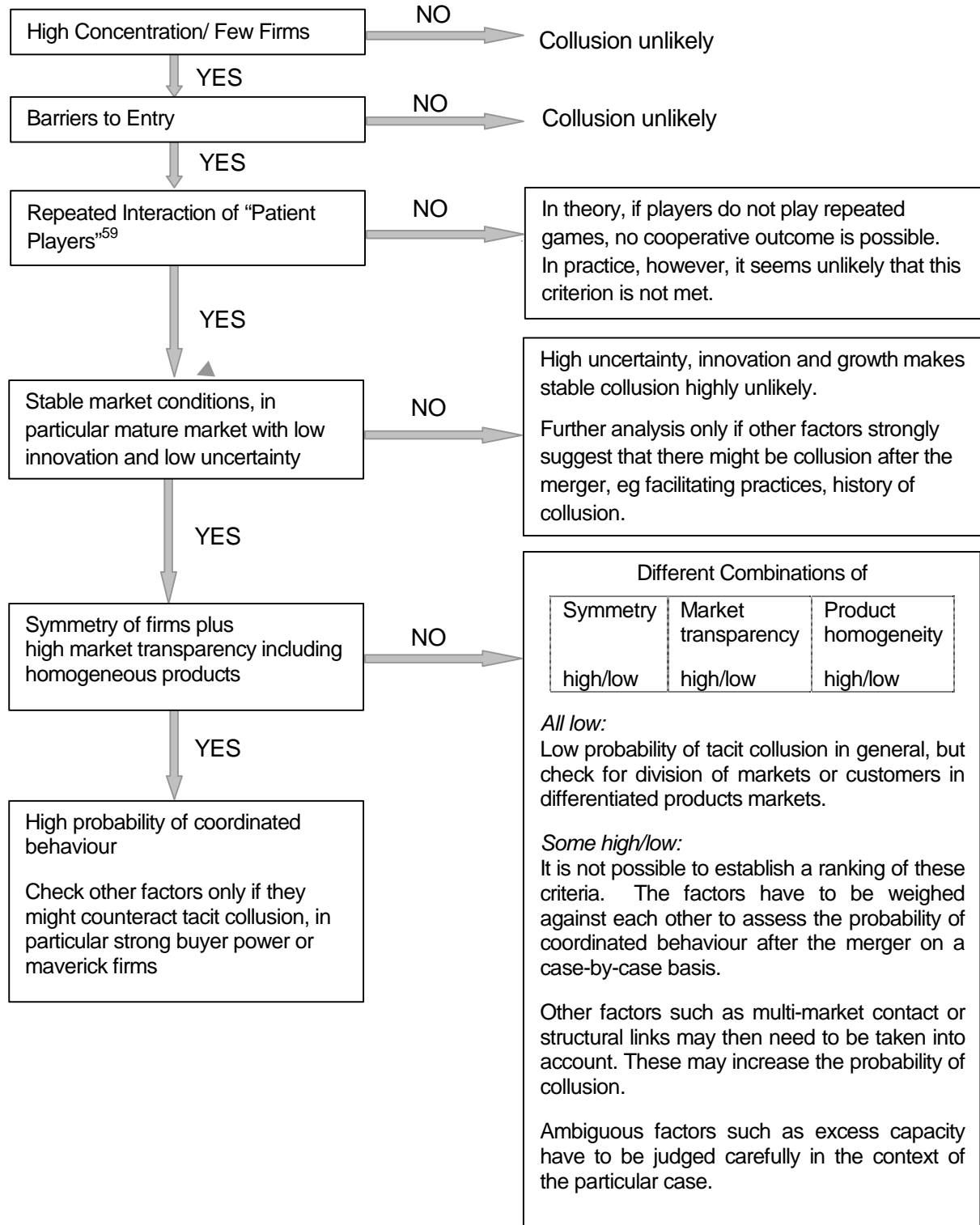
In a situation where some of the additional factors are present but others are not, no further ranking can be offered. A careful analysis has to weigh the factors against each other on a case-by-case basis. Under these circumstances, factors that are not of immediate importance such as multi-market contact might then be taken into account. Ambiguous factors such as excess capacity also have to be considered cautiously in the specific context of the merger.

Based on the findings of the previous sections, in particular the relationship between necessary criteria and market characteristics, Figure 2.2 summarises these thoughts in the form of a step-wise approach to analysis of the likelihood of collusion after a horizontal merger.[58] The diagram should not be understood as a flowchart that should be followed strictly but rather as a guide to a highly complex issue.

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[57] Bundeskartellamt (2000) Section II.3.
[58] This step-wise approach is only geared to analyse the likelihood of collusion and it does not include any other potential effects of a merger such as foreclosure or efficiency gains.

**Figure 2.2
A Step-Wise Approach**

High Concentration/ Few Firms	NO →	Collusion unlikely

YES ↓

Barriers to Entry	NO →	Collusion unlikely

YES ↓

Repeated Interaction of "Patient Players"[59]	NO →	In theory, if players do not play repeated games, no cooperative outcome is possible. In practice, however, it seems unlikely that this criterion is not met.

YES ↓

Stable market conditions, in particular mature market with low innovation and low uncertainty	NO →	High uncertainty, innovation and growth makes stable collusion highly unlikely. Further analysis only if other factors strongly suggest that there might be collusion after the merger, eg facilitating practices, history of collusion.

YES ↓

Symmetry of firms plus high market transparency including homogeneous products	NO →	Different Combinations of

Different Combinations of

Symmetry	Market transparency	Product homogeneity
high/low	high/low	high/low

All low:
Low probability of tacit collusion in general, but check for division of markets or customers in differentiated products markets.

Some high/low:
It is not possible to establish a ranking of these criteria. The factors have to be weighed against each other to assess the probability of coordinated behaviour after the merger on a case-by-case basis.

Other factors such as multi-market contact or structural links may then need to be taken into account. These may increase the probability of collusion.

Ambiguous factors such as excess capacity have to be judged carefully in the context of the particular case.

YES ↓

High probability of coordinated behaviour **Check other factors only if they might counteract tacit collusion, in particular strong buyer power or maverick firms**

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[59] The term "patient players" refers to market participants who value profits in future periods enough such that the loss of these profits could serve as a punishment for deviating from the collusive equilibrium. See Section 2.3.1 for details.

2.8   Summary

Economic theory shows that in oligopoly many outcomes are possible, ranging from non-collusive one-shot game equilibria to collusion in which oligopolists jointly act as a monopolist. From the review of the literature, in particular the contributions of game theory, we identified necessary criteria for tacit collusion. The most basic requirements on which all other criteria rely are the presence of only very few firms in the market, repeated interaction between the firms and entry barriers. Without these, we can be confident that an oligopolistic market will perform non-collusively. Even with these requirements, in order to collude tacitly, firms have to be able to coordinate on a collusive equilibrium, detect deviations and enforce compliance by punishing deviators.

It was found that economic theory cannot identify sufficient conditions for tacit collusion. It cannot be ruled out that even in circumstances that are highly favourable to collusion in many respects, firms may choose not to coordinate on a cooperative outcome.

The necessary criteria were established on the basis of theoretical concepts and considerations. In order for these criteria to be satisfied, certain market characteristics have to be present. A number of such market characteristics that might facilitate collusion were discussed in Section 2.5 and summarised in Table 2.3. These factors do not represent an exhaustive list that needs to be complete for tacit collusion to be possible and/or likely. Instead, the presence of these factors facilitates collusion, which becomes easier to sustain the more factors are present.

However, firms might find alternative ways to satisfy the necessary criteria and coordinate their behaviour even if some of the factors mentioned are not present. To sustain a tacitly collusive outcome, it is crucial that the necessary criteria can be satisfied in some way. The described market characteristics are the most common form of doing so but that does not exclude alternative methods. Nevertheless, theory suggests that in the absence of all or most of the favourable factors, that is, in a market with asymmetric firms, differentiated products, demand instability and buyer power or any combination of these, collusion is highly unlikely.

We have endeavoured to relate the various factors to the conditions we regard as necessary for collusion in a systematic way. This should help to provide a coherent framework for assessing any merger in an oligopolistic market.

This assessment has to take place, in a real-world situation, under pressure of time and often with inadequate information. While recognising this, a later section of the report examines some of the many EU cases where collective dominance has been an issue against the criteria that our review has shown to be conducive to a (tacitly) collusive outcome.

3   UNILATERAL AND COORDINATED EFFECTS

3.1   Introduction

Mergers may considerably change the structure of markets, particularly in oligopolistic markets, such that following a merger a new market equilibrium, in terms of, say, prices and level of output produced, emerges, with a possible reduction in competition and/or detrimental welfare effects. Merger control thus should aim to prevent the creation or strengthening of market power following a merger, given the difficulty in preventing and/or identifying anti-competitive behaviour, or the exercise of market power, once it has been created.

In order to identify the likely anti-competitive effects made possible by a merger it would be desirable to be able to compare the market equilibrium before the merger with the one that is expected to emerge following it. However, this is not always possible. Many economic models attempt to predict how the market equilibrium will shift following a merger, but different models will be appropriate in different circumstances. Nevertheless, anti-competitive effects of horizontal mergers may be classed as unilateral effects or coordinated effects, depending on the nature of the new equilibrium.

This section reviews the notion of unilateral effects with a view to understanding their role, if any, in an assessment of collective dominance. We define what is meant by unilateral effects and, importantly, mark their distinction from coordinated effects. We also briefly review some of the economic literature concerning the existence of such effects and the role of market characteristics on their magnitude. It will be noted that some of the market characteristics that contribute to the likelihood of coordinated behaviour also have an impact on the unilateral effects of mergers. Despite this overlap, we argue in this section that the notions of unilateral and coordinated effects are conceptually different and that it would not be desirable to mix the two.

3.2   Overview of Coordinated and Unilateral Effects

Coordinated effects refer to the reduction in welfare caused when the merger enables a collusive equilibrium to emerge in the market. In turn, collusion, tacit or otherwise, refers to the firms' attempt to reach, together, the joint profit maximising outcome, resulting in higher prices and lower output than the competitive levels. In effect, it represents a reduction in competition in the market with other possible consequences on top, such as a reduction in the rate of innovation or level of quality.

Coordinated effects are so called because even though firms may be acting independently from each other, as in the case of tacit collusion, they reach a 'coordinated' outcome. The merged firm is only able to raise its prices if its rivals match this increase and if every firm in the oligopoly fears a return to competitive prices and profits if it undercuts its rivals. Market conditions must be such that firms are able to reach terms of coordination, to detect and to punish deviations from these terms. Thus, coordinated effects result from an anticipation of coordinated actions and re-actions, such that, market power is exercised by collective action.

These effects were described in detail in Section 2 of this report and will not be discussed further here, except in contrast to unilateral effects.

Traditionally, the term unilateral effects has been used in EU merger control to refer to the reduction in welfare due to the increase in prices and reduction in output by the merged firm when the merger creates a single dominant firm in the market. In this case, the merger eliminates the competitive constraint that the merging parties placed on each other, creating a single firm which can behave independently from the rest of the market. However, as will be shown in this section, unilateral effects can refer to the consequences of mergers in oligopolistic markets which do not lead to single dominant firms, but create, instead, more tightly knit oligopolies.

Unilateral effects, in the more general sense, refer to the overall detrimental welfare effects resulting from the individual changes or adjustments in prices and output that occur in the market following a merger in an oligopolistic market or, arguably, in any market. These adjustments are profitable to the firms in the oligopoly and may lead to higher prices but are not a result of firms trying to co-ordinate their actions. In other words, any increase in price or reduction in output that occurs is merely due to firms (merging and non-merging firms) adjusting their actions to the new market structure regardless of what their competitors do, as long as it is profitable for them to do so – the key point is that firms act alone to maximise their individual profits. A merger between two competing firms, for instance, eliminates some competition in the market, increasing the market power of the merging firms, and perhaps also that of the non-merging firms to some extent, allowing them to raise prices.[60] There is also no need for a retaliation mechanism to sustain the new equilibrium outcome, as in the case of collusion or coordinated effects, since there is no incentive to deviate from the new equilibrium in the first place as no firm could increase its profits by doing so.

Two types of economic models can best illustrate unilateral effects in oligopolistic markets: Cournot models with homogeneous goods, where firms may have different capacities and costs, and Bertrand models where firms produce products which are differentiated both in terms of costs and appeal. Both types of model predict a reduction in consumer surplus and an increase in producer surplus when the mergers do not generate cost synergies. These models are discussed below.

3.3   Cournot Oligopoly Model – Homogeneous Products

The Cournot model with homogeneous goods was briefly introduced in Section 2. In this setting, firms decide on the level of output to produce which will maximise their individual profits, taking into account the level of output they expect their rivals to produce, that is, they compete in quantities. Oligopolists, when behaving in a Cournot fashion, are able to reach a price above the perfectly competitive price.

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[60]   The merged firm, by increasing prices and/or reducing output, pushes the overall prices in the market up to the benefit of the non-merging firms as well. "A merger can therefore be seen as a sort of "public good" (the public good being high prices) provided by the insiders, while the outsiders might "free ride" on the provision of the public good." Motta (1999) p4.

To see the effects of a merger when firms behave as predicted by Cournot, it is helpful to understand how firms are believed to behave according to this model. The market price will depend on the total output produced in the market so that a firm's profitability depends on its level of output as well as on that produced by its rivals and on its marginal cost. Firms in this model are not price takers, and it follows that the equilibrium is a set of outputs in which each firm chooses its profit-maximising output level given its beliefs about the other firms' choice, that is, a firm maximises its profits with respect to its own output level, holding rivals' output levels constant.[61]

Furthermore, in reaching its decision on how much to produce, a firm is assumed to consider only the effect of the change in the market price caused by its output choice on its own profits and not the effect on total industry profits, which is the case when firms collude. Hence, each firm actually produces a level of output that exceeds the 'optimal' level in the industry's point of view, that is, the joint profit maximisation level or any level approaching this on which firms could agree to collude.

As a result, the equilibrium market price in the Cournot models is lower than any collusive price and/or the monopoly/perfect cartel price, but it is still higher than the perfectly competitive price or marginal cost, such that it is not a socially efficient equilibrium.

The equilibrium prices can be written to show the relationship between the relative mark-up (ie. the ratio between the profit margin and the price) or Lerner index, the firm's market share and the elasticity of demand at equilibrium:

$$\frac{p - c_i}{p} = \frac{s_i}{|e|} \qquad (1)$$

Where p is the equilibrium market price, c_i is firm i's marginal cost, s_i is its market share and e is market price elasticity of demand. This relationship shows that the relative mark-up is proportional to a firm's market share and inversely proportional to the elasticity of demand. [62]

We can see from equation (1) that the Cournot mark-up is the same as a monopoly's or perfect cartel's mark-up only when there is just one firm in the market ($s_i = 1$).[63] However, if there is more than one firm in the market, such that each will have market share, s_i, less than 1, each firm's mark-up will be lower than the monopoly or cartel equivalent, other things equal, but still higher than the competitive level.

This illustrates the point made earlier that the Cournot equilibrium is not a social optimum, since the relative mark-up is always positive, but also that prices are lower than when firms maximise joint profit. Nonetheless, as firms' market shares approach zero, possibly as the number of firms

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[61] It is assumed, also, that each firm's beliefs about the other firms' choice are actually correct. See Varian (1992) p286.
[62] It also follows that firms with the lowest marginal cost, according to this model, have the largest market shares and are the most profitable.

[63] The monopoly relative mark-up is given by $\dfrac{p - c_i}{p} = \dfrac{1}{|e|}$

in the market becomes so large that each firm has an infinitesimal share of the market, the relative mark-up also approaches zero, or the perfectly competitive level.

Moreover, since prices and profitability fall as total market output rises, a firm's best response to an increase in output by a rival, which is likely to lower the market clearing price, is to reduce its own output. Hence, the choice variables in this case, which are quantities, are referred to as *strategic substitutes*: The 'reaction curves' showing how a firm, say firm A, reacts to firm's B choice of output are downward sloping:
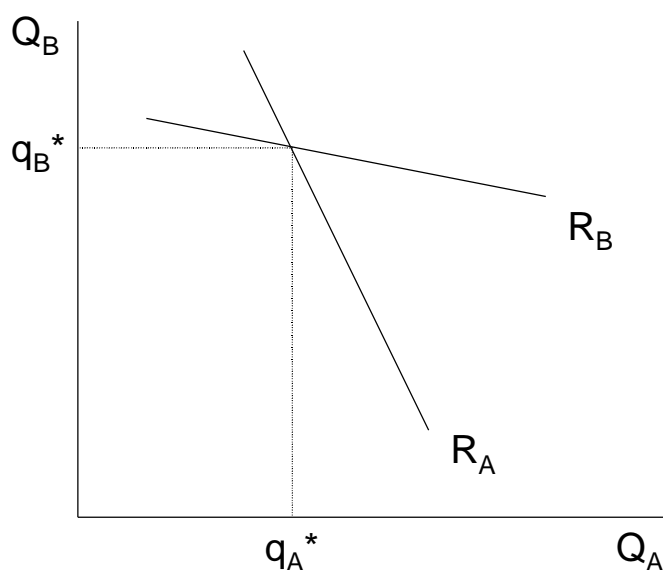
Where R_A and R_B are firm A's and firm B's reaction curves, respectively, and q*q* is the equilibrium set of outputs.

3.3.1 Merger Implications

It can be inferred from the relationship depicted in equation (1), that if all firms have the same constant marginal cost, c_i, and hence the same market share ($s_i = 1/n$), the market price falls as the number of firms, n, in the market rises. More generally, however, it can be shown that the equilibrium market price is positively related to the level of concentration (measured by the Herfindahl index) in the market for given levels of costs, in other words, negatively related to the number of firms in the market. This is done by incorporating the Herfindahl index (H), ie the sum of the squared market shares of all firms in the market, into the formula above, which gives the following relationship:[64]

$$\frac{\left(p - \sum c_i s_i\right)}{p} = \frac{H}{|e|} \qquad (2)$$

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[64] By multiplying both sides of (1) by s_i and summing over all i.

This relationship has an important implication for merger control in that a merger which increases concentration leads to a higher equilibrium market price and lower total output, other things equal, if the firms in the oligopoly behave in the way predicted by Cournot. This shift from one market equilibrium to another following a merger which does not lead to collusion in the market but which nevertheless results in higher prices, a reduction in consumer welfare and possibly also in total welfare, is what is referred to as unilateral effects.

According to the Cournot model, the quantity produced by the merged firm following the merger will be lower than the sum of the quantities produced by its parts pre-merger, whereas the quantities produced by the non-merging firms are likely to increase.   This response by the non-merging firms, however, will always only partly offset the reduction in output by the merged entity, with the implication that all mergers in homogeneous goods markets that do not generate efficiency gains result in lower total output and higher prices overall, even without collusion or coordinated effects.   Thus, all such mergers reduce consumer welfare to a certain extent.

Furthermore, according to equation (2), mergers in already highly concentrated markets and/or which substantially increase concentration should cause more concern with respect to a reduction in consumer surplus than when the market is fragmented and/or when the change in concentration is negligible.

Care must be taken, however, in assuming that an increase in concentration will always lead to lower overall welfare (ie consumer surplus plus producer surplus). Farrell and Shapiro (1990), for instance, show that the overall welfare effect depends on the relative cost structures of the merging and non-merging parts, and hence on the reallocation of output between these firms:

> *"In Cournot equilibrium, larger firms have lower marginal costs, so welfare is enhanced if a fixed total output X is shifted towards them and away from smaller, less-efficient firms. But such shifts will increase concentration."[65]*

Thus, although Cournot mergers, absent cost synergies, necessarily raise prices, that is, reduce consumer surplus, they may enhance total welfare nonetheless.[66]

The implication for merger control depends on whether antitrust authorities place more weight on consumer surplus or on total welfare (ie the sum of consumer surplus and producer surplus). If the concern is mainly for consumer welfare, then all horizontal mergers in homogeneous product markets that do not generate efficiency gains may be undesirable depending on the magnitude of the unilateral effects, that is, even if they do not lead to collusion or coordinated effects.

3.3.1.1   Unilateral vs. Coordinated effects

It is possible, and useful at this point to contrast the welfare effects associated with unilateral effects with that of coordinated effects.

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[65] Farrell and Shapiro (1990) p342.
[66] For a merger to lower prices it must generate considerable economies of scale or learning. These requirements are what Farrell and Shapiro consider cost synergies and not the reallocation of production from a high cost firm to a low cost firm.   See Farrell and Shapiro (1990) pp347 and 360.

Willig (1991) develops what he calls a heuristic theoretical representation of the relationship between the welfare impact of a merger and concentration.[67] He finds that the welfare impact of a price rise resulting from a merger depends on the elasticity of market demand and on the Lerner index, $\dfrac{(p-c)}{p}$, associated with the market in question. The Lerner index, in turn, is determined by the mode of behaviour in the market and on the concentration level.

The following relationship is assumed between the Lerner index and the mode of behaviour among firms in the market, which, according to Willig, characterises the equilibria of many other simple oligopoly theories:

$$\frac{p-c}{p} = \frac{H\beta}{e}$$

(3)

Where ß is the parameter representing the mode of behaviour among firms in the market. ß may take a range of values, with for example, ß=0 representing price taking behaviour, ß=1 representing Cournot behaviour and ß=1/H pure cartel behaviour. It follows as suggested earlier, that the relative mark-up will be larger when firms behave as if in a 'perfect cartel' than when they compete à la Cournot.

Also, collusion falling short of a perfect cartel may be represented by values of the mode of conduct parameter lying between 1 and 1/H, with the degree of competition falling as ß rises from 1 to 1/H. These values of ß generate mark-ups which are also higher than the Cournot value, but below the perfect cartel margin.

Thus, although the mode of conduct is determined exogenously, and not much can be said about the actual effects of mergers, it is clear in this model that coordinated and unilateral effects are conceptually different. That is, assuming that pre-merger firms are not colluding, the post-merger equilibrium is either another Cournot equilibrium, where the mode of conduct parameter, ß=1, does not change, or a collusive equilibrium, characterised by ß>1. It is also possible to infer that coordinated effects lead to larger price rises than unilateral effects and to a larger reduction in consumer surplus. In fact, Willig shows that the welfare impact of a merger is greater, other things the same, if the merger leads to a greater value of ß, and hence to a less competitive mode of conduct.[68]

We have shown how unilateral effects may emerge following a merger in a market where firms have a choice over their output level and produce homogeneous products. Moreover, all such mergers produce unilateral effects. The extent of these effects, however, according to the Cournot model, depends on several parameters, such as the level of concentration and the change brought about by the merger, as described above.

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[67] This model assumes products are homogeneous and that all firms have the same level of constant marginal costs, also, there are no efficiencies created by the merger and no dynamic effects or possibilities of entry into the market. Willig (1991) p289.
[68] Willig also shows that for constant ß, the greater its value, signifying a less competitive mode of conduct, the greater the welfare impact of a given merger. Willig (1991) p289.

Other factors that may affect the extent of the unilateral effects in this model, and which may be looked at in order to give the practitioner an insight into the magnitude of the unilateral effects, include the ability of firms to raise price, differences between firms' marginal costs and efficiency gains that may occur due to the merger.

3.3.2   Ability of firms to raise prices

3.3.2.1   Elasticity of demand

The ability of merging firms to raise prices evidently depends on the price elasticity of demand. If consumers can easily switch between producers, for instance, because the industry is characterised by low switching costs, the merging firms will not have much market power and will not be able to raise prices substantially. Thus, the lower the price elasticity of demand the higher the scope for raising prices.

3.3.2.2   Likelihood of entry

If the increase in prices following a merger induces entry into the industry the market power of the merging firms will also be constrained. The likelihood of entry depends on the sunk costs associated with entry. The larger (and more sunk, ie committed to the industry and not recoverable) the costs that an entrant has to incur, the higher the scope for price increase.

3.3.2.3   Buyer power

The presence of buyer power, which refers to the concentration of buyers in the market and their ability to switch between alternative suppliers, can also undermine the ability of firms to raise prices. Powerful buyers may, for instance, threaten to switch to a different supplier if their current supplier increases its price, or they may decide to produce the product themselves. This stimulates competition between suppliers and limits the ability of firms to raise prices.

3.3.2.4   Increasing marginal costs

According to the Cournot model, the resulting market output and price level depend on the ability of the non-merging firms to increase output, thus offsetting the reduction in output by the merged firm and reducing its ability to raise prices.

If the non-merging firms behave as predicted by Cournot but have increasing marginal costs, it will be relatively difficult and costly for them to increase output following the merger. This makes the merger more profitable to the merging firms as their rivals are not able to absorb all the sales that are diverted to them. Also, the unilateral effects will be larger, as the lower output response by the non-merging firms results in higher prices overall and lower consumer surplus.[69]

An extreme case occurs when non-merging firms are already operating at maximum capacity. In this case the merged entity will have more market power and be able to profitably raise prices, as its rivals will not be able to absorb any of the demand which is diverted to them**.**

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[69]   Perry and Porter (1985) p36.

3.3.3   Different cost functions

Farrell and Shapiro (1990) analyse the welfare effects of horizontal mergers in a model where firms are not symmetric (ie equally efficient) and marginal costs are not constant. In models where these restrictive assumptions apply (ie firms have symmetric and constant marginal cost) it is true that mergers which increase concentration and prices also reduce total welfare. However, Farrell and Shapiro show that when these assumptions are relaxed, even though all mergers lead to higher prices and lower total output absent cost synergies, overall welfare may not be reduced.

In Cournot models, as mentioned previously, firms with the largest market shares have the lowest marginal cost. If follows that, according to Farrell and Shapiro, if a merger shifts production from high cost firms (small firms) to low cost firms (large firms) it may be beneficial, in the sense that the increase in overall producer surplus offsets the reduction in consumer surplus. That is, even though, absent cost synergies, all mergers raise prices, the shift in production from a high cost firm to a low cost firm increases total welfare. However, if the merger authorities' main concern is consumer surplus it suffices to say that mergers in Cournot markets are likely to reduce consumer surplus.

3.3.4   Efficiency gains

Farrell and Shapiro (1990) also show that horizontal mergers which generate efficiency gains may reduce prices. In their model efficiency gains refer to economies of scale and learning, not to the reallocation of production from high cost to low cost firms (see footnote 66). It follows also from Farrell and Shapiro's analysis that 'economies of scale and learning effects necessary for a merger to lower prices are greater the larger are the merging firms' market shares and the less elastic is industry demand'.[70]

Efficiency gains may lead to lower prices and higher welfare if they offset the increase in market power, or loss in competition, caused by the merger. This is possible since efficiency gains reduce unit costs of production, such that it may be more profitable for the merged firm to reduce its prices and, thus, attract new consumers, to the detriment of their rivals, which is nevertheless welfare enhancing. Thus, mergers which generate efficiency gains may increase competition in a market rather than reduce it. The higher the efficiency gains the more likely it is that prices will fall following the merger.

It is important to distinguish, however, between cost savings that reduce variable costs from those that reduce fixed costs, since reducing fixed costs will not directly affect the volume of products produced and are not likely to cause a reduction in prices. Hence, savings in variable costs are of more relevance to merger control than savings in fixed costs, in particular if antitrust authorities place higher weight on consumer welfare than on producer and/or total welfare.

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[70]   Farrell and Shapiro (1990) p361.

3.4   Bertrand Oligopoly Model - Differentiated Products

Although the discussion above helps to understand the concept of unilateral effects, it is only relevant in markets where firms sell homogeneous goods and where there are certain capacity constraints. Given that many, if not most, mergers occur in markets in which firms sell differentiated products, an analysis based on a Bertrand model with differentiated products may be more illustrative of unilateral effects of mergers in oligopolistic markets than homogeneous goods merger models.

In the Bertrand model firms compete in prices rather than output.   As discussed earlier in Section 2, if firms produce homogeneous goods consumers will be indifferent between the products at equal prices and, will buy from the firm which sells at the lowest price.[71] It follows that, at the equilibrium, all firms sell their products at marginal cost, if they are equally efficient, or, if their costs differ, that the lowest cost firm sells at a price just below the second lowest cost firm and supplies the whole market.[72] These results, however, do not apply when firms produce differentiated products.
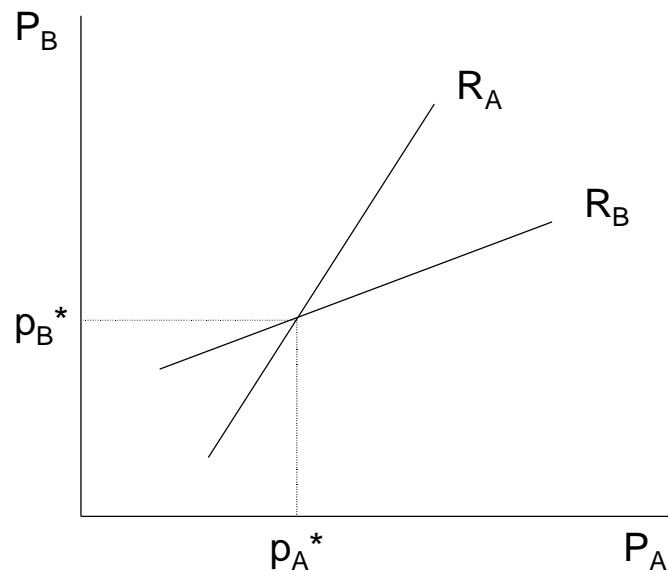
In differentiated product markets, consumers will not be indifferent between products at equal prices as each product is not a perfect substitute for another, and prices above marginal cost can be sustained.

According to the Bertrand model, a firm chooses its price so as to maximise its profit given the prices charged by its rivals.   It follows that an increase in the price charged by one firm also induces other firms to increase their prices, such that the price of all products in the market are likely to rise.   In this case, the products are referred to as strategic complements in prices.[73]   The figure below illustrates this by drawing reaction curves of a pair of duopolists.

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[71]   Provided this firm is capable of supplying the entire market.
[72]   This is referred to as the Bertrand Paradox.
[73]   In the Cournot model, if a firm increases its output other firms will typically want to reduce their output in order to force the price up. In the Bertrand model, on the other hand, if a firm increases its price others will typically find it profitable to increase their prices as well.

Where R_A and R_B are firm A's and firm B's reaction curves, respectively and p*p* is the equilibrium set of prices.

3.4.1 Mergers in differentiated product markets

Similarly to a merger in a homogeneous product market (based on the Cournot model), a merger in a differentiated product market eliminates some competition and increases the market power of the merged firm and, perhaps, also that of other firms in the market.

Imagine, for instance, two firms which produce each other's closest substitutes in a differentiated products market. If one of the firms attempts to raise its price, it may gain extra revenue per product sold, but it will loose more revenue in total from the sales that are diverted to the other firm if it was originally selling at the profit maximising price. Hence, neither firm has an incentive to raise prices and/or reduce output.

If these two firms merge, however, the two competing products will now be under one ownership. As a result, the lost sales caused by increasing the price of one of the products are likely to be recaptured by the merged firm, even if only partially, in the sales of the other product (and vice-versa).[74] Hence, there is an incentive for the merged firm to unilaterally raise the prices of both products. Furthermore, since the products are strategic complements in prices, non-merging firms may also be able to raise their prices.

It is possible, using the Bertrand framework, to formalise the distinction between a merger which has purely unilateral effects from one which has coordinated effects. We illustrate this using a

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[74] The revenue gained by increasing prices must be more than the revenue lost due to the diverted sales if the merged firm is to have an incentive to raise its prices. This is unlikely to occur if too many sales are diverted to other competing products, that is, it depends on the products' elasticity of demand and the number of close competitors.

hypothetical example of a symmetric triopoly, in which three firms each sell a differentiated brand of the product in question.

The demand system is as described below: it is symmetric in the sense that the demand for each brand depends in a linear way (positively and identically) on the prices of the competing brands and (negatively and identically) on the brand's own price and each firm is assumed to have constant marginal costs of 0.67. The parameters in the demand system were chosen to yield neat results. We ignore the possibility of new entry (or exit.)

$$Q_a = 1 - P_a + \frac{P_b}{6} + \frac{P_c}{6}$$

$$Q_b = 1 + \frac{P_a}{6} - P_b + \frac{P_c}{6}$$

$$Q_c = 1 + \frac{P_a}{6} + \frac{P_b}{6} - P_c$$

Q and P refer respectively to quantity and price, and subscripts a,b,c refer to each of the brands of the three firms.

3.4.1.1 Pre-merger equilibrium

Prior to the merger, we assume that each firm sets its price independently of the others to maximise its own profits in a one-shot game. This yields a price-setting Nash equilibrium with the following outcomes[75].

- Price of all three brands = 1

- The market is shared equally between the three brands

- At this price, each brand has an own price elasticity of –3, and all cross-price elasticities are +0.5.

3.4.1.2 Post-merger equilibrium: unilateral effects

Now suppose that firms A and B merge. The merged firm (A/B) is now in Bertrand competition with just the one outsider, C. Firms A/B and C are still assumed to maximise their own profits given the price of their rival. However, the crucial difference is that the prices of A and B are now

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[75] Algebraically, this equilibrium is calculated by maximising each firm's profits with respect to its own price, holding rivals' prices constant. This yields a best response function for each firm, which shows the optimal price for the firm, corresponding to the prices of its two rivals. Since there is a best response function for each firm, the equilibrium reflects the solution to a system of three simultaneous equations.

set cooperatively, taking into account (internalising) the cross-effects of the price of A(B) on the demand for B(A)[76]. The new equilibrium prices are:

$$P_a = P_b = 1.0339$$
$$P_c = 1.00565$$

Thus, the prices of the merged brands have risen by 3.4 per cent, and the outsider uses the opportunity of these higher prices to raise its own price a little, by 0.56 per cent.

3.4.1.3 Post-merger equilibrium: coordinated effects

Alternatively, suppose that, in the post-merger world, tacit collusion now replaces Bertrand competition[77]. In that case, firm A/B and firm C now set their prices up to the joint maximising levels. At the limit, this is as if there is a single firm, selling three brands and setting their prices to internalise all cross-effects. The equilibrium now becomes[78]:

$$P_a = P_b = P_c = 1.0833$$

With tacit collusion, therefore, all three firms are able to raise their prices by 8.3 per cent.

3.4.1.4 Comments

In this particular example, both unilateral and coordinated effects on price are significant. However, it should be stressed that the numerical values are quite arbitrary. Higher cross-price elasticities, for example, would ensure greater effects. Moreover, the difference between unilateral and coordinated effects could become more pronounced once we allow for asymmetries in the cross price elasticities. Note, however, that, quite generally:

- there cannot be unilateral and coordinated effects simultaneously – it is one or the other

- the price of the outsider will always rise (absent cost savings)

- all three prices will rise by more with coordinated effects.

3.4.2 Implications for merger control

Unless there are good reasons to expect a collusive outcome, it may be more practical to focus on unilateral effects in the analysis of mergers in differentiated product markets than on coordinated effects, particularly because economic analysis of unilateral effects is more amenable

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[76] Algebraically, this equilibrium is calculated by maximising firm A/B's profits with respect to both P_a and P_b, holding P_c constant, and maximising C's profits with respect to P_c, holding P_a and P_b constant. The new equilibrium reflects the solution to the revised system of three simultaneous equations

[77] For example, suppose that the game is a repeated game, in which the parameters are such that, while tacit collusion is not the equilibrium when there are three players, it is the equilibrium with only two players.

[78] Algebraically, this equilibrium is calculated by maximising joint profits with respect to each of the three prices and solving the resulting three simultaneous equations.

to quantification than that of coordinated effects. In fact, this is the approach usually taken by US agencies.[79]

As illustrated in the previous section, the estimation of unilateral effects involves estimating the post-merger Bertrand equilibrium, given the new market structure and possibly the new cost structure of the merged entity. Shapiro suggests that:

> *"If a significant number of consumers consider the merging firms' products to be their first and second choices (at pre-merger prices), then the merged entity will have an incentive to impose a non-trivial price increase following the merger.   Unless product repositioning or entry would defeat (make unprofitable) such a price increase, and unless reduction in marginal costs imply that the price increase will not in fact raise profits, the merger will injure consumers and be anticompetitive"[80]*

A key step in the assessment of mergers in differentiated product markets is the estimation of the Diversion Ratio. Diversion Ratio refers to the fraction of the sales lost by the brand of one of the merging parties, when its price is increased by say, 10 per cent, which is recaptured by the brand of the other merging party. In other words, it measures the number of consumers who regard the merging firms' brands as their first and second choices. This ratio will be higher the closer substitutes are the brands of the merging firms.

The accuracy of the estimated Diversion Ratio will depend on the data available. When sufficient and good quality data is available it may be possible to estimate elasticities econometrically and more accurately, but it is also possible to use less sophisticated data, such as survey data, to estimate this ratio.

Shapiro suggests also that market shares may be used when the 'brands in the market are not especially 'close' to or 'distant' from each other' and statistical analysis is impossible.[81] In this case, if the price of one of the merging firms' brand rises, the customers of this brand who switch are assumed to do so in the ratio of the other suppliers existing market shares.[82] Obviously, the larger the shares of the merging firms the higher the diversion ratio.

Once the Diversion Ratio has been estimated, it is then used to calculate the expected rise in price following a merger. Shapiro suggests the following formula for estimating the post-merger price increase:

$$\frac{(P*-P)}{P} = \frac{mD}{(1-m-D)} \qquad (4)$$

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[79]   See Shapiro (1995) p3.
[80]   Ibid p4.
[81]   Ibid p5.
[82]   Assuming also that not many customers of brand A reduce their overall purchases in the market if brand A's price increases. For a numerical example see Shapiro (1995) p6.

Where *P** is the post-merger price, *P* is the pre-merger price, *m* is the pre-merger percentage mark-up, $\dfrac{P-c}{P}$, where c is marginal cost, and *D* is the Diversion Ratio between the two merging brands. It must be noted, however, that this formula assumes constant-elasticity of demand and that the two merging brands are symmetric prior to the merger.

The predicted increase in price according to the formula above also assumes no cost synergies and no product repositioning or entry due to the merger, and these possibilities must be considered in order to decide whether the merger will be anti-competitive. It is important, for instance, to recognise that firms can respond strategically to a merger by repositioning their competing brands closer to the merging brands and also that new entry may occur, constraining the ability of the merging firms to increase price.[83] Cost synergies enter the analysis in much the same way as in Cournot models.

Assessing unilateral effects seems to be particularly important in mergers in differentiated product markets, as these effects may be substantial. This view is certainly taken by Antitrust Division economists in the US:

> *"[An] important example is the cereal merger between Kraft and Nabisco, which was decided earlier this year. Economic experts for both sides, relying on supermarket scanner data and survey evidence, spent considerable time estimating elasticities of demand for the purpose of evaluating unilateral effects. In her well-reasoned opinion, Judge Wood discusses unilateral effects at great length, giving emphasis to the econometric estimates of cross-price elasticity between the key merging brands, Grape Nuts and Shredded Wheat, for evaluating possible anticompetitive unilateral effects."[84]*

3.5 Conclusion

Unilateral effects, in the academic literature, refer to the effects of mergers on price, and implicitly welfare, of replacing two independent non-cooperative firms with a single entity which, of course, perfectly co-ordinates the prices of the merged brands. This apart, both pre- and post-merger equilibria are assumed to be non-cooperative.

This section has shown how unilateral effects emerge both in homogeneous and in differentiated goods markets following a merger. In particular, it is to be noted that these effects occur with all horizontal mergers that do not lead to collusion. It has also been shown that unilateral and coordinated effects are analytically different concepts and are mutually exclusive.

Unilateral and coordinated effects lead to different equilibrium outcomes following a merger and, although unilateral effects are expected to occur with all horizontal mergers, in certain circumstances when market conditions allow, coordinated effects are more likely to occur. Both

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[83]   It must be noted, however that game-theoretic analysis of pricing competition with differentiated products indicate that rivals will typically find it optimal to raise their prices in response to higher prices set by the merging firms.

[84]   Shapiro (1995) p10.

effects cannot occur at once, however. That is, either the merger leads to another Cournot or Bertrand equilibrium or to a collusive one, with the first two situations representing unilateral effects and the latter coordinated effects.

There may be situations where both types of effects of the merger appear to occur simultaneously. For instance, there might be a real world sequence in which a merger initially only has unilateral effects, that is, the immediate post merger equilibrium is non-collusive, but, with subsequent learning, etc, this may be displaced by tacit collusion. Also, in principle, the merger might lead to tacit collusion amongst outsiders, even though the merged firm still sets its prices unilaterally. The first situation, however, may be thought of as a merger which has coordinated effects, albeit not immediately realised, and the second possibility is perhaps too contrived to worry about.[85]

In effect, therefore, it does not make economic sense to mix unilateral and coordinated effects in merger analysis by attributing the outcome of a merger partly to unilateral effects and partly to coordinated effects.

Nevertheless, merger control should involve an analysis of both effects. An analysis of unilateral effects will show the likelihood of a significant increase in prices even without any collusion. If the unilateral effects are negligible but the structure and other characteristics of the market suggest a likelihood of collusive conduct between the remaining firms in the market after the merger, then an analysis of coordinated effects will also be appropriate. A merger may thus be blocked on one count or the other. However, whether this two-step approach is possible may depend upon the formulation of the merger regulation.

The two-step approach is well suited to a regulation which would prohibit mergers which substantially reduce competition, as in the US, for example, but less so for the EU's Merger Regulation which prohibits a merger only where a dominant position is created or strengthened and effective competition therefore impeded. Thus, whether or not it makes sense to assess both types of effects depends on the exact wording of the merger regulation.

Mergers with unilateral effects may create or strengthen single dominant positions, but in the context of collective dominance, which we have taken to involve tacit collusion, only coordinated effects are relevant.

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[85] And such collusion should be dealt with under other powers of the competition law.

4   EMPIRICAL REVIEW

Section 2 distilled from the theoretical literature on tacit collusion a set of conditions that are necessary for such coordinated behaviour to come about. The first half of this section explores whether such a result is backed by empirical evidence. The review of EU cases which follows in the second part aims to illustrate how well the Commission's approach to merger appraisal sits with the theoretically-backed approach outlined in Section 2.7

4.1   Empirical support for the theory

How does the theory stand up to empirical scrutiny? Have the necessary conditions and the factors underlying these conditions been shown to be associated with markets that have exhibited collective dominance? Is fewness of numbers, for example, really necessary? If so, is there any evidence on how many are few? Has empirical investigation shed any light on whether factors can be ranked? Are there other important contributing factors that have not been picked up by the theoretical literature? If a correlation between a particular factor and the practice of tacit collusion is found, is the correlation sufficiently robust and of high enough magnitude to allow one to advocate basing a screening device on them? Through what mechanisms have firms been able to sustain coordinated behaviour?

The answers to these questions would be useful as a way to confirm or contradict the conclusions reached by the theoretical literature and to settle issues in those areas where theory is ambiguous. However, there is no empirical counterpart to the plethora of theoretical studies and the previous questions remain largely unanswered.

This section reviews briefly some of the findings that have emerged from the applied studies. First, it presents some results from studies that, drawing evidence from a single industry or across industries, have sought to identify those factors that tend to be associated with collusion. Inevitably, these studies tend to draw on cases of explicit rather than tacit collusion. Second, it describes a few industry specific studies that have explored the role of particular factors in allowing firms to collude and have described the mechanism through which such coordinated behaviour is sustained. Though drawing on a limited sample of studies, it is hoped that these studies cover sufficiently varied environments to illustrate the variety of mechanisms through which collusion can be sustained.

4.1.1   What factors are associated with collusion

There is a sizeable body of literature that has concerned itself with establishing the relation between the formation and longevity of a collusive agreement with various structural characteristics of the market. Posner (1970) is seminal in this field and the studies of Palmer (1972), Hay and Kelley (1974) and Asch and Seneca (1975, 1976) follow in that same tradition. Based on the population of anti-trust cases instituted by the Department of Justice between 1890 and 1969, Posner (1970) reports the breakdown of these cases along various different dimensions in an attempt to draw an association between the number of cases brought about and certain features of the market. Of greatest interest to the discussion centred in collective dominance is Posner's finding that price-fixing cartels are more likely to be found in industries with

a low concentration. Though this finding sits glaringly at odds with the theory discussed in Section 2, the result is also echoed in Asch and Seneca's (1975). The studies are, of course, of explicit rather than tacit collusion.

Although these studies have provided answers to some of the opening questions in this section, they suffer from a key methodological weakness. Invariably, the sample of industries where collusion takes place is taken from cases that have been brought to the attention and dealt with by the competition authority. As noted by Dick (2000), it follows that by selecting cases based on prosecution status, these studies do not separate clearly between those factors linked to the likelihood of tacit collusion from those factors linked to collusive behaviour that is detected. It is this which drives Posner's (1970) and Asch and Seneca's (1975) surprising finding: cartels formed in a fragmented industry raise their visibility to the authorities and are therefore more likely to be made a subject of investigation.

This problem has been circumvented by studies that have focused their analysis on cartels unregulated by national anti-trust laws, so that the issue of detection does not arise. This is the approach taken by, for example, Jacquemin et al (1981), Suslow (1988) and Marquez (1992). However, the cartels examined by these authors concern export or international commodity cartels that typically had the support of government decrees and often the status of quasi-state trading associations. As such, this selection of cartels inflates the incentives of firms to enter into cartel agreements. In particular, participating firms are not made to bear the costs of enforcing privately an agreement and as such, the role of some of the factors is likely to be distorted. Jacquemin et al (1981) acknowledge that their finding of a negative (though insignificant) relation between concentration and the duration of the Japanese export cartels is closely tied to the fact that the cartels studied are assisted by government authorities.

Dick (1996, 2000) exploit data on the Webb-Pomerone cartels to get away from this problem. These cartels refer to export cartels that are legal in the US and have the ability to collude on prices, establish quotas and divide markets.[86] Crucially, however, the private costs of enforcing agreements are borne by the parties. Dick (2000) finds that firms were more likely to organize cartels with the motivation of increasing prices in industries with potential market power, slow entry, low contracting costs, standardised products, growing demand, dispersed buyers and prior attempts at collusion. However, the study warns that the explanatory power of these factors is relatively low and that, by themselves, do not provide a "reliable basis" to be used as screening devices in settings where collusion remains subject to legal sanctions.

The use of data from the Webb-Pomerone cartels is an ingenious move and it is successful in getting round some of the selection bias problems identified with earlier studies. However, an important difference between Webb-Pomerone cartels and firms tacitly colluding remains. In particular, parties to a Webb-Pomerone cartels are allowed, legally, to settle on how they should collude – they can agree on what price level to set, what quota to attribute to each member or how to carve up geographic markets between them. As such, they do not face the task of coming to a tacit understanding of what the focal point should be. Accordingly, the relevance of

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[86] Such export cartels were granted exemption from US anti-trust laws by the *Webb-Pomerone Export Trade Act of 1918.*

factors contributing to the complexity of arriving at an agreement – the number of firms, the volatility of market conditions, for example – are likely to be under-estimated in these studies.

Table 4.1 below summarizes the evidence on the impact of various factors on the likelihood that coordinated behaviour is observed. For the most part, the impact of the different factors are as expected and are consistent with the theory. Where this is not the case, it is necessary to understand whether the theory has been contradicted or whether the result is driven by the particular methodology adopted and it remains consistent with the theory.

First, the positive relation between anticipated demand growth and the likelihood of coordinated behaviour, found by Dick (1996, 2000) and Suslow (1988) is explained by the fact that the collusive arrangements examined in these studies covered export cartels often with the scope of exploring joint marketing practices - an anticipated growth in demand will tend to increase the benefits from such a cartel being created. Second, the surprising result by Posner (1970), Asch and Seneca (1975) and Jacquemin et al (1981) that low seller concentration is associated with a greater likelihood of collusion is, as argued previously, driven by the sampling problems associated with the methodology associated with these studies.

Table 4.1
Summary of Empirical Evidence on Factors Affecting Likelihood of Coordinated Behaviour

Factors		Evidence that factor lowers likelihood of coordinated behaviour	Evidence that factor raises likelihood of coordinated behavour
Demand factors	Elastic demand at competitive prices	Eckbo (1976), Marquez (1992)	
	Large and sophisticated buyers	Dick (1996, 1997)	
	Differentiated products	Hay and Kelley (1974), Dick (1996, 1997), Asch and Seneca (1975), Jacquemin et al (1981) and Fraas and Greer (1977)	
	Lumpy purchase	Hay and Kelley (1974)	
	Volatile demand	Suslow (1988), Dick (1996)	
	Anticipated demand growth	Jacquemin et al (1981), Palmer (1972)	Dick (1996, 2000), Suslow (1988)
Supply factors	Low seller concentration	Hay and Kelley (1974), Dick (1997), Eckbo (1976), Marquez (1976. 1992), Palmer (1972), Fraas and Greer (1977)	Posner (1970), Asch and Seneca (1975), Jacquemin et al (1981)
	Competitive fringe with elastic supply	Eckbo (1976), Griffin (1989)	
	Ease of entry	Dick (1997), Eckbo (1976), Asch and Seneca (1975)	
	Cost symmetries		Eckbo (1976), Fraas and Greer (1977)
Other factors	History of prior collusion		Dick (2000)
	One shot equilibrium	Asch and Seneca (1975)	

Source: Based on Dick and Knight (1998), Notes to Accompany Seminar on Tacit Collusion, p. 16-17.

Some of the empirical literature has concerned itself with analysing the contribution of a single market characteristic to the likelihood that firms collude. Thus, there is a considerable strand of research that has explored the relation between concentration and profitability, which in turn, is likely to be higher when firms collude. The work stems from Bain (1951) who found a weak positive relationship between concentration and profitability. Weiss (1974) surveyed over 50 studies that backed Bain's finding though later research reports conflicting results – Hart and Clarke (1980) and Clarke (1984) found no relation between concentration and profitability whilst Salinger (1990) concluded that a relation, though weak, did exist. Furthermore, Demsetz (1973) suggested that a link between concentration and profitability could be due to efficiency reasons

rather than market power reasons. Demsetz (1973) proposed a method to identify between which of the two was the driving force behind the relation. Subsequent work has produced evidence supporting both hypotheses.[87]

Evans and Kessides (1994) examined the impact of multi-market contact on domestic pricing in the US airline industry. Using panel data on airline fares, the authors show that fares are higher in those city-pair markets served by airlines with extensive contacts across different routes. This result is consistent with the view that airlines are less likely to price aggressively on a route for fear of reprisals on other routes and sits comfortably with the theoretical analysis reviewed earlier.

Albaek et al (1997) study the impact of the 1993 decision by the Danish competition authority to publish statistics on transaction prices for two grades of ready-mixed cement in three Danish regions. The authority was following the guidelines set in the Danish Competition Act which calls for transparency in competitive conditions. However, the authors suggest that the impact of such a move backfired. The publication of such data allowed firms to reduce the intensity of the competition between themselves and increase their prices. The authors note that subsequent legislation passed in 1997 lays far less emphasis on the need to create market transparency.

4.1.2 The mechanics of collusion

The review of the economics literature in Section 2 discusses the mechanisms that induce firms to arrive at and sustain coordinated behaviour. It is insightful to look at what these mechanisms have been in practice and how they have allowed firms to collude. Though only a few cases are discussed, these will hopefully illustrate the range of colluding practices employed by firms. The examples discussed below are a sample from those cases that have received the attention of a formal analysis in the economics literature and not a sample of all cases brought to the attention of competition authorities.

4.1.2.1 *Use of trigger strategies*

The Joint Executive Committee (JEC) was a railroad cartel operating transport between Chicago and the east Coast in the second half of the nineteenth century. The detailed records kept by the cartel have provided a fruitful arena in which to explore the mechanics of a cartel and to test game-theoretic models of collusion. The data provided by the JEC has served as a stage for a debate within the literature concerning the mechanism through which firms are believed to have sustained collusion. In particular, the debate centres on opposing interpretations of observed price wars.

On the one hand, Green and Porter (1984) propose that in a setting where information is imperfect, firms are able to sustain an optimal level of collusion via trigger strategies which involve switching between periods of collusive behaviour – where price is set between the Cournot and monopoly level – and periods of price wars – where price is set at the Cournot level. The empirical studies by Porter (1983), Coslett and Lee (1985) and Ellison (1994) lend support to this interpretation of price wars. Though Ellison (1994) is cautious about his results, they do suggest

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[87]   See Ferguson and Ferguson (1994) pp95-96 and Hay and Morris (1990) for an overview of this literature.

that the events triggering a price war are those leading to unusually low demand for one firm, such as an unanticipated demand shock.

On the other hand, Rotemberg and Saloner (1986) proposes that firms' collude in an anti-cyclical fashion, setting prices further away from the joint maximising level in periods of high demand than in periods of low demand. The intuition for this view rests neatly with the theory outlined in Section 2. In periods of falling demand, firms have a greater incentive to deviate than in periods of growing demand as the cost of an ensuing punishment is lower in the former setting. Accordingly, to eliminate the incentive to cheat, the price level must be lower in the former setting. To the best of our knowledge, there are no empirical studies on the JEC that have provided support for this interpretation of price wars.

In a similar vein, Slade (1987) explores data on the retail gasoline market in Vancouver to test for the degree to which firms in that market coordinated their pricing decisions. This is a very transparent market - prices being posted outside the gasoline station. Slade sets out to identify which amongst a number of candidates was the mechanism used by the retailers to sustain collusion. Exploiting price and quantity data collected from periods during price-wars, the author models the price-war dynamics with a view to test alternative supergame strategies. In particular, the author contrasts the hypothesis that the punishment strategies involve periods of reversion to Nash behaviour with the hypothesis that the price changes in the punishment phase are related to the previous-period rival price changes. Though not conclusive, Slade finds some evidence pointing towards the latter hypothesis,

4.1.2.2 Follow the leader

The investigation by the Mergers and Monopolies Commission (MMC, since 1999, the Competition Commission) in the UK into the salt industry provided a good insight into the mechanics of how the two producers in this market were able to coordinate their prices from 1980 to 1984. The industry is characterised by significant barriers to entry, important economies of scale, both firms had considerable excess capacity, the good in question is homogenous and it had a long history of common price agreements. The MMC found that one firm would announce a price increase one month before implementing it and that its competitor would then match this increase. Over a ten year period there was an "absence of a single instance of one company failing to follow the lead of the other in setting list prices".[88] The larger of the two firms told the MMC it was reluctant not to follow any price increase by the rival as this would increase its own market share and lead to retaliation by the rival. Rees (1993) studies this market and finds that the observed behaviour is not consistent with the competitive behaviour expected in one-shot games. Instead, the behaviour of the duopolists accords with the behaviour predicted by Abreu (1988) relating to the use of carrot-stick strategies to sustain a collusive outcome.

4.1.2.3 Transparent market

Christie and Schultz (1994a) and Christie and Schultz (1994b) present strong evidence that brokerage firms trading in Nasdaq stocks implicitly colluded to maintain supra–competitive profits.

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[88] MMC (1986).

The study was motivated by the authors' observation that the bid and ask quotes by 60 independent market makers on certain stocks were set in even eighths and did not make use of odd eighths.[89] The practice of not using odd-eighths were confined to a number of stocks and did not cover all those traded in Nasdaq. The authors concluded that the behaviour of the market makers was not being driven by a structural feature of the Nasdaq market, but rather by an implicit agreement.

The number of market makers involved, up to sixty, suggests that the ability for collusion to be reached and sustained would be close to impossible. The 'fewness' condition in Section 2 would suggest as much. Christie and Schultz (1994) suggest that such complexity was only overcome by the very high level of transparency in the market and the ability of market makers to single out any deviant and to apply a punishment that would harm the deviant alone. The ability to carry out such a tailor made punishment acts as a considerably greater disincentive for deviation to occur in the first place than when the punishment is felt across the market.

Prompted by the study, lawsuits were brought against the market making firms and the DoJ investigated the practices of these firms. In addition, Christie et al (1994) report that following the attention given to the study the market makers themselves changed their behaviour overnight and began trading in odd-eighths.[90]

4.1.2.4   Collusion in bidding auctions

Porter and Zona (1997) examine the school milk procurement market in Ohio during the 1980's. The authors find evidence that the behaviour of those firms participating in this market is consistent with collusive behaviour.   The authors present evidence suggesting that players respected each other's incumbencies preferring not to bid, or to bid at non-competitive levels, for business outside their area. They note that the school milk market exhibits many of those factors identified in Section 2 as increasing the likelihood that firms will collude. In particular, the products are homogenous, the market in general and the prices in particular are transparent, demand is inelastic, there is little uncertainty in terms of new technologies or volatile demand, and firms interact across various geographical markets.

4.1.3   Summary

The questions posed at the beginning of this section have remained largely unanswered by the empirical literature. The cross-industry studies that have explored the importance and interaction of the market characteristics in affecting the likelihood of collusion have inevitably and invariably been based on cases of collusion that have been detected or on lawful explicit collusion. Either strategy brings with it sampling problems that are likely to bias any results.

The industry specific studies reveal examples of collusion which appear to fit the criteria identified in our review of the theoretical literature. It is true that other studies fit these criteria less well. But

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[89]   Price fractions for bid or ask quotes must be multiples of one-eighth of a dollar for all stocks whose bid price is greater than $10. Therefore bids can be in even eights – 0, 2, 4, 6 – or in odd eighths – 1,3,5,7.
[90]   See Christie and Schulz (1994a) for a brief overview of these studies and their impact.

this only confirms the complexity of oligopolistic behaviour. It does not undermine the value of those criteria as a framework for the assessment of coordinated behaviour.

4.2 EU Cases

There is now a sizeable number of cases where the Commission believed, at least initially, that a merger falling under the Merger Regulation might create or strengthen a position of collective dominance although in only two cases (*Gencor/Lonrho* and *Airtours/First Choice)* has the Commission decided, after a full investigation, to prohibit the merger.

The Commission has described its approach to collective dominance cases as involving three steps:

> *"First, the supply structure is examined and the members of the oligopoly are identified. Second, the structural characteristics of the market are analysed in order to see whether the market is prone to oligopolistic dominance, and finally the impact of the merger on the competitive relationship between the oligopolists is analysed with a view to determining how the merger will affect the incentives of the members of the oligopoly to compete with each other following the merger."*[91]

Of particular interest for the purpose of this report is the Commission's comments on the second of these steps. Summarising, it says:

> *"Having identified the oligopoly, the Commission will analyse whether the market is likely to be conducive to oligopolistic dominance. The underlying assumption is that in markets which are transparent, develop relatively slowly (for example, have low growth, low rate of technological development, and homogeneous products) and are subject to high barriers to entry, it is more likely to find oligopolistic dominance since in such markets it is often easier for suppliers to detect competition and respond correspondingly. In other words, the threat of retaliation is likely to be prompt and credible in such markets. In contrast, fast developing, less transparent markets, where competition takes place across a multitude of marketing parameters, and where entry barriers are low, will provide fewer possibilities for detection of competition."*

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[91] European Commission contribution to OECD (1999).

The Commission then lists the characteristics which they say they have looked at in past cases of which *Gencor/Lonrho* would be a notable example. These characteristics are:

   a) market transparency;

   b) low rate of product and/or process innovation;

   c) mature market;

   d) price elasticity of demand;

   e) symmetry of costs;

   f) symmetry of market shares;

   g) structural links; and

   h) multimarket contacts.

This is a sensible approach, and accords closely to that which we have derived from our review of the economics literature. We have endeavoured, on the basis of our review, however, to provide a systematic and coherent framework for the assessment of mergers in oligopolistic markets, distinguishing between conditions that are necessary if collusion is to be achieved and sustained, and factors that contribute to that end. These include the factors in the Commission's list above.

We have used our framework in a review of the more significant EU cases. We do not intend in this report to give a detailed analysis of each case. Rather our survey has concentrated on the weight that the Commission has put on the various factors that we would consider relevant to the assessment of whether a merger increases the likelihood of collective dominance. The table at Appendix 2 provides a summary of our case analysis.

For the most part, the Commission has approached each case by stringing together a series of factors it believes have a bearing on the likelihood of coordinated behaviour such as the symmetry of parties. However, it would appear from some of the more recent cases, such as *Exxon/Mobil*, that the Commission's reasoning in merger cases is increasingly couched in terms of the necessary conditions highlighted in Section 2. This is an encouraging development.

4.2.1   Very few significant firms

The Commission and the CFI have, with no exception, always considered the number of players in a market as an important indication of the likelihood that a merger might lead to collective dominance. This position reflects the conclusions of economic thinking, and indeed conventional wisdom, stressing that collective dominance is untenable amongst a large number of players. Further, it reflects the relative ease with which the number of significant players in a market can be established.

The Commission's decisions do not yield a magic number of firms which it considers too few. The early case of *Nestle/Perrier* and the blocked decisions in *Gencor/Lonrho* and *Kali und Salz*

suggested that the Commission drew the line at a duopolistic structure. The decision in *Price Waterhouse/Coopers*[92] is consistent with this view as the Commission resolved that there was little danger of collective dominance since there would remain five players in the industry.

The Commission's decision in *Price Waterhouse/Coopers* is particularly explicit in this respect.

> "*From a general viewpoint, collective dominance involving more than three or four suppliers is unlikely simply because of the complexity of the interrelationships involved, and the consequent temptation to deviate; such a situation is unstable and untenable in the long term*"[93].

In the course of this appraisal, the Commission also had to consider a second possible merger in the same industry. Taken together, the Commission believed that there would have been an increased likelihood of collective dominance had this second merger not been discontinued.

Airtours/First Choice was the first case where the Commission prohibited a merger that would have left three major firms in the market. There would also remain a not insignificant fringe of smaller tour operators. The Commission noted that the decrease in the number of major competitors from four to three would reduce the number of competitive relationships by half – from six to three – and that the number of bilateral links in which one of the major parties would not participate would fall from three to one.[94] From this observation, the Commission drew the implication that, post-merger, the interdependency between the parties and the transparency of the market would be reinforced, as would the incentive to coordinate.[95] To view the number of parties in terms of the number of bilateral competitive relations is an interesting approach and, in terms of the Commission's past decisions, it is a new one.

The approach provides a quantifiable idea of the degree to which the complexity of interrelationships is reduced following a merger, as highlighted by the Commission in *Price Waterhouse/Coopers*.[96] However, the measure is exclusively dependent on the number of parties in the market and, as such, provides limited further insight into the likelihood of coordinated behaviour than a simple head count.

The Commission has taken care to qualify the number of parties in a market by their market share. Where the Commission finds that, due to a very fragmented market, the main parties do not account for a very high share of the market, it concludes that collective dominance is unlikely, as in some of the relevant markets in *AKZO Nobel*.[97] On the other hand, where the Commission finds that a small number of firms hold a high combined market share, the Commission will proceed in its investigation. To our knowledge, the Commission has invariably assessed the

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[92] *Price Waterhouse/Coopers & Lybrand* Case No IV/M 1016 1998 OJ L50/27 para 103.
[93] Ibid para 103.
[94] *Airtours/First Choice* Case No IV/M 1524 22 September 1999 para 143. The number of bilateral relations is given by $\binom{N}{2} = \frac{N!}{2(N-2)!}$ where N is the number of firms.
[95] *Airtours/First Choice* supra note 94 paras 143 and 144.
[96] As a matter of curiosity, in *Price Waterhouse/Coopers & Lybrand* the merger between the two auditing firms led to a decrease in the number of competitive relationships by one third - from 15 to 10 - and to a reduction in the number of bilateral relations in which one of the major firms is not involved by almost one half - from 10 to 6.
[97] *AKZO Nobel/Hoechst Roussel Vet* Case No Comp/M 1681 22 November 1999 paras 57 et seq.

concentration in a market through the combined market share of the top few firms. *Airtours/First Choice* stands out in this respect, as the Commission made use of the Herfindahl-Hirschman Index to measure concentration and compute the change in concentration due to the merger.[98]

A small number of parties with a high combined market share have not been judged by the Commission to be sufficient indicators of collective dominance. Where the small number of parties and the high combined market shares raise concerns, the Commission has proceeded to examine the case in light of other factors. Whilst the bulk of these other factors are discussed further below, it is timely to review here two factors that fall within the ambit of market shares: asymmetry and fluctuations of market shares.

Other things being equal, asymmetric market shares suggest that firms' incentives and market strategies differ, thereby making coordinated behaviour harder to achieve. This reasoning permeates the assessment of some of the markets in *AKZO Nobel*.[99] Also, in *Airtours/First Choice* the similar market shares of the remaining major tour operators was expected to facilitate the creation of collective dominance.

In *Nestle/Perrier,* the Commission authorised the merger to go through with the remedy that some of Perrier's sources of mineral water would be sold-off to BSN, the main competitor of Nestle.[100] Interestingly, this remedy brought the market shares of Nestle and BSN closer and, on the basis of market symmetry alone, would appear to run against the desired effect of minimising the possibilities of collective dominance.[101]

The Commission has interpreted fluctuating market shares as evidence of effective competition between parties and an indication that coordinated behaviour is unlikely to come about. This reasoning was followed in *New Holland/Case* in the competitive assessment of some of markets considered in that case.[102] The Commission should, however, attach qualified weight to this factor as the competitive vigour in a market prior to a merger may be a poor indication of the situation following the merger. Indeed, the purpose of the entire exercise is to assess whether such a change in behaviour is likely to come about.

As noted, the review of the case law provides no definite answer as to how few is few. The Commission objected to the merger in *Airtours/First Choice* where three significant players would remain in the market. A tentative upper-bound of four can be read from the Commission's clear indication in *Price Waterhouse/Coopers* that the complexity of interrelationships would be too great amongst more than this number of parties.[103] But it would be unwise to generalise from this one case.

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[98]   *Airtours/First Choice supra* note 94 para 139.
[99]   *Akzo/Nobel/Hoechst Roussel Vet* supra note 97
[100]   *Nestle/Perrier* Case No IV/M190 22 July 1992 para 138.
[101]   Ibid paras 38 seq.
[102]   *New Holland/Case* Case No Comp/M 1571 28 December 1999 paras 39 and 48.
[103]   *Price Waterhous/Coopers & Lybrand* supra note 92 para 103.

4.2.2 Barriers to entry

High barriers to entry and exit allow the oligopolists to insulate themselves from outside competition. With easy entry, the stability of coordinated behaviour would be jeopardised and there would be no risk of collusion.

According to Venit (1998) the approach taken by the Commission has in fact been wider than assessing the size of barriers to entry. The overriding goal of the Commission is to determine whether new competitors are likely to enter the market. As such, it has proceeded by first setting out whether market conditions attract or dissuade entry and then analysing the possibility that such entry will indeed take place within a reasonable period of time. The second step involves scanning the industry for potential entrants.

In *Gencor/Lonrho*, for example, the Commission found the control of the economically viable reserves of platinum by the incumbent oligopolists, the capital intensive nature of the activity and the high sunk costs involved to be substantial barriers discouraging entry.[104] In light of this, it concluded that no significant entry would be likely.

In *Airtours/First Choice* the Commission found that due to the high level of market concentration entry would have to be more than merely possible. In particular, in order to be 'sustainable' entry would have to be at a sufficient scale to offer effective competition. Such large scale entry (or the ability to quickly acquire sufficient scale), however, was thought to be difficult in this market since the major tour operators were significantly vertically integrated and had substantial control over the charter airline sector. The Commission's view was that in order to enter the market a firm would therefore also have to be vertically integrated. This factor was also believed to act a barrier to expansion to the existing fringe competitor, further limiting their ability to constrain prices and encouraging collusion.

Elsewhere, the Commission has identified as barriers to entry certain market features that would not be denoted as such by the economics literature. In *Nestle/Perrier*, the Commission found that, together with the rebate system foreclosing access to retailers and wholesalers and the strong brand consciousness of consumers, the stagnant market growth, the mature technology and the high advertising expenditure constituted effective barriers to entry.[105] While all five factors are likely to dissuade entry, other things equal, some care must be taken in interpreting the last three as barriers to entry. A more efficient manufacturer would, for example, be able to undercut the incumbents and steal market share away from the incumbents even in a stagnant market.

In some of the markets affected in *Rhodia/Donau Chemie*[106] and in *CVC/Danone*[107] the Commission concluded that the barriers to entry were low and that attempts to collectively dominate would be thwarted by entry. In *Agfa-Gervaert*[108] and *Rohm and Haas*[109] the Commission established that users of other technologies would be likely entrants in the markets

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[104]   *Gencor/Lonhro* Case No IV/M 619 24 April 96 1 para 154.
[105]   *Nestle/Perrier* supra note 100 paras 93 seq
[106]   *Rhodia/Donau Chemie/Albright & Wilson* Case No IV/M 1517 13 July 1999 paras 58 and 77.
[107]   *CVC/Danone/Gerresheimer* Case No IV/M 1539 5 July 1999 para 39.
[108]   *Agfa-Gevaert/Sterling* Case No IV/M 1432 14 April 1999 para 29.
[109]   *Rohm and Haas/Morton* Case No IV/M 1467 19 April 1999 para 29.

under consideration. This is likely to be an increasingly important source of potential competition in high-tech industries.

Where the Commission has found that there are significant factors discouraging entry, it has taken some care to identify what lay behind them. This is an important exercise as it is likely to influence the remedies the Commission might propose. The Commission can do little to lower the high sunk costs of opening new mines, change the capital intensive nature of mining or to stimulate the demand for bottled mineral water. On the other hand, where the barriers to entry are behavioural in nature – for example, the use by incumbents of exclusivity contracts, the existence of strong brand loyalty, the blocking of access to an essential facility – the Commission would be in a position to propose remedies that would mitigate the problem; respectively, forbidding exclusivity contracts, licensing a brand name and forcing incumbents to give access.

4.2.3   Repeated interaction

The survey of the economic literature in Section 2 tied the notion of repeated interaction to the frequency with which parties play the same game. Stripping down the game theoretic jargon, this refers to the frequency with which a firm reviews its price list or sets its output target in light of the fact that the decision will affect its profits as well as those of others in the market.

Within the context of collective dominance, repeated interaction is important inasmuch as it allows parties to learn from experience what decisions to make and, crucially, how to coordinate behaviour. Furthermore, where coordinated behaviour has been in place, it gives the opportunity for parties to punish a deviant.

In past cases, the Commission has at times drawn attention to a number of features that can be interpreted as being linked to the condition that firms interact often enough to allow them to learn and enable them to punish. The link, however, is rarely drawn out explicitly. Three such features stand out: the rate of change in the market, the ability of firms to review their production levels and the lumpiness of orders.

The ability of firms to learn how to coordinate, and their ability to respond to a deviant by pursuing a punitive strategy, depends on the market not changing very rapidly. Both abilities are hampered by, for example, rapid market growth, significant technological innovation or entry of new competitors as these features alter the payoff structure of the game. The latter factor was discussed above and the first two will be reviewed within the context of other necessary conditions that will be treated below.

A firm is restricted in its ability to learn and in its opportunities to punish where, due to the technology used, the flexibility in its choice of output level is limited. Where marginal costs of production are significant a firm will be less ready to experiment until it learns to coordinate and it will be less willing to expand production in order to punish a deviant. The converse is likely to be the case where the opposite is true or where firms hold significant stocks. The relevance of this factor is discussed at greater length below.

The frequency with which firms interact is lower in markets where orders are lumpy, large and infrequent. In such settings, coordinated behaviour is less likely as the immediate gain from

cheating is substantial compared whereas the costs of punishment are heavily discounted as they will be incurred in the distant future.

While there have been cases where the market is characterised by lumpy orders, it seems from our review that the Commission has generally been correct to find – or assume – that the condition of repeated interaction is met.

4.2.4 Capacity to reach a mutually acceptable equilibrium/ Ease of detection of cheating/ Enforceability of compliance

Section 2 suggested that the ability to reach an agreement, to detect cheating and to enforce a collusive or cooperative outcome are dependent upon certain structural and behavioural factors. Generally, a factor will contribute to more than one of these conditions being met. The homogeneity of the firms' products, for example, is likely to contribute to all three conditions being met.

The Commission's assessment of the competitive effects of a merger is typically made by reference to the presence and relevance of these structural and behavioural factors rather than in terms of the three, more abstract, conditions. It seems appropriate, therefore, to review the merger cases by considering the Commission's treatment of these factors.

This Section will underline the standard reasoning by the Commission in its appreciation of a factor, and will tie this to a few case examples. The discussion will highlight where the Commission has interpreted a factor in an unorthodox way or where it has attributed singular importance to it. Further, where the Commission has drawn a clear link between the factor and a necessary condition, this will be singled out.

4.2.4.1 *Homogeneity of goods*

Other things being equal, coordinated behaviour is more likely to come about in markets where the goods are homogenous. This reasoning follows from the economic review in Section 2 and is generally taken as read by the Commission.

The classification of products as homogenous is clearest when these refer to commodities. This was the case in *Kali und Salz*[110], *Gencor/Lonrho*[111] and *Rhodia/Donau*[112].

Elsewhere, the Commission has sought to qualify the degree to which products are homogenous. The Commission found X-ray films to be "essentially homogenous"[113] in *Agfa-Gevaert*, the audit services to be "relatively homogenous"[114] in *Price Waterhouse/Coopers,* and found the electrical oils supplied by the main firms in *Castrol/Calress* to be sufficiently distinct.[115]

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[110] *Kali und Salz/MdK/Treuhand* Case No IV/M 308 14 December 1993 para 57.
[111] *Gencor/Lonrho* supra note 104 para 138a.
[112] *Rhodia/Donau Chemie/Albright & Wilson* supra note 106 para 52.
[113] *Agfa-Gevaert/Sterling* supra note 108 para 25.
[114] *Price Waterhouse/Coopers & Lybrand* supra note 92 para 100.
[115] *Castrol/Calress/JV* Case No Comp/M 1597 14 October 1999 para 33.

By construction, the degree of product homogeneity in a market is closely tied to how broadly the market is defined. Other things equal, the narrower the definition of a market, the greater the likelihood that products will be considered as homogenous. Because of the importance of product homogeneity as a facilitating factor, the market definition must be particularly robust in collective dominance cases.

The Commission concluded that the *Nestle/Perrier* cases concerned homogenous goods after a lengthy probe led them to exclude soft drinks from the relevant market.[116] In *Airtours/First Choice*, the definition of the market as short haul package holidays was crucial to the Commission's argument that tour operators' products were virtually homogenous.[117] Even then the wide variety of destinations and price and quality of holidays, all with their own requirements for airline seats and holiday accommodation, can be said to cast some doubt on the validity of the Commission's view. Less controversially, medical products were defined quite narrowly in *AKZO Nobel*, leading to the conclusion that within each market considered in that case, products were homogenous.[118]

The Commission has acknowledged that products can be differentiated by advertising and branding even where these seem physically homogenous. The existence of brand loyalty was taken into account by the Commission in *Nestle/Perrier*[119] and in *New Holland/Case*[120]. In both cases, however, the Commission saw brand loyalty as a factor making it harder for entrants to break through and did not examine how it might alter consumers' perceptions of the homogeneity of products. This should be kept in mind given that it is the consumers' (or, more generally, the buyers') perception of the products' homogeneity that affects the likelihood of coordinated behaviour by making it harder to reach a coordinated price or by clouding market transparency.

4.2.4.2 Market growth

The economic theory presented in Section 2 suggests that a growing or declining market is less conducive to coordinated behaviour than a market that has faced a stable level of demand. The Commission has recognised this and in a number of cases has drawn a strong link between the rates of change in market size and the likelihood of finding collective dominance.

In *Gencor/Lonrho*, the Commission was explicit that "a fairly stable market will not encourage new entry or aggressive moves to capture the growth of the market"[121] citing this factor when justifying its decision. Similarly, in *Airtours/First Choice* the Commission found that the rate of market growth was not likely to stimulate competition. In particular, any market growth was expected to be captured by the majors rather than by the fringe competitors. On the other hand, in *Castrol/Carless* the decline on the size of the relevant market and the ensuing idle capacity led the Commission to reason that there would be incentives to compete on price.[122] Similar reasoning was given by the Court in its assessment of the declining potash market in *Kali und*

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[116]   *Nestle/Perrier* supra note 100 para 19.
[117]   *Airtours/First Choice* supra note 94 para 28.
[118]   *AKZO Nobel/Hoechst Roussel Vet* supra note 97 paras 13 et seq.
[119]   *Nestle/Perrier* supra note 100 para 96.
[120]   *New Holland/Case* supra note 102 para 34.
[121]   *Gencor/Lonrho* supra note 104 para 151.
[122]   *Castrol/Carless/JV* supra note 115 para 28.

Salz.[123] At the opposite end, similar incentives to compete were found to be present in one of the high growth markets assessed in *France Telecom/Orange*.[124]. These incentives were considered to be sufficient to outweigh the increased likelihood of collusion due to high concentration.

4.2.4.3   Technological maturity of market

The Commission has adopted the view that tacit collusion is more likely to come about in an environment where the technology is mature, well understood by all participants and unlikely to undergo significant innovations. Conversely, a rapidly innovative market is likely to allow less coordinated behaviour.

The technological maturity of the market has been included in the "list of factors" considered by the Commission. The Commission has not relied on it exclusively, or heavily, when drawing its conclusions in a case. In *Nestle/Perrier*[125], *Kali und Salz*[126] and *Gencor/Lonrho*[127] the maturity of the market was one of several factors pointing the Commission in the same direction. In *Valeo/ITT Industries*[128] and *Rhodia/Donau*[129], the Commission also found the relevant markets to be mature though, due to other considerations, it concluded that the merger did not raise competitive concerns.

An interesting prospect, which to the best of our knowledge has not yet arisen, is whether, despite all other factors pointing towards the likelihood of tacit collusion, the Commission would not oppose a merger on the grounds that the market is characterised by heavy R&D and rapid innovation. *Glaxo Wellcome/SmithKline*[130] appears to be a case which fulfilled such conditions: within a therapeutic market, concentration was high and goods were fairly homogenous, price was transparent, there were ample multi-market contacts and some structural links, and there was intense R&D effort. Disappointingly, the Commission did not couch its review of the case in these terms and preferred to resort, almost exclusively, to an analysis of concentration and market share movements.

We believe that in markets subject to rapid and unpredictable technological change it will be difficult to sustain tacit collusion even when concentration is high and there are other facilitating factors such as similar cost structures. It is important that the analysis is a dynamic one. However, it is particularly difficult to predict the pace and impact of technological change and to assess the likelihood that a dramatic change is just around the corner. In this respect, it is understandable that the Commission takes a cautious position when attaching weight to technological change as a factor making coordinated behaviour harder.

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[123] "A falling market is generally considered to promote, in principle, competition between the undertakings in the sector concerned", *French v Commission* Case No C 68/94 31 March 1998 para 238.

[124] *France Telecom/Orange* Case No Comp/M 2016 11 August 2000 para 40,

[125] *Nestle/Perrier* supra note 100 para 126.

[126] *Kali und Salz/MdK/Treuhand* supra note 110 para 57.

[127] *Gencor/Lonrho* supra note 104 para 152.

[128] *Valeo/ITT Industries* Case No IV/M 1245 30 July 1998 para 23.

[129] *Rhodia/Donau Chemie/Albright & Wilson* supra note 106 para 52.

[130] *Glaxo Wellcome/SmithKline Beecham* Case No Comp/M 1846 8 May 2000.

4.2.4.4 Symmetry

Undertakings with similar market shares and facing similar cost structures are likely to hold similar incentives. In turn, this will make it more likely that such firms are able to coordinate their activities. This view, borne out by the economics literature as reviewed in Section 2, is reflected in a number of cases dealt with by the Commission.

In its characterisation of firms as symmetric, the Commission has distinguished between symmetric market shares and symmetric production costs. This is logical, although the two are often related since production costs tend to be associated with the scale of operations and therefore market share.

In *Nestle/Perrier* the Commission described the two parties remaining in the market after the merger as forming a "symmetric duopoly"[131] – they would have similar market shares and similar capacities. The Commission placed a fair amount of weight on this as it considered that:

> "*given their equally important stake in the market...any aggressive competitive action by one would have a direct and significant impact on the activity of the other and almost certainly provoke strong reactions*".[132]

The Commission judged that the incentives of the two were particularly aligned as both parties were "similar in size and in nature" and were both active in the wider food industry.[133]

In the Commission's opinion, the similarity of the parties in *Nestle/Perrier* extended to their cost structure. This reinforced the view that the post-merger market would be conducive to coordinated behaviour as "significant differences in costs can reasonably be considered an element that would hinder the implementation of tacit parallel behaviour."[134]

The emphasis given by the Commission to the firms' symmetries in *Nestle/Perrier* did not set the standard for the cases that have followed since. In *Kali und Salz,* the Commission did not draw attention to the asymmetric market shares of the two main undertakings that would remain in the market. This point was duly noted and taken up by the Court in its judgement.[135]

On the other hand, the Commission did present a careful analysis of the similarities between the two large parties following the proposed merger in *Gencor/Lonrho*. The analysis here drew on both the similarities of their market shares as well as on a careful comparison of the cost structures of the two firms.[136]

In *Pilkington-Technict/SIV*[137], the Commission expressed its concern over the similar cost structures of the undertakings in the market, and its analysis of costs played an important role in

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[131]   *Nestle/Perrier* supra note 100 para 123.
[132]   Ibid.
[133]   Ibid.
[134]   Ibid para 125.
[135]   *France v Commission* supra note 123 para 226.
[136]   *Gencor/Lonrho* supra note 104 paras 182-185
[137]   *Pilkington-Technict/SIV* Case No IV/M 358 21 December 1993 para 41.

Mannesmann/Vallourec/Ilva[138]. In *Airtours/First Choice* the Commission judged that the scale of the operations of the four large tour operators was beyond the critical size necessary to enjoy significant economies of scale. Furthermore, given that they fly to the same destinations, largely use the same hotels and need the same high load factor, the Commission concluded that all four operators had essentially the same cost structure.[139]

In its decisions, the Commission has not always felt it necessary to consider the symmetry of costs. This is particularly true in cases where other factors provide a strong indication that coordinated behaviour is not likely. This may reflect the fact that detailed data are necessary to establish this point and that the Commission is reliant on the parties to deliver this data in a form that would allow meaningful comparisons to be made.

On the other hand, assessing the symmetry of market shares is a less data intensive exercise and, judging from the cases reviewed, the Commission has been prompt in carrying it out. In *AKZO Nobel*, the Commission gave considerable weight to the asymmetry of market shares. It systematically concluded the assessment of each affected market by comparing market shares and, where an asymmetry did exist, noting that "therefore the operation will not lead to any competitive concerns."[140]

In the review of the motor fuel retailing markets in *Exxon/Mobil*, the Commission highlights that even in the presence of asymmetric market shares there might be symmetric costs as the economies of scale are at the level of the retail outlet.[141]

In this same case, the Commission also brings to light the relevance of assessing the symmetry of firms in terms of the degree to which they are vertically integrated and in terms of the financial clout of their parent companies.[142] In *Airtours/First Choice* it was the vertically integrated nature of the major tour operators that particularly distinguished them from the fringe operators.

It emerges from a review of the cases that the Commission places considerably weight on any evidence of asymmetric costs and market shares.

4.2.4.5 Transparency

In the cases looked at, the Commission has seen market transparency as an important ingredient in establishing the likelihood of coordinated behaviour. In *Nestle/Perrier*, the Commission noted that the high degree of market transparency would allow each party to "follow permanently...the behaviour and the sales evolution of each other [and] would also permit immediate detection of any deviation by any single major brand from the expected performance."[143]

Structural characteristics may determine whether a market is transparent or not. In *Gencor/Lonrho*, the Commission established that the commodity nature of platinum and the fact

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[138]   *Mannesmann/Vallourec/Ilva* Case No IV/M 315 31 January 1994 paras 68 et seq.
[139]   *Airtours/First Choice* supra note 94 paras 99 and 100.
[140]   *AKZO Nobel/Hoechst Roussel Vet* supra note 99 para 94.
[141]   *Exxon/Mobil* Case No IV/M 1383 29 September 1999 para 477.
[142]   Ibid.
[143]   *Nestle/Perrier supra* note 100 para 122.

that it is traded in a world metal exchange showed conclusively that its price was transparent.[144] Further, the small number of firms in the market and the fact that new capacity is generally added through investment projects that are generally known in the industry contributed to the transparency of the market in general.[145] All this facilitated coordination in the Commission's view.

In *Airtours/First Choice* the Commission distinguished between transparency in the planning period – when capacity decisions are made – and in the selling season. It found that transparency was high in both periods. Capacity levels, for instance, were believed to be transparent due to factors such as that the major tour operators were publicly quoted companies and would not be able to keep substantial capacity additions secret, and also that they were likely to be in contact with the same hotels and shared discussions concerning seat requirements and availability.

In the selling season prices were also believed to be transparent, especially since the major operators employed 'yield management systems' for which a major input included current information on prices and availability of competing products. Also, catalogues guaranteed almost complete price transparency. However, the fact that the major operators each had thousands of different prices for the variety of holidays on offer reduces market transparency. Nevertheless, the Commission concluded that transparency in the planning period was enough to facilitate the creation of collective dominance as it believed that prices were mainly determined by the amount of capacity offered.

In other cases the Commission looked at behavioural characteristics to establish the level of transparency. In *Nestle/Perrier, for instance,* the Commission found that the major suppliers published standardised price lists that could be easily compared and also implemented a "regular exchange of information on quantities sold each month, broken down by major brands."[146] In *Gencor v Commission,* too, the Court established that the publication of production and sales statistics, as well as the typically long-term contracts prohibiting resale of the product, contributed along with the market's structural elements to make it a transparent one. [147]

In another decision, the Commission established in *Pilkington-Techint/SIV*, that there was insufficient price transparency for coordinated behaviour to be possible.[148] The lack of price transparency was due to the established practice of one supplier negotiating "substantial and variable discounts individually"[149] off its price list and the absence of a price list altogether of another. This is an illustration of the significance of the buying side of the market in the Commission's analysis.

A review of the Commission's decisions suggests that the Commission has placed great faith in bidding processes as mechanisms for ensuring that firms are not sufficiently aware of rivals'

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[144] *Gencor/Lonrho supra* note 104 para 144.
[145] Ibid paras 145 et seq.
[146] *Nestle/Perrier supra* note 100 paras 121 and 122
[147] *Gencor v Commission* Case T 102/96 25 March 1999 para 228.
[148] *Pilkington-Techint/SIV supra* note 137 para 63.
[149] Ibid at para 36.

prices and output and are therefore not likely to tacitly collude. In *Valeo/ITT Industries*[150], *Agfa-Gervaert*[151] and *Castrol/Carless*[152], for example, the Commission has taken the view that the competitive bidding process ensures that prices are not transparent and therefore parties are not likely to be able to coordinate.

However, the reliance on bidding mechanisms as a means of keeping transparency low must be read in light of the following. First, bids are often made for specific products so that low transparency is the outcome of both the mechanism and the difficulty in establishing a comparison between products. This was the case in *Valeo/ITT Industries*. Second, the Commission should be aware, as it was in *ABB/Daimler-Benz*[153] that firms might collude in the bidding process. In particular, they might coordinate so that they take turns in putting forward a tender.

When assessing the degree of transparency in a market, it should be kept in mind that market transparency is likely to increase if a merger is approved. The reduction in the number of players will tend to make it easier for firms to inform themselves of the actions of the remaining competitors and hence to coordinate their decisions. The more significant the firms involved in the merger, the more potent is this effect likely to be.

4.2.4.6 Price Elasticity

Where market demand is relatively inelastic at the prevailing price, there is an incentive for a monopolist or group of firms acting in a coordinated fashion to increase price. Inelastic demand also decreases the incentive to cheat. In a number of cases, the Commission has drawn attention to the low elasticity of demand. In *Gencor/Lonrho* the Commission noted that the low price elasticity "creates a incentive for anti-competitive parallel behaviour, since all suppliers would lose by engaging in price competition."[154] In *Airtours/First Choice* the Commission found that demand would not be greatly affected if prices rose generally, even though there was little brand loyalty and consumers were sensitive to small different in prices. This suggested that "the integrated operators could increase the overall level of prices if they were to behave in a parallel way".[155] The Commission gives similar reasoning in *Nestle/Perrier*.[156]

Formal techniques used to derive estimates of price elasticity are well understood and accepted. Nevertheless, it appears that with the exception of *Gencor/Lonrho*, the Commission has adopted informal judgements on the degree of price elasticity as in, for example, *Price Waterhouse/Coopers*, *Nestle/Perrier*. No doubt this reflects the difficulty the Commission has in gathering the necessary data, the tight time frame in which it operates and the readiness with which any econometric analysis can be challenged.

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[150]   *Valeo/ITT Industries* supra note 128 para 54.
[151]   *Agfa-Gervaert/Sterling* supra note 108 para 26.
[152]   *Castrol/Carless* supra note 115 para 32.
[153]   *ABB/Daimler Benz* Case IV/M 580, 18 Oct. 1995.
[154]   *Gencor/Lonrho* supra note 104 para 149.
[155]   *Airtours/First Choice* supra note 94 para 98.
[156]   *Nestle/Perrier* supra note 100 para 124.

4.2.4.7   Buyer power

The presence of strong buyer power may produce conflicting effects in terms of the ability of oligopolists to coordinate behaviour. On the one hand, a more fragmented buyer side market makes it easier for cheating to be detected as any deviant move would become known to more market players. On the other hand, buyer power can be effective in countervailing seller power.

In its consideration of buyer power issues, it appears that the Commission has limited its attention to the latter effect. The extent to which buyers have countervailing power is linked to the size of the buyers and, crucially, to their ability to switch suppliers.

In *Alcatel/AEG Kabel,*[157] the Commission accepted the view that 80 per cent of cables were bought by twenty important public utilities and in both *Robert Bosch/Magnet*[158] and *DuPont/Hoechst*[159] the Commission found that the large car manufacturers had significant buyer power.

However, *Gencor/Lonrho* serves as a warning against accepting that a small number of large buyers is a sufficient condition to conclude that the parties face buyers with substantial countervailing power. In *Gencor/Lonrho*, the Commission did not dispute the parties' claim that "buyers are highly concentrated with about ten main buyers on a worldwide basis."[160] However, it noted that two of the main fabricators are linked to one of the parties and that the terms of the standard contracts offered to buyers suggest that the power of buyers is low.[161]

The reliance on a simple analysis of buyer concentration to judge the degree of buyer power is further weakened when, as in *Gencor/Lonhro*, the buyers are not the end-users of a product and are able to pass on costs to their own customers. This lowers their incentive to switch between suppliers.[162]

In *Enso/Stora*, the Commission noted that other than the usual threat of switching suppliers, buyers may thwart attempts of suppliers to exploit their market power by sponsoring a new entrant.[163] This is a reasonable view for the Commission to take and it is in line with the notion that merger appraisal is a prospective exercise rather than an analysis of the pre-merger market structure.[164]

In *CVC/Danone*, the Commission notes that larger customers exhibit buyer side power by monitoring their suppliers' costs and other pricing parameters in order to curtail the sellers'

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[157]   *Alcatel/AEG Kabel* Case No IV/165 18 December 1991 para 25.
[158]   *Robert Bosch/Magnet Marelli* Case No IV/M 1491 25 May 1999 para 28.
[159]   *DuPont/Hoechst/Herberts* Case No IV/M 1363 5 February 1999 para 37.
[160]   *Gencor/Lonrho* supra note 104 para 150.
[161]   These conditions include the relatively low discounts and "clauses preventing customers from reselling any quantity without authorisation from the producer" *Gencor/Lonrho* supra note 104 para 150.
[162]   Ibid.
[163]   *Enso/Sora* Case No IV/M 1225 29 September 1999 para 91.
[164]   Baker and Lofaro (2000).

power.[165] Furthermore, in this case, the Commission found that contracts were typically of short duration and that buyers could switch suppliers at short notice and with no difficulty.[166]

Where brand names are important, a concentrated buyer-side of the market may not be sufficient to countervail sellers' market power. The threat to switch suppliers, and thereby not carry a favoured brand, would not be credible. The Commission acknowledged this fact in *Nestle/Perrier* where it noted the concern of retailers and wholesalers for their "future margin of negotiation vis-à-vis Nestle and BSN [the remaining duopolists in the market]" [167] as they considered that they would have to sell the brands of both suppliers.

The Commission has paid appropriate attention to the role that buyer power may have in preventing coordinated behaviour by sellers. Further, the cases reveal that it has correctly interpreted the mechanisms through which buyer power operates and that these factors – rather than a simple analysis of concentration on the buyer-side of the market — are the factors to be considered.

4.2.4.8   Multi-market contact

Multi-market contacts allow firms to draw on additional information about their rivals and give them further opportunity to retaliate in the case where a rival is found to have deviated from coordinated behaviour.

In *Nestle/Perrier*[168] and, more explicitly, in *Gencor/Lonrho*[169], the Commission was clear in drawing the link between the role of multi-market contact and the expanded ability of firms to discipline a member of an oligopoly that has behaved unacceptably.

The parties involved in the cases investigated by the Commission are likely to be large firms, and as such, likely to operate across various markets. Multi-market contacts are therefore likely to be commonplace. It is not, of course, size per se that is the issue. Instead, the relevance of multi-market contacts is best seen ex-post, where any retaliatory or behaviour that is directed into other markets can be investigated separately from the merger.

From a practical standpoint, the Commission has probably been right not to attribute too much weight to multi-market contacts and to attach more weight to those factors, such as firm symmetry, which have a clearer impact on the likelihood of collusive behaviour.

4.2.4.9   Role of the fringe and of maverick competitors

The coordinated behaviour of a small group of oligopolists can be disrupted by the presence of a fringe of smaller firms or by the existence of a maverick competitor who does not share the collusive strategies of the larger firms. In addition, if one of the merging parties is the maverick, its

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[165]   *CVC/Danone/Gerres* supra note 107 paras 35 et seq.
[166]   Ibid.
[167]   *Nestle/Perrier* supra note 100 para 84.
[168]   Ibid para 123.
[169]   *Gencor/Lonrho* supra note 104.

destabilising influence on any coordinated behaviour is considerably lessened. Both of these scenarios were discussed in Section 2, and both have been considered by the Commission.

In *CVC/Danone*[170] the Commission found that although the main parties would hold a substantial share of the market and that barriers to entry were high, competitive pressure would be kept up by other existing producers. This decision is particularly important in pointing out that an assessment of the power of a fringe should be carried out in junction with the assessment of barriers to entry. The Commission should be concerned where the fringe is weak and barriers high, and should be less so when barriers to entry are low. On the other hand, the Commission found in *Nestle/Perrier, Kali und Salz* and *Airtours/ First Choice* that the fringe would not be powerful enough to upset collusive behaviour.

It is more difficult to identify what the impact of the presence of a maverick firm would have been on competition in a market. The nature of a maverick firm, though intuitively clear, may be objectively hard to identify, as may the way in which its behaviour might differ from established oligopolists.

In *France Telecom/Orange,* the Commission saw the takeover of Orange in the Belgium market for telecommunication services as putting an end to the role of Orange in breaking up the duopolistic pricing behaviour that had characterised that market previously.[171] The Commission concludes by expressing its concern at the effect of the loss of this competitor.

4.2.4.10 Ability to change production level

Section 2 showed that the ability of parties to contract and expand output has ambiguous effects on the likelihood of coordinated behaviour. On the one hand, where output can be expanded easily and at low cost, a party will have a greater incentive to deviate. On the other hand, the remaining parties will also find it easier to punish the deviant.

The Commission's decisions reveal that it has preoccupied itself with this question and has assessed it by examining the existence or not of slack capacity and by analysing the structure of the firms' operating costs.

In *Gencor/Lonrho* the Commission established that a "large part of the operating costs of a mining shaft do not vary with the output of the shaft but are fixed".[172] Similarly, in *Nestle/Perrier*, the Commission established that marginal costs were relatively small. In both cases, therefore, parties would be able to increase their production level without incurring significant cost increases. This, however, is dependent on the parties holding spare capacity.

In *Nestle/Perrier,* the Commission found that the two large parties, Nestle and BSN, did have considerable capacity reserves and would be able to respond to an increase in demand.[173]

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[170] *CVC/Danone/Gerresheimer* supra note 107 para 38.
[171] *France Telecom/Orange* supra note 124 para 28.
[172] *Gencor/Lonrho* supra note 104 para 138b.
[173] *Nestle/Perrier* supra note 100 para 56.

Similarly, there was sufficient slack capacity in *Pilkington-Techint* for firms to expand output readily.

4.2.4.11 Structural links

The Commission has consistently sought to establish the existence of structural links between undertakings in an industry. The impact of the findings from such an exercise on the Commission's decision has shifted following *Kali und Salz*. Prior to this case, structural links were considered to be necessary factors for a finding of collective dominance. In subsequent cases, they were interpreted as a factor, alongside others, that would make coordinated behaviour more likely to come about.

In *Exxon/Mobil*, the Commission was careful in laying out the various routes through which structural links may influence the likelihood of collusion. First, they might contribute to the transparency in the market as parties gain better information of others' "strategy, cost structure and plans".[174] Second, structural links may make "market players care about the welfare of their partners"[175] and therefore provide further incentive to collude rather than compete aggressively.

The ties between firms that have been regarded by the Commission as structural links have differed considerably in nature. In *Price Waterhouse/Coopers*, the Commission found that the parties were linked through their membership and running of the institutions self-regulating the auditing sector.[176] In *Pilkington-Techint*[177] and in *Rhodia/Donau*[178] the oligopolists were considered to be linked through a supplier relationship. In *Gencor/Lonrho*, ownership ties between the parties remaining in the industry were found to form an important structural link.[179]

Implicit in the Commission's decisions in the cases just mentioned is the view that the impact of structural links on the ability to coordinate is dependent on their nature and that some ranking of their significance is possible. Ownership ties such as cross-shareholdings are regarded as forming a tighter link than membership of a trade association. This is a reasonable position to take.

The Commission draws on its assessment of structural links not only to form a view on the likelihood of collective dominance but also to propose remedies such as conditions for approval of a merger. This was the case, for example, in *Kali und Salz*. A careful assessment of the impact of any structural links on the likelihood of coordinated behaviour is particularly important. The Court's overhaul of the Commission's appraisal of the structural links in *Kali und Salz* and the ensuing conditions imposed by the Commission on the parties will have served as a lesson.

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[174] *Exxon/Mobil* supra note 141 para 480.
[175] Ibid.
[176] *Price Waterhouse/Coopers & Lybrand* supra note 92 para 101.
[177] *Pilkington-Techint/SIV* supra note 137 para 39.
[178] *Rhodia/Donau Chemie/Albright & Wilson* supra note 106 para 54.
[179] *Gencor/Lonrho* supra note 104 para 156 et seq.

4.2.4.12 Past behaviour and behaviour in similar markets

Evidence of coordinated behaviour in the past or in other geographic markets might be of some help in assessing the likelihood that such behaviour will come about in the market under consideration. The extent to which such inferences are relevant, however, depends on how appropriate it is to compare the market over time or across geographical areas. Amongst other factors, this will in turn depend on the extent to which the market has grown, on whether there have been technological innovations and on whether the market leader is the same.[180]

The Commission has explored this route and in *Kali und Salz*[181] and *Gencor/Lonrho*,[182] for example, found that parties had coordinated in the past and that conditions were in place for this to be repeated in the future.

In contrast, the Commission has sought to read into fluctuating market shares and (downward) price movements evidence of effective competition. In *AKZO Nobel* the Commission established that in some of the affected markets, the fluctuating market shares were evidence of competition and concerns over coordinated behaviour were unwarranted. On the other hand, in *Nestle/Perrier*[183] the evolution of prices over the five years prior to the merger was taken by the Commission as strongly suggesting that the parties had coordinated in the past and might do so again in future.

The reasoning behind looking for evidence of past coordinated behaviour is that if its been done before, it can be done again. As discussed above, there is some merit in this. It must be noted, however, that it does divert the analysis away from looking for the underlying reasons why collusion might occur again.

The Court's judgement in *France v Commission*[184] makes it clear that the reliance on evidence related to past behaviour should be limited. The analysis should be prospective in nature. We share the Court's position and underline that the use of past evidence must be qualified by the extent to which the market has changed and by how much it is likely to change following a merger.

4.3   Insights from Case Review

The cases mentioned above and those included in the table in Appendix 2 are a selection of those where the Commission has addressed the issue of collective dominance. Although this review has not been exhaustive, it has provided us with insights into how the Commission assesses the likelihood of collective dominance and it has pointed our way to a few policy suggestions.

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[180]   The US Merger Guidelines examine this issue explicitly. US Merger Guidelines (1997) Section 2.11.
[181]   *Kali und Salz/MdK/Treuhand* supra note 110 para 57.
[182]   *Gencor/Lonrho* supra note 104 paras 168-172.
[183]   *Nestle/Perrier* supra note 100 para 124.
[184]   *France v Commission* supra note 123 para 163.

First, it seems that the Commission has generally relied too heavily on going through a check-list of factors rather than drawing a map, so to speak, of how the factors will influence the likelihood of coordinated behaviour.

Second, the Commission has generally not recognised, at least not fully nor explicitly, the role of the necessary conditions outlined in Section 2 and reviewed in this section. In its assessment of a case, it has not linked the factors found to these necessary conditions.

The Commission's approach in *Exxon/Mobil* and its response to the parties in *Airtours/First Choice* are an exception to the above critique. In both of these cases, the Commission sought to examine the case through a set of conditions, similar to those identified in Section 2 of this report. As noted, the decision in *Airtours/First Choice* has been appealed on the grounds that the Commission has not adequately demonstrated the likelihood of tacit collusion as a result of the merger and that tacit collusion is a requirement for a finding of collective dominance.

Third, the Commission appears to apply an initial screening test based on the number of significant firms and on their combined market share. This is a reasonable and justifiable approach.

Fourth, the Commission is not consistent in applying a test based on the existence or not of barriers to entry. We suggest that any screening of mergers for collective dominance should also have regard to conditions of entry.

Fifth, other than market concentration, the Commission does not appear to place the factors in a clear hierarchy. This is a reasonable approach as each case brings with it its own peculiarities and the relevance of a factor varies from case to case.

Sixth, the Commission has attributed considerable weight to the symmetry of firms. This is reasonable from a theoretical point of view and makes strong intuitive sense. On the other hand, the Commission should be rather cautious in putting weight on evidence of multi-market contacts or even of past collusive behaviour.

5 US EXPERIENCE

This section of the report deals briefly with the approach of the US competition agencies towards mergers in oligopolistic markets.

The rule by which mergers in the US are to be assessed is set out in Section 7 of the Clayton Act, 1914. It declares unlawful any merger or acquisition the effect of which may be "substantially to lessen competition or to tend to create a monopoly" in any line of commerce, or activity affecting commerce, in any section of the country. The statute aims to prevent anti-competitive mergers "in their incipiency". While a predictive analysis is required, it is not necessary to prove that a merger will have anti-competitive effects, only that that is a probable outcome.

There are no indications in the statute itself of how the substantive rule is to be interpreted. That task has fallen to the courts. In addition to the (now) considerable body of case law, the enforcement agencies (the Anti-Trust Division of the Department of Justice and the Federal Trade Commission (FTC) who share responsibility for merger control) have published guidelines which explain how they would currently analyse a case and their enforcement priorities.

5.1 The Horizontal Merger Guidelines

The first guidelines were published in 1968. There have been a number of subsequent revisions. The current US Horizontal Merger Guidelines (Guidelines) were issued in 1992, with an amendment dated 8 April 1997 to the section of the Guidelines that deals with the treatment of claims that a merger would increase efficiency notwithstanding any adverse effects on competition. Following the extant case law, the early guidelines put much stress on the structural effects of a merger and devised a screening system in terms of concentration to establish whether or not a merger was likely substantially to lessen competition or to tend to create a monopoly. The analysis of the effect of a merger on concentration remains an important part of the assessment process, but a major change brought about by the 1992 Guidelines is that the agencies acknowledge that they must also provide a credible theory of how the merger will adversely affect competition if it is to be challenged.

Of the cases notified to the agencies as required by the Hart-Scott-Rodino Act, generally less than 4 per cent receive an in-depth investigation (known as a second request for additional information) and less than 2 per cent are actually challenged.[185]

5.2 Concentration Screens

Having defined the market(s) relevant to the assessment of any merger, the US agencies examine the effect on market concentration which they regard as a useful indicator of the likely anti-competitive effect of a merger. "Other things being equal, market concentration affects the likelihood that one firm, or a group of firms, could successfully exercise market power." The preferred concentration measure is the Herfindhal-Hirschman index (HHI), calculated by summing the squares of the market shares of all the firms engaged in the market. Markets in

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[185] Information provided by the FTC.

which the HHI is less than 1000 are regarded as unconcentrated and mergers in such markets are unlikely to have anti-competitive effects. Markets with HHIs between 1000 and 1800 are categorised as moderately concentrated. A merger which would increase the HHI by more than 100 in such a market is considered likely to increase market power. A highly concentrated market is one with an HHI above 1800 and a merger increasing concentration by more than 50 in such a market would be considered likely to raise significant competition concerns.

The Guidelines warn that because of possible data limitations these screens will not necessarily be interpreted with arithmetic precision. Nevertheless, they are an important step in the process of merger review in the US.

5.3   Effects on Competition

In the words of the Guidelines (Section 2.0):

> *"[...] market share and concentration data provide only the starting point for analysing the competitive impact of a merger. Before determining whether to challenge a merger, the Agency will also assess the other market factors that pertain to competitive effects, as well as entry, efficiencies and failure."*

A fact-intensive market and economic analysis is required.

The Guidelines set out two alternative types of competitive effects that might arise from a merger, coordinated effects and unilateral effects. It is important to note, because the Guidelines do not have legal force and are only a guide to enforcement practice, that this distinction has been endorsed by the courts.

5.4   Coordinated Effects

Section 2.1 of the Guidelines explains coordinated effects thus:

> *"A merger may diminish competition by enabling the firms selling in the relevant market more likely, more successfully, or more completely to engage in coordinated interaction that harms consumers. Coordinated interaction is comprised of actions by a group of firms that are profitable for each of them only as a result of the accommodating reactions of the others. This behaviour includes tacit and express collusion and may or may not be lawful in and of itself".*

The Guidelines continue:

> *"Successful coordinated interaction entails reaching terms of coordination that are profitable to the firms involved and an ability to detect and punish deviations that would undermine the coordinated interaction. Detection and punishment of deviations ensure that coordinating firms will find it more profitable to adhere to the terms of coordination than to pursue short term profits from deviating, given the costs of reprisal".*

In short, coordinated interaction requires not only that competitors reach an agreement, but also that it is possible to detect and punish firms that breach the agreement.
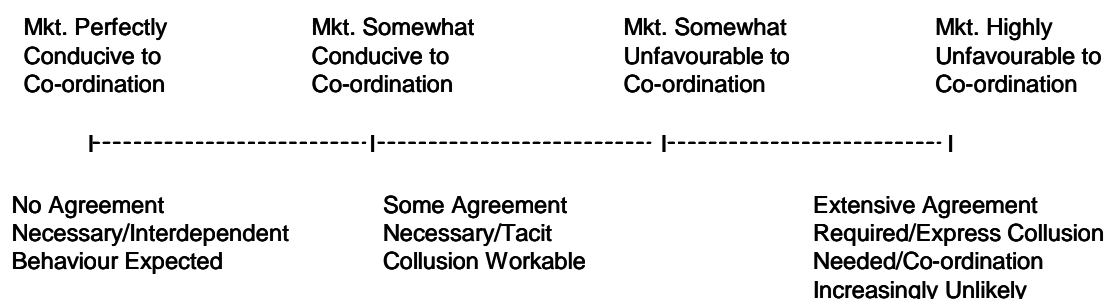
Coordination becomes easier, and therefore more likely, as a market becomes more concentrated. But high concentration is certainly not a sufficient condition for successful coordination. Among the factors that the Guidelines suggest may also be relevant to the assessment are:

> *"the availability of key information concerning market conditions, transactions and individual competitors; the extent of firm and product heterogeneity; pricing or market practices typically employed by the firms in the market; the characteristics of buyers and sellers; and the characteristics of typical transactions".*

The Guidelines add that where there has been collusion in the past, conditions in that market are likely to be seen as conducive to coordination.

The diagram below indicates how the US agencies conceptualise the relationship between market conditions and the likelihood of coordinated conduct.

Figure 5.1
Relationship between Market Conditions and Likelihood of Coordination[186]

Mkt. Perfectly Conducive to Co-ordination	Mkt. Somewhat Conducive to Co-ordination	Mkt. Somewhat Unfavourable to Co-ordination	Mkt. Highly Unfavourable to Co-ordination

|--------------------------|--------------------------|--------------------------|

| No Agreement Necessary/Interdependent Behaviour Expected | Some Agreement Necessary/Tacit Collusion Workable | | Extensive Agreement Required/Express Collusion Needed/Co-ordination Increasingly Unlikely |

At one extreme are markets where, despite concentration, the conditions are unfavourable to successful coordination – where products are differentiated and demand fluctuates unpredictably, for example. It may be expected that coordination would then be unlikely without recourse to an explicit collusive agreement. Even with an agreement, coordination may prove unsustainable, given the stresses and strains of potential cheating.

Moving along the spectrum to conditions that are increasingly conducive to coordination reduces the need for oligopolists to reach an explicit agreement. Indeed, in markets that are "perfectly conducive to coordination", a collusive outcome (in game theory terms), with prices approaching the monopoly level, can be expected without any agreement or communication between firms.[187]

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[186] US' contribution to OECD (1999).
[187] It could be argued that interdependent pricing in such circumstances is not an example of coordinated interaction: each firm acts unilaterally and rationally in its own interests with no express or even tacit meeting of minds. The standard analysis of unilateral effects asks whether, as a result of a merger, a firm will be able to raise prices because part of the cost of the price increase, from

However, the agencies accept that markets that are perfectly conducive to coordination will be rare, and that some form of contact or communication between firms will generally be necessary to hold the coordination together.[188]

The Horizontal Merger Guidelines set out in some detail the factors that, in the view of the agencies, are conducive to reaching terms of coordination, detecting deviations from those terms, and punishing such deviations. This part of the Guidelines reflects both the agencies' enforcement experience and insight drawn from economic analysis of oligopoly.

5.5   Unilateral Effects

Section 2.2 of the Guidelines explains unilateral effects thus:

> *"A merger may diminish competition even if it does not lead to increased likelihood of successful coordinated interaction, because merging firms may find it profitable to alter their behaviour unilaterally following the acquisition by elevating price and suppressing output".*

The price increase is profitable regardless of the actions of other firms in the market.

The agencies have suggested that a merger needs to create a "very large market share, eg greater than 35%", for significant unilateral effects to be likely. [189]   The Guidelines continue:

> *"Unilateral competitive effects can arise in a variety of different settings. In each setting, particular other factors describing the relevant market affect the likelihood of unilateral competitive effects. The settings differ by the primary characteristics that distinguish firms and shape the nature of their competition. These include a merger between two firms in a product differentiated market which produce close substitutes and which, after the merger, would command a large share of the market, and a situation where competitors would be unable to increase their own output, say because of capacity constraints, to take advantage of competitive opportunities offered if the merging firms were to raise their prices after the merger".*

Clearly, a key factor in the assessment of possible anti-competitive effects, whether coordinated or unilateral, will be entry conditions into the relevant market.

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lost sales, is internalised by the acquisition of a competitor. It could be argued, if a merger increases the awareness of oligopolists' interdependence, that the merged firm would, in a similar way, factor the effects of that into its own unilateral pricing decisions. However, the view of the US agencies is that interdependent pricing should still be treated as an example of coordinated interaction as giving rise to a collusive outcome.

[188]   There is a considerable literature relating to the question how oligopolistic pricing should be dealt with under the Sherman Act where there may be no direct evidence of an unlawful agreement. It includes Turner (1962), Posner (1969), Hay (1982), Baker (1993) Lopalka (1996). This is not an issue for merger control, however. As the Guidelines state, the US agencies are able to challenge a merger under Section 7 of the Clayton Act whether or not the coordinated behaviour that concerns them would be unlawful under the Sherman Act.

[189]   Parker and Balto (1999).

5.6   Application

Although the agencies begin with no pre-determined view, most recent merger cases brought by the two agencies have been based on an analysis of unilateral rather than coordinated effects. To an extent, the emphasis on unilateral effects reflects the weaker predictive power of economic models of oligopoly and the difficulty of establishing evidence sufficient to satisfy a court. As Carl Shapiro has put it "while we are fairly confident in listing factors that facilitate or hinder collusion, including market structure, there is no single accepted method of quantifying the increased likelihood of collusion attendant to a merger".[190]   In contrast, econometric and simulation techniques have been used to generate estimates of the unilateral prices effects of horizontal mergers.[191]   Nevertheless, the agencies see it as a major objective of merger policy to prevent the more tacit forms of collusion as these are difficult to deal with under the other anti-trust statutes.

While the Guidelines set out in some detail the considerations that may be held to be conducive to coordination, the agencies do not see these as more than a useful check-list or framework of thought. History shows that collusion has occurred in many different market situations.[192] The agencies emphasise that not all the factors identified in the Guidelines need be present, though some such as the number and relative size of firms, the information available to market participants and the stability of market conditions are likely always to be important. Any factor can be significant in a particular case, for example, the absorption by the merger of a previously maverick firm.   Documentary evidence of a wish to see such a firm "taken out" could be conclusive. The alleged coordination does not have to be perfect - there can be coordination on one dimension of competition and not on another. The agencies' task is to combine a factual analysis with a convincing theory of how the coordinated effects would come about. The theory will also need to be supported by depositions of industry witnesses.

As already mentioned, the agencies give considerable weight to any evidence of past collusive or coordinated conduct in the market or some closely similar market. In the words of one official to a member of the team, "it is not a necessary condition but it sure helps a lot". Another official suggested that it would only be where a merger reduced the number of firms in a market from three to two that she would be happy putting forward a coordinated effects case without evidence on past conduct. Otherwise, the analysis would focus on unilateral effects. However, evidence that might justify alleging coordinated effects need not add up to full-blown collusion.   For example, in one case the agency relied on evidence from trade customers that prices had risen in the past when one of the then suppliers had dropped out of the market. But the US view is that it would be difficult to substantiate coordinated effects where there remained four or more firms in the market unless there was some clear facilitating device or practice which could be argued to be the vehicle for a "meeting of minds" and to constitute collusion.

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[190]   Shapiro (1995).
[191]   The Shapiro speech illustrates the approach to the estimation of unilateral effects. See also Section 4 of the present report.
[192]   See, for example, Hay and Kelly (1974), Fraas and Greer (1977), Asch and Seneca (1976), Dick (1996).

5.7 Cases Illustrating Coordinated Effects

It is not possible in this interim report to provide a complete survey of merger cases where the US agencies have been concerned with the effects of a merger in an oligopolistic market. It needs to be remembered that a merger can only be prohibited in the US through court proceedings. In fact, few cases end in the courts; most are settled at some prior stage of the process, often after some restructuring of the transaction to meet the agency's concerns, usually by a consent order. There are therefore few litigated cases in which the courts have had to adjudicate on an agency's assessment of coordinated effects. But we mention here several cases which were drawn to our attention where coordinated effects were a major feature of the assessment.[193]

Mergers involving four major drug wholesalers were challenged by the FTC in 1999 – the mergers of McKesson and AmeriSource and of Cardinal Health and Bergen-Bruswig. One of the factors that the court relied upon in assessing competitive effects was the past efforts of coordination. In particular, the court focused on contacts between VHA, one of the largest hospital GPOs with three of the four merger parties, which contained certain provisions that, on their face, guaranteed VHA members a favourable price. There was evidence, however, that in practice the clause set a floor on the price that the firms would offer to other hospitals and GPOs and that the agreement served to deter the defendants from trying to undercut one another. Based on this evidence, the court concluded that the defendants would have an increased ability to coordinate their pricing practices after the merger.

In a case concerning a Shell Texaco joint venture,[194] the FTC's concerns about the competitive effects in refining, terminals and marketing in various parts of the country were met by a divestment consent order. Notwithstanding that concentration in the relevant markets after the transaction would have remained moderate, such factors as product homogeneity, pricing transparency and information exchanges suggested to the FTC that coordination of pricing was likely.

> *"One critical fact was that industry members have raised prices in the past by selling products outside the market, sometimes at a loss, in order to remove supplies that had been exerting downward pressure on prices. That type of conduct would not make economic sense from the perspective of an individual firm unless it could be confident that it would lead to a coordinated increase in price".*

The *Degussa Aktiengesellschaft* case[195] involved the merger of Degussa's hydrogen peroxide interests in the US with those of E I DuPont and was also settled by consent order. The merger would have led to a significant increase in concentration, reducing the number of US producers from seven to six. In addition to product homogeneity, reliable information on prices and faciltating practices such as product swaps to avoid competitive conflict, there was past history of express collusion and documentary evidence projecting an increase in prices as a result of the merger. The FTC also noted large price differentials between different end uses; "that indicates at

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[193] The first four FTC cases in the following account are taken from the article by Parker and Balto cited earlier. The remainder are from papers provided by one or other agency. They are just a sample of the case law.
[194] FTC Dkt No C3803 21 April 1998.
[195] FTC Dkt No C3813 19 June 1998.

least two things: an ability to coordinate prices and the inability of arbitrage to break down pricing differentials".

The *Exxon Corporation* case[196] concerned a joint venture between Exxon and Royal Dutch Shell which would have combined their businesses in producing a viscosity index improver used in the production of motor oil. The product is an essential input and represents only a small fraction of the final cost of motor oil. The transaction would have given the parties 50 per cent of the concentrated market and reduced the number of suppliers from four to three (with one integrated producer producing only for its own needs). The product is differentiated and subject to on-going technical improvement. These features militate against coordination. Nevertheless, the FTC reasoned that, because of demand characteristics, including the high costs to customers in switching between suppliers, there would still be an incentive to coordinate and that collusion could be effected by sharing customers rather than agreeing on prices.

In a complaint filed on 30 August 1996 against USA Waste Services and Sanifall, the Department of Justice (and the States of Texas and Pennsylvania) challenged the merger of two firms engaged in solid waste hauling services. The relevant local markets were relatively concentrated and entry not easy. The merger would have eliminated one of a small number of significant competitors with the likelihood of higher prices and poorer quality service in the areas affected. The authorities' complaint noted that:

> *"Solid waste handling is an industry highly susceptible to tacit or overt collusion among competing firms. Overt collusion has been documented in more than a dozen criminal and civil anti-trust cases brought in the last decade and a half. Such collusion typically involves customer allocation and price fixing, and, where it has occurred, has been shown to persist for many years".*

The case was settled by a consent decree requiring divestment.

In a not dissimilar case, also settled by a divestment under a consent decree, the Department of Justice challenged a merger of Mid-American Dairymen Inc and Borden/Meadow Gold Dairies Holdings Inc that would have led to a monopoly of supplies of milk to schools in parts of Louisiana and to a reduction in the number of suppliers in other areas from three to two. In its complaint filed on 9 March 1997, the Department of Justice alleged that the merger would lead to an increase in prices. It noted:

> *"the sale and delivery of fluid milk to schools is a business highly susceptible to tacit or overt collusion among competing firms. Numerous dairy firms have been convicted of collusion in school milk bids in a number of criminal anti-trust cases brought in the last two decades. Such collusion typically involves the allocation of school contracts among competitors, and, where it has occurred, has typically persisted for many years."*

These two cases, two of several that could be cited, illustrate the impact of any past history of explicit collusion. In other cases, the concern has been about coordinated effects of a more

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[196]   FTC File No 97 10007 20 August 1998.

subtle kind. In 1997, the Department of Justice challenged Cargill's proposed acquisition of Akzo Nobel's western hemisphere salt operations. The product was homogeneous, the market concentrated and demand stable. The Antitrust Division alleged that the merger would be likely to lead to an increase in prices because "the remaining competitors [would be able] to engage more easily, frequently and effectively in coordinating pricing interaction that harms customers". The case was finally settled by a divestment without a formal complaint being filed.

Another case in which the Department of Justice alleged coordinated conduct among oligopolists concerned the gypsum industry. In 1995, Georgia Pacific Corporation proposed to acquire the gypsum business of Domtar Inc. The companies were fourth and third largest suppliers of gypsum in the Northeast Region of the US. The merger would have led to the three largest suppliers accounting for 90 per cent of the region's gypsum board production capacity. In its complaint filed on 29 March 1996, the Department set out its views on the effects of the merger:

> *"The proposed acquisition will facilitate coordinated pricing activity among the gypsum board manufacturers serving the Northeast Region and will increase the likelihood of anticompetitive price increase for consumers. Gypsum board is a homogenous product, and price is an important dimension of competition. Important price, cost and capacity information is widely available among industry participants. Manufacturers' price changes are announced publicly well in advance of their implementation. Manufacturers which do not sell or currently sell small amounts of gypsum board in the Northeast Region from plants located either within or without the Northeast Region, have insufficient excess capacity or are too distant from the Northeast Region to economically sell enough gypsum board to customers in the Northeast Region to defeat an anticompetitive price increase. Consequently, as a result of this transaction, consumers in the Northeast Region face the danger that gypsum board prices will increase".*

The Department sought to have the merger prohibited.

A case of particular interest involved the Case Corporation, Fiat s.p.a. and New Holland. NV Case was to be merged with a wholly owned subsidiary of Fiat and New Holland would acquire all the shares of the merged entity. There would be effects in a number of markets for agricultural and construction equipment. The merger fell within the jurisdiction of both the US agencies and the Commission. In its decision of 28 October 1999, the Commission cleared the merger in Phase One after the parties undertook to make various divestments to meet the Commission's concerns about the creation or strengthening of dominant positions, including collective dominant positions in the combine harvester and backhoe loaders markets. The Department of Justice filed a complaint against the merger on 4 November 1999 and it sought to have the merger blocked. It summarised its reasons as follows:

> *"The acquisition will eliminate the head-to-head competition between Fiat and Case which has benefited consumers. In addition, given the small number of competitors, Fiat's acquisition of Case substantially increases the likelihood that the remaining dominant firms in these markets will tacitly collude in a non-competitive manner. Higher prices are likely to result from the elimination of an independent, significant competitor. For these reasons, the proposed acquisition threatens to harm customers in the approximately $1.5*

> *billion tractor markets and the approximately $250 million small square baler, large square baler and self-propelled windrower (collectively "hay and forage equipment") markets".*

In 1998, the Department of Justice challenged the proposed acquisition by Northwest Airlines Corporation of 51 per cent of the voting rights of Continental Airlines Inc. The Department noted that competition between these two major "hub and spoke" US carriers had been effective enough to limit either of them from seeking a system-wide increase in prices.

> *"As a result of Northwest's ownership of Continental, however, the two carriers' interests are more closely aligned, making it less likely that either will be the one "spoiler" that blocks a nation wide price increase. Fewer spoilers will lead to higher prices for consumers".*

In addition to the direct reduction of competition between the two, the Department alleged that "coordinated pricing activity between providers of scheduled airline passenger services likely will be facilitated". While North West strongly rejected this analysis, the alliance was, in the event, abandoned.

Sometimes a complaint will ascribe both unilateral and coordinated effects to a merger. Thus, in its complaint in May 2000 against the proposed Alcoa Inc and Reynolds Metals Company merger, involving the largest and second largest aluminium producers in the US, the Department of Justice alleged that the merger would increase both the likelihood of unilateral increases of prices by Alcoa, whose market share was significantly increased, and the likelihood of anti-competitive coordination among Alcoa and other remaining firms in the market. The Department noted that although the chemical grade aluminium market was more concentrated than the market for special grade aluminium, both markets had "certain characteristics conducive to anti-competitive coordination, including product homogeneity, stable, predictable and inelastic demand and supply, and transparency of actions by suppliers and customers". The final judgement in this case required a divestment.

In July 1999, the Department of Justice filed a complaint against the Cargill and Continental Grain Company merger. After the merger, 80 per cent of the grain trading market would have been controlled by the two leading firms. The Department's competitive impact statement alleged that Cargill's acquisition of Continental Grain will substantially lessen competition in relevant markets

> *"by enabling Cargill unilaterally to depress the price paid to farmers and other suppliers. The complaint further alleges that the proposed transaction will also make it more likely that the few remaining grain trading companies that purchase corn, soybeans and wheat in these markets will engage in anti-competitive coordination to depress grain prices".*

In its complaint against the proposed Worldcom Inc and Sprint Corporation merger, filed in June 2000, the Department of Justice alleged coordinated as well as unilateral effects in a number of the relevant markets. In the US market for long distance telephony services, for example, dominated by AT&T, WorldCom and Sprint, the Department noted that competition from Sprint provided a significant constraint on the prices charged by WorldCom. "The proposed acquisition, by eliminating this competition from Sprint, will permit the merged entity profitably to charge higher

prices than it could profitably charge absent the merger" and vice versa. Moreover, "the merger will also facilitate coordinated or other collusive pricing or other anti-competitive behaviour by the merged entity and AT&T". These three companies accounted for 80 per cent of the market with the next largest competitor having only 3 per cent of the market. The Department was satisfied that competition from fringe operators would not be sufficient to prevent coordinated pricing.

The FTC has also alleged both unilateral and coordinated effects in a number of high-profile merger cases. The Coca-Cola and Dr Pepper merger[197] would have brought together the firms with the largest and fourth largest shares of the market for soft drinks concentrates and syrups. The post-merger market share would have been 42 per cent. The FTC's main concern was with the elimination of a substantial independent competitor, increasing Coca Cola's opportunities to increase prices unilaterally. But it was also concerned that the merger would make it easier for the major producers remaining after the merger to collude, not least because there was a history of collusion among their customers, the soft drinks bottlers. The FTC rejected Coca Cola's argument that it would be "virtually impossible" for the companies to monitor any collusive arrangement and to prevent cheating.

In an on-going case, In the Matter of HJ Heinz Company, Milnot Holding Corporation and Madison Dearbon Partners Capital,[198] the FTC concluded that a merger of Heinz and Beech-Nut, subsidiary of Milnot (ultimate parent of which is Madison, a private equity investment firm), would substantially lessen competition in the market for jarred babyfoods. There is one other producer, Gerber, the market leader. Heinz and Beech-Nut competed for the "second slot" on retailers' shelves. In the FTC's view, the elimination of this competition posed a serious risk of an increase in the price of baby foods. The FTC was also concerned at the likely coordinated effects of the merger. Quoting long-established case law, the FTC observed: "No environment could be more conducive to coordinated interaction than a duopoly…and because of the substantial entry barriers in this market, it is without doubt that this duopoly is for ever". The FTC had evidence that suggested the likelihood of tacit collusion in that both Gerber and Heinz had in the past signalled a wish to see less vigorous competition. The FTC could see nothing in the conditions in the baby food market to suggest that the remaining two suppliers would be unable successfully tacitly to collude if the merger was permitted.[199]

5.8   Conclusions

It needs to be borne in mind that the substantive test in US merger control is whether or not competition would be substantially lessened by any merger proposal. This is less restrictive than the dominance test of the Merger Regulation even as the latter has been extended to apply to collective dominance.

A notable feature of current US practice is the attention devoted by the agencies to the analysis of unilateral effects of a merger in a concentrated market. This is largely a result of the development of more sophisticated analytical techniques which make it possible, when the data are available,

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[197]   117 FTC 735 1994.
[198]   FTC Docket No 9295.
[199]   This summary is taken from the Post Trial Memorandum in Support of the Federal Trade Commission Motion for Preliminary Injunction, 15 September 2000.

to estimate the likely effect of the structural change on prices. And it is the effect on prices that is the fundamental concern of the US agencies. While it is not feasible to make similar estimates of the impact of coordination among oligopolists, this is not to say that the US agencies have abandoned their concern with coordinated effects. Indeed, Parker and Balto sum up the lessons to be drawn from the US agencies' experience this way:

> *"First, the coordinated interaction theory is alive and well, and it will be applied in the appropriate case. Second, there is no standard checklist of essential facts that is applied to coordinated interaction cases. Some cases are more straightforward than others, but difficult cases don't get a free pass. Third, mergers resulting in a leading firm with a very large market share are not always challenged under a unilateral effects theory; the agencies will allege coordinated effects when the facts make that appropriate. Finally, the mere fact that products are differentiated does not mean that a coordinated theory will not apply".*[200]

Of these conclusions, we would draw particular attention to the point that there can be no standard checklist of factors that will demonstrate the likelihood of coordinated anti-competitive effects. Assistance is certainly drawn from analysis in the Merger Guidelines of the factors conducive to coordination. More, the Guidelines provide a useful discipline to the agencies' merger review process. But the factors set out in the Guidelines still have to be worked into a coherent theory to explain how the effects alleged by the agency would be likely to come about, given the facts and circumstances of the particular case.

Of the several factors, a high degree of market concentration is perhaps the nearest to a necessary condition for successful coordination, with any merger leading to a duopoly particularly likely to be challenged. However, while an analysis of concentration is always an important part of any assessment, it is clear from US experience and case law that concentration alone is in no way a sufficient condition.

Another interesting fact about the US experience is the significance attached to any evidence of past collusive or coordinated conduct. Notwithstanding that merger control is an exercise in prediction, a study of how a market has operated in the past can still be revealing. Moreover, it needs to be remembered that the US agencies may have to satisfy a court that a merger would substantially lessen competition before it can be stopped. As tacit collusion with no contact or communication between oligopolists would not be unlawful under the antitrust laws, courts might be reluctant to condemn a merger merely on the ground that coordinated interaction was a likely outcome: certainly they would feel on stronger grounds if evidence of past anti-competitive conduct was put before them.

It would seem from the case law that the US agencies do not regard unilateral and coordinated effects as mutually exclusive. The agencies acknowledge that analytically the concepts are distinct. The explanation we have been given by a senior US official of how it comes about that both types of effect are mentioned in the one case runs as follows:

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[200] Parker and Balto (1999).

> *"We intended to argue that (a) there is a reasonable likelihood that the planned merger will create consumer harm, (b) we cannot predict with complete certainty/confidence how that harm will be manifested, and (c) given the structure and prevailing conditions in the industry, there is a risk of either a worsening of (independent) oligopoly pricing or tacit/explicit collusion. Either eventuality would be detrimental to consumers. This "pleading in the alternative" is not all that unusual, particularly in the context of predicting whether the merged firm will exercise its market power through price or quality effects (or other non-price discrimination)".*

In short, unilateral effects are easier to quantify than are coordinated effects.

Finally some useful lessons can be found in US experience on remedies. We have drawn on this experience in Section 6 of our report.

6   REMEDIES

The possible effects of anti-competitive mergers — coordinated or unilateral effects — have been discussed in Section 3 of this report. Anti-trust authorities' aim in merger control is to limit, or ideally to completely prevent, these negative effects on competition resulting from a merger.[201] This section of the report explores the various options authorities have to remedy the potential competitive harm of mergers and the suitability of these remedies in different market situations.

In contrast to the analysis of coordinated and unilateral effects, the remedies dealing with these effects have received little attention in the theoretical economic literature. In the legal literature, the topic has been dealt with more extensively, albeit rarely in a comparative way. Competition authorities have themselves lately given increasing attention to the question of remedies stimulated not least by the merger boom of recent years. Pre-eminent among these is the FTC in the US. Its Divestiture Study published in 1999 is a comprehensive and systematic review of the success of remedies ordered by the FTC between 1990 and 1994.[202]   The study provides valuable insights into the factors that influence the effectiveness of remedies.

The following section on structural versus behavioural remedies, provides a general discussion of remedies and reviews the arguments for and against structural and behavioural remedies with particular emphasis on EU and US practice. Section 6.2 on applicability of remedies for dominance looks at remedies in the context of single dominance and Section 6.3 considers some general issues on the choice of remedy. Section 6.4 examines issues arising from coordinated behaviour, particularly how the arguments might change in a situation of collective dominance. Some case examples for both single and collective dominance from the EU and the US are given in Section 6.5 on antitrust experience with remedies in oligopolies. Finally, some conclusions are offered.

6.1   Structural Versus Behavioural Remedies

A merger which the Commission finds, after a second phase investigation, incompatible with the common market, in that it creates or extends a dominant position such that effective competition within the market is impeded, will be prohibited. However, remedies short of outright prohibition are possible, notably when competition concerns arise only over some of the activities of the merging parties. From the outset it was possible for the Commission to accept commitments from the parties that would resolve its concerns in the course of a second phase investigation, and since an amendment of the Merger Regulation in 1997[203] the Commission has also been able to accept commitments during phase one "where the competition problem is readily identifiable and can easily be remedied."

There have in fact been an increasing number of cases since 1997 that have been cleared subject to commitments of one sort or another, including several collective dominance cases.

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[201]   A merger can of course also have positive effects such as efficiency gains which are taken into account by anti-trust authorities.
[202]   FTC (1999).
[203]   EC Regulation 1310/97

According to Claude Rakovsky of the Merger Task Force, this is likely to be because companies are "more and more aware of the limits of what can be accepted by the Commission" and willing to consider remedies that would avoid the cost of a failed merger.[204] Drawing on its growing experience with remedies of this type, the Commission on 21 December 2000 issued a Remedies Notice which "sets out the general principles applicable to remedies acceptable to the Commission, the main types of commitments that have been accepted by the Commission in cases under the Merger Regulation, the specific requirements which proposals of commitments need to fulfil in both phases of the procedure, and the main requirements for the implementation of commitments."[205]

In the US, the merger wave has tripled the number of reported Hart-Scott-Rodino transactions between 1991 and 1999. The total value of these mergers has increased eleven-fold during this period, from $169 billion to over $1.9 trillion.[206] Parker and Balto (2000) note that, in this merger wave, it is becoming increasingly difficult to find remedies that provide secure and effective relief to competition concerns. The reason for this, they suggest, lies in the increasingly strategic nature of mergers through which firms attempt to reach a more dominant position in the market. Furthermore, as industry concentration rises, the number of potential acquirers of divested assets decreases.

Remedies, as an alternative to a prohibition decision, should be designed to resolve the competition concerns identified by the anti-trust authority. Depending on the nature of the competition problem, there are several possible remedies which can generally be classified as structural or behavioural remedies.

The former are aimed at ensuring that the structure of the industry within which firms compete does not become one which facilitates anti-competitive behaviour. On the other hand, behavioural remedies, designed to facilitate competition, are geared at shifting firms' behaviour in a way that promotes effective competition or prevents anti-competitive or exploitative behaviour. Examples include commitments to licence or to supply competitors or putative competitors, and commitments to relax restrictive distribution arrangements[207] or not to practice price discrimination.

In the EU as well as in the US it is the responsibility of the anti-trust authority to show that a merger is likely to harm competition. However, in the event the authority finds reasons to object to the merger, the burden is on parties to propose remedies and provide evidence that these will be effective and that they are likely to solve the competition concerns raised by the authority. In both jurisdictions, structural remedies, most importantly divestures, are the preferred form of remedy.

The Commission in its Remedies Notice states that:

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[204] Rakovsky (2000).
[205] Commission Notice on remedies acceptable under Council Regulation (EEC) No 4064/89 and under Commission Regulation (EC) No 447/98 para3.
[206] Parker and Balto (2000).
[207] It could be argued that remedies aimed to facilitate competition are structural not behavioural, but this is a semantic point.

> *"In assessing whether or not a remedy will restore effective competition, the Commission will consider all relevant factors relating to the remedy itself, including inter alia the type, scale and scope of the remedy proposed, together with the likelihood of its successful, full and timely implementation by the parties".*[208]

Furthermore, the Commission stresses the importance of analysing these factors in the context of particular market structure including specific market characteristics. An important aspect is the uncertainty of the eventual outcome inherent in any proposed remedy. It is in the interest of the Commission to keep this uncertainty as low as possible, which should be taken into account when parties propose remedies.

Similarly, in the US the:

> *"first objective [of the FTC] is to determine which remedies will effectively and fully preserve competition. A second objective is to select a remedy that will preserve competition with as much certainty as possible. The risk of inadequate relief, or the burden of untimely relief, should not be borne by consumers."*[209]

With respect to the suitability of structural and behavioural remedies, the EU Commission's Notice refers to a principle laid down by the CFI in the *Gencor/Lonhro* case that the basic aim, where commitments are accepted as a condition of clearing a merger, has to be that a competitive market structure is restored.[210] The Commission notes that this suggests that structural remedies such as divestment are to be preferred to behavioural remedies, especially behavioural remedies that would involve the Commission in continual monitoring such as commitments not to engage in discriminatory conduct or to deal with a subsidiary on an arms' length basis. However, behavioural remedies that would prevent the creation of a dominant position by significantly reducing entry barriers into a market will not be ruled out.

This approach is based on the CFI's statement in *Gencor/Lonhro* regarding structural versus behavioural remedies:[211]

> *"It is true that commitments which are structural in nature, such as a commitment to reduce the market share of the entity arising from a concentration by the sale of a subsidiary, are, as a rule, preferable from the point of view of the Regulation's objective, inasmuch as they prevent once and for all, or at least for some time, the emergence or strengthening of the dominant position previously identified by the Commission and do not, moreover, require medium or long-term monitoring measures. Nevertheless, the possibility cannot automatically be ruled out that commitments which prima facie are behavioural, for instance not to use a trademark for a certain period, or to make part of the production capacity of the entity arising from the concentration available to third-party competitors, or, more*

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[208] Commission Notice on Remedies Acceptable Under Council Regulation (EEC) No 4064/89 and Under Commission Regulation (EC) No 447/98 published 2000 para7.
[209] Parker and Balto (2000.
[210] Judgement of the Court of First Instance of 25 March 1999 in *Gencor v Commission* Case T102/96 [1999] ECR-753 at para 316.
[211] Op.cit. at para 319.

generally, to grant access to essential facilities on non-discriminatory terms, may themselves also be capable of preventing the emergence or strengthening of a dominant position."

Sometimes a package of structural and behavioural remedies will be appropriate.

More generally, the Commission recognises that each case, and the remedy that might be appropriate, has to be addressed on its own merits. Or as Parker and Balto reporting on US experience put it, "there are no absolute rules. We evaluate remedies based on the facts in each case."[212]

6.2   Applicability of Remedies for Dominance

Until the Nestle/Perrier case[213], the main concern of merger control in the EU was that a merger could lead to the creation or the strengthening of a single dominant entity in one or more markets. Under Article 82 the Court of Justice has tended to express the concept of dominance as the ability of an undertaking to act without regard to its competitors, actual and potential, or its customers, and, in particular, to set prices as it chooses.[214] In the Gottrup-Klim case, the Court said:

"The concept of a dominant position is defined in settled case-law as a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by giving it the power to behave to an appreciable extent independently of its competitors, its customers and ultimately of the consumers."[215]

As laid out in Section 1.1 on collective dominance, with Nestle/Perrier the Commission began to look at collective dominance when assessing the effects of a merger. But this does not appear to have led to any change in the approach to remedies. The Commission's Notice on remedies provides useful guidance on both policy and procedures, but it draws no distinction between mergers which create or strengthen a position of single firm dominance and those where a position of collective dominance is created or strengthened. The implication is that considerations that apply to the one type of case will also apply to the other.[216]

Given the absence of an explicit distinction between remedies for single and collective dominance, is there any reason to discuss the two situations separately? To answer that question it is useful to step back and look at the mechanisms that give rise to the competition concerns in both cases.

As noted above, the concept of dominance in general refers to a situation in which one or more firms have enough market power to act independently of third parties in the market. The main concern is that, after the merger, prices could rise and/or quality could decrease. In the case of single dominance, there is one entity under unified control that could act as a de facto monopolist. Collective dominance could lead to the same anti-competitive results when several firms coordinate to raise prices or reduce output. Remedies should be designed to prevent such outcomes of the merger. Hence, insofar as the remedy can be described as the restoration of effective competition, there is no substantial difference between remedies for single and collective dominance.

In a situation of single dominance, the restoration of effective competition mainly involves the recreation of a competitor that was lost due to the merger. Ideally, a new firm - either created by divestment of an ongoing business or by entry encouraged by partial divestment - would take over the role of the competitor that was absorbed through the merger. The case of collective dominance, however, seems to pose a more complex problem to anti-trust authorities aiming to restore effective competition. The anti-competitive effect arises through the coordination between the firms including firms not merging. As argued in Section 2, coordinated effects occur as a result of firms acting strategically in a market in which conditions are favourable to tacit collusion. The special considerations arising from the coordination of firms to act similarly to a dominant firm as opposed to the existence of a single dominant firm will be discussed in Section 6.4. The following section presents a general discussion of the issues that apply to both single and collective dominance.

6.3   General Concerns Regarding the Choice of Remedies

Of the various matters that need to be taken into account in determining whether a divestiture will be an acceptable remedy to the Commission's competition concerns, two requirements stand out as of overriding - and inter-linked - importance:

a) the assets to be divested need to provide the basis of a viable business that can operate independently of the merger parties and, in a reasonably short period of time, be expected to provide effective and sustained competition to those parties; and

b) the purchaser of the assets needs to be capable of operating the assets and running a viable, competitive business and have the incentive to compete with the merged firm.

The first of these requirements is most likely to be met if the divestment is of an on-going business, whether of the acquired or the acquiring firm, rather than a collection of assets, whether physical assets such as plant or intangibles such as brands or intellectual property. A viable business that is operational immediately after the divestiture, including supplier and customer base, allows for a fast and lasting transfer of market share from the merger parties to the new competitor. The cases included in the FTC study support this intuitively obvious principle. The study found the success rate to be considerably higher if an on-going business was divested rather than assets to facilitate new entry. In particular, out of 22 divestments of on-going

businesses, 19 were viable whereas out of the 15 selected asset divestments only nine were viable.[217] But even a full divestiture of an on-going business may not be enough to ensure that effective competition is restored. It may be necessary to include other ancillary assets in the divestiture package if a viable business in new hands is to be created.

For example, in the oil industry merger BP/ARCO, there were significant competitive overlaps in the production, sale, and delivery of Alaska North Slope crude oil. The parties entered into a separate agreement with the State of Alaska which would have combined various assets of BP and ARCO. This mix-and-match approach at best only partially cured the direct overlaps, but failed to create a firm with the efficiencies possessed by ARCO. The FTC rejected the proposed consent decree and sought to enjoin the merger. Ultimately, after extensive negotiations, the parties agreed to the divestiture of all of ARCO's complete, free-standing Alaska businesses, including oil and gas interests, tankers, pipeline interests, exploration data, and selected long-term supply agreements. In this case, divestiture of an on-going business plus ancillary assets was necessary to provide the acquirer of the assets (Phillips) with the ability to fully restore competition.[218]

The case *Unilever/Amora-Maille*[219] is another example in which the merger parties were required to sell more than the assets immediately responsible for the competition concern. The Commission found that the combination of two brands would create a dominant position in France in three relevant markets (mayonnaise, salad dressings and other cold dressings). For the phase one clearance of the transaction, Unilever divested the brand "Bénédicta" as a whole, including products in markets that were not affected by the merger and the use of the brand in all other countries. The Commission believed that a new entrant would require the full product range and an international presence to establish itself as a successful competitor to Unilever.[220]

However, divestiture of an on-going business, as in the above cases, may not always be a practicable proposition. The acceptability of a remedy involving the divestment of assets - a partial rather than a full divestiture - will depend heavily upon the identity of the purchaser and his capabilities. US practice is increasingly to seek an "up-front" buyer for any business or assets that are to be divested. Indeed, "up-front buyers are probably the most vital tool, in assuring a successful divestiture" and up-front buyers are employed in over 60% of US cases resolved by non-behavioural undertakings.[221] The Commission's usual approach, in contrast, has been to allow a specified, and often quite lengthy, period after a merger has been cleared within which an agreed divestiture must be implemented. Arguably, this policy gives too much weight to the commercial interests of the parties who have offered the divestment package and one Merger Task Force official has commented that there could be a case for shortening the period.[222]

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[217] Out of the 3 divestments of on-going businesses that were not successful as remedies, one was not viable at the time of divestiture, one was not operated independent of the merged firm and one was not operating in the relevant market. FTC (1999) p11.
[218] This example is taken from Parker and Balto (2000).
[219] Case No Comp/M 1802.
[220] This example is taken from Rakovsky (2000) see pp6-7 for more detail.
[221] Parker and Balto (2000).
[222] Rakovsky (2000).

Naturally, merger parties have a strong interest in limiting the required divestment. With respect to general profitability concerns, asset divestment might not be in line with firm strategy at the point of the merger. Strategically, it would be against the firm's interest to create a new and efficient competitor. Therefore, the proposed assets may be chosen such that the divestment package is not attractive to potential buyers, assets may not be properly maintained prior to the completion of the divestment and there are no incentives to ensure a timely execution of the sale. The anti-trust authorities have several options for dealing with these problems, for example the appointment of a trustee to sell the assets or the threat to void the clearance decision in the case of failure to divest. In order to provide a further incentive for firms to comply with the requirements, a "crown jewel" provision – the right of an appointed trustee to sell the assets and add assets to make the package more saleable – could be used. The US agencies have used this tool successfully since 1980.

In certain situations divestiture, although the easier remedy to impose and monitor, may not be the most appropriate remedy. This could be the case if a separation of assets would diminish the pro-competitive effects of the merger. For example, in R&D intensive high-technology markets, on-going research projects might be severely disrupted if businesses or assets were disentangled. Even if a separation of businesses could be attempted, in addition to efficiency losses, the result could be cooperation between firms or the new firm being dependent on the previous owner. The FTC has used licensing as a remedy in such cases, for example in the merger between Ciba and Sandoz.[223]

As pointed out earlier, behavioural remedies are likely to require on-going involvement and monitoring by the competition authority and might, even with appropriate enforcement, not fully resolve the competition problems. Therefore, behavioural remedies such as firewalls and non-discrimination provisions are rarely favoured but might be suitable under special circumstances. The FTC has used these remedies particularly for competition concerns in vertical mergers. The *Time Warner/Turner* case is an example in which the FTC approved the merger based on a wide variety of behavioural rules.[224]

There may, however, be cases in which no remedy short of the prohibition is likely to restore competition. Example of such situations were given by Rakovsky (2000):

- The merged firm is of much bigger size than any other competitor and there is no separable (and viable) entity that could be divested to match the gap.

- Strong vertical links exist at the heart of the deal that could not be loosened.

- In very concentrated oligopolistic markets, the problem might be that the only credible buyers would themselves be part of the oligopoly.

This last point goes to the heart of the problem of remedies for collective dominance.

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[223] Parker and Balto (2000).
[224] Ibid.

6.4　Issues Arising from Coordinated Behaviour

Turning now to the particular question of remedies in collective dominance cases, the competition concern that has to be dealt with is the likelihood that the structural change brought about by a merger will lead to coordinated behaviour - tacit collusion - by a group of oligopolists, or to more effective such coordination.　As discussed at length in Section 2, several necessary conditions have to be met for a tacit collusion mechanism to be implemented and maintained over time.　The effects of this coordination in the market can be similar to a single entity acting as a monopolist but in this case the problems arise if the conditions in the market are favourable to coordination. The merger might make coordination more likely but the anti-trust authority will generally not be able to change the conditions in the market.　Examples of such unchangeable conditions include the nature of the products, cost structures of firms and the growth and stability of demand.

It was pointed out earlier that the difficulty of dealing with tacit collusion ex-post might justify a tighter ex-ante control of mergers that are likely to result in tacit collusion.　Given certain unchangeable market conditions favourable to tacit collusion, the question arises whether the remedy will be able to restore the status quo ante or if it might even improve the status quo ante, for example making the market more competitive by encouraging the entry of a maverick firm.

The objective that a remedy should ensure that competition will be at least as effective as before the merger implies that a structural remedy involving divestment will invariably be the most appropriate remedy.　As said earlier, the full divestiture of an on-going business is more likely to restore effective competition than a partial divestiture of assets.　In certain cases, partial divestment might be the more practical remedy, however.

As in any dominance case, finding a suitable buyer for the divested assets can prove difficult.　In collective dominance cases this problem is even more acute.　The competition concern arises from the behaviour of the remaining competitors in addition to that of the merger parties. Divestment to one of the other oligopolists has the risk that the purchaser will be content to coordinate his behaviour with that of the other few firms in the market.　Therefore an outside buyer seems more desirable.　However, in a tight oligopoly with substantial entry barriers – the case in which collective dominance concerns are likely to arise – there might not be an outside party willing or capable of entering the market.

Even if there is a suitable outside buyer, the remedy could be ineffective if the buyer finds it more profitable to "join the club" and coordinate with the existing firms.　The chances of that happening decrease with the dissimilarity of the buyer but the more of an outsider the buyer is, the more likely the divestment will fail.　Evidence of a higher probability of failure if the buyer has insufficient expertise in the market was found in the FTC study.[225]　Hence, there is a trade off between the success of the divested business in terms of an on-going and profitable operation and the likelihood of coordination between the entrant and the other firms.

If it is not feasible to divest an on-going business, authorities have the option of remedies designed to encourage entry instead.　The divestment of selected assets in combination with

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[225]　FTC (1999) p14.

various other remedies such as licensing or granting access to essential facilities could induce entry by a new firm or aid the expansion of a smaller competitor. In a market conducive to tacit collusion, however, it could prove even more difficult than in the case of single dominance to find an entrant who will not cooperate with the incumbents. Entry into the tight oligopoly would clearly be a risky venture and the entrant could be more vulnerable to predatory behaviour if it is not a large player itself. Instead of establishing itself as an effective competitor and facing potential aggressive behaviour from incumbents, the entrant might seek to coordinate with the incumbents.

In addition to strategic reasons for cooperation, there is the risk of a continuing relationship between the merger parties and the purchaser of the divested business or assets due to business related requirements. The more the purchaser depends upon the parties for inputs or know-how to run his business, the less likely that business is to emerge as a truly separate competitive force.[226] This point is particularly significant in collective dominance cases where the danger is that the attraction of coordinated, rather than genuinely competitive, conduct will survive any remedies, even divestment, that may be put in place.

Despite these potential problems from continuing coordination, it could still be argued that in the case of divesture to a purchaser that is significantly different from the incumbent group, the new firm could act as a maverick and could destabilise a previously collusive equilibrium in the market. In such a situation, the remedy might even be able to improve the competitiveness of the market compared to the situation before the merger. However, even though this is a possible outcome, it seems achievable only under exceptional circumstances.

Another problem in finding an effective remedy in collective dominance cases is that the divestment process itself may serve to reinforce the oligopolistic tendencies in a market. If the parties to a merger reason that the authorities will accept a divestment commitment of some kind as a remedy for their competition concerns, there will be discussions at some stage, up-front or after a conditional clearance decision has been reached, with potential purchasers where a good deal of useful business information and intelligence will be shared. It is hard to avoid the conclusion that the firms involved may be more likely to look for ways of continuing some kind of cooperation after the event of divestment rather than opting to engage in aggressive competition.

Some forms of remedies might make the market conditions even more favourable to coordination. For example divestments involving supply agreements or sharing of essential facilities establish structural links between firms which, as pointed out earlier, makes collusion more likely. Furthermore, divestiture leads to a redistribution of assets which might produce an industry where firms have more symmetrical positions - this too could make collusion more easily sustainable. On the other hand, as part of the conditions for the approval of the merger, it may be possible to obtain commitments that would strike down some features of the market that facilitate coordination; possibilities would include any structural links such as minority shareholdings in competitors, cross-licensing agreements or participation in joint ventures, and information sharing agreements.

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[226] The FTC study found evidence that continuing relationships between buyers and sellers of divested assets reduces the probability of success of the remedy. First, this can be due to harmful strategic actions of the seller that are hindering the buyer to establish

Remedies that are directed at coordinated behaviour itself are quite unlikely to be effective. It is as impracticable to require firms not to take account of their interdependence in their decision making after a merger as it is in any other situation. It is true that such behavioural remedies as price caps can be contemplated as a way of reducing the welfare loss from the exercise of market power, whether collectively or individually. A price cap on the merger parties may well constrain the general level of prices in the market. But price caps do nothing to deal with the underlying structural problem and are more a short-term palliative than a long-term remedy. They have been used by the UK authorities but only in the case of a completed merger where the conclusion was that divestment would be too draconian a remedy for the perceived adverse effects of the merger.

Clearly, there are no easy answers to the question of what would be an effective remedy in collective dominance cases.

6.5   Antitrust Experience with Remedies in Oligopolies

The following case examples of decisions by the FTC and the Commission illustrate the competition concerns identified and the remedies used in several highly concentrated markets. The last case, Staples/Office Depot, is an example of a situation in which no remedy could be found that seemed sufficient to resolve the competition concerns.

6.5.1   Exxon/Mobil

The Commission's decision in Exxon/Mobil[227] of 29 September 1999 is an excellent example of the type of commitments that the Commission has felt able to accept as resolving its competition concerns over a merger. The Commission had concluded that dominant positions were created or strengthened in a number of markets in which the two multi-national oil companies operated:

i) in the wholesale transmission of gas in the Netherlands, the dominant position of Gasunie would be strengthened by the elimination of the only other "active" competitor;

ii) in the long distance wholesale transmission of natural gas in the south of Germany, a market in which a number of characteristics could facilitate coordination, the merger would strengthen a position of collective dominance by a reinforcement of structural links between the existing six major suppliers and the elimination of Mobil as a potential competitor to the oligopoly;

iii) in underground storage facilities for natural gas servicing the south of Germany, the merger would strengthen the dominant position of Ruhr Gas;

iv) in base oils, the merger would strengthen the dominant position of Exxon and BP/Mobil (though competition would not be weakened in the markets for additives and finished lubricants);

v) in a number of national retail motor fuel markets, the merger would strengthen existing oligopolies;

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itself in the market. Second, on-going relationships can lead to a successful new business which is coordinating rather than competing with the merged firm.
[227]   *Exxon/Mobil* Case No IV/M 1383 29 September 1999.

vi) in aviation lubricants, the merger parties would have a dominant position;

vii) in aviation fuels, the merger would lead to a dominant position in the supply of jet fuel at Gatwick Airport.

The Commission was able to clear the merger subject to the following conditions:

i) Mobil Europe Gas Inc (MEGAS) to be sold as a viable going concern to a purchaser approved by the Commission, the sale to include MEGAS' contracted supply and sales service portfolio and all associated transport and other service agreements. A trustee to be appointed to supervise the running of the business pending its sale. The Commission were clearly concerned to ensure the viability of the divested business, for example, in having access to natural gas supplies.

ii) Exxon were to sell their 25% equity interest in Thyssengas GmbH to a third party approved by the Commission. The Commission considered that this would compensate for the strengthening of the oligopoly otherwise resulting from the merger. Shorn of the link with Exxon, Thyssengas was more likely to replace Mobil as a potential challenger to the oligopoly. The Commission noted that this view was not shared by all it had consulted, especially in view of the continuing structural links between Thyssengas and other oligopolists. The parties were also to use "reasonable efforts" to get a reallocation of Mobil's voting rights in Erdgas Munster to increase the chances of this company being an effective potential competitor when the market was liberalised.

iii) In an effort to offset any increase in entry barriers as a result of the merger, the parties agreed to sell to third parties Mobil's rights to one or more of the depleted reservoirs suitable for conversion into storage facilities servicing the south of Germany.

iv) The parties agreed to transfer control over one or more base oil businesses to BP Amoco and/or one or more other third parties approved by the Commission, in one or other of the following ways:

- transfer of ownership of a business or of equivalent capacity

- long term lease or similar arrangements, subject to various specified conditions to   ensure independent operation by the lessee.

In addition to the base oil manufacturing facilities, necessary personnel, supply contracts, customer lists and contracts related to the divested facilities, access to technology and technical support were to be included in the package.

The Commission concluded that these steps would be sufficient to ensure that Exxon/Mobil was not in a dominant position in base oils.

v) The commitments to deal with the various strengthened oligopolies in the retail market for motor fuel were:

- the parties to dispose of Mobil's share in Aral. In the Commission's view, this would "entirely remove" incentives for Exxon or BP/Mobil and Aral to coordinate their competitive behaviour in markets where the merger would have given them a collective dominant position;

- the parties to terminate Mobil's participation in the fuels part of the BP/Mobil joint venture. This would serve to eliminate all overlaps between Exxon and Mobil's fuel business where the Commission had concluded that the merger would create or, more likely, strengthen a position of collective dominance.

vi) Exxon's world-wide aviation lubricants business with commercial airlines was to be sold to a purchaser approved by the Commission. The sale was to include all necessary managerial and technical support (Mobils' aviation lubricants business was considered to be too integrated into the rest of the business for a viable business to be successfully divested). The divestment would mean that Exxon would not be in a dominant position in this market.

vii) The parties committed themselves to sell aviation fuel pipeline capacity from Coryton refinery to Gatwick Airport equivalent to Mobil's 1998 sales volume at Gatwick. In the Commission's view, this should remove the bottleneck control that the merger would otherwise give the parties over the supply of jet fuel to Gatwick. In turn, that would mean that the merger would not result in a dominant position.

The case illustrates how the remedy has to be carefully crafted to deal with the particular competition concerns arising on a properly defined market. The remedies accepted in the markets where collective dominance was the issue seem no different in kind from those put in place to deal with single firm dominance.

6.5.2   DuPont/ICI[228]

An example of a case investigated by the FTC in which coordinated interaction was the main concern was the proposed acquisition of the Tioxide division of Imperial Chemical Industries (ICI) by DuPont in 1998. This example shows that even the divestment of an on-going business might not resolve the competition problems if there is no acquirer with the incentives and ability to fully restore competition. DuPont was the leading supplier both in the US and the world of titanium dioxide (TiO_2) pigments which are used in paints, plastics, paper, inks, and other products to provide whiteness, enhance brightness, and improve opacity. ICI was the second-largest supplier in the world, with plants located both in the US and abroad. The deal was structured so that DuPont would acquire ICI's TiO_2 facilities outside North America, and NL Industries, another competitor, would acquire ICI's TiO_2 assets in the US.

The DuPont/ICI transaction did not result in a production overlap in North America. However, ICI was a significant importer of TiO_2 into the US, especially for use in plastics and architectural coatings, to the extent that imports accounted for a majority of ICI's sales to North American customers. This implied that the merger parties were in fact competitors in North America. ICI was also developing new sulfate-based TiO_2 products to compete with DuPont's chloride-based

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[228]   This example is adapted from Parker and Balto (2000).

products. Consequently, the acquisition would still give DuPont control over a very substantial percentage of the supply of TiO_2 for North American customers. The concern of the FTC was that the elimination of an important import competitor like ICI could facilitate or increase the likelihood of coordinated behaviour.

The additional undertakings that DuPont proposed would have eliminated one of ICI's European plants from the acquisition. NL Industries would instead have acquired the plant and DuPont would have supplied TiO_2 products to NL for two years. DuPont would not have competed against NL for North American customers by sourcing them from plants acquired from ICI; and DuPont would have divested ICI's North American customer lists, current contracts, and customer information. The FTC, however, found several problems with these proposals. The plant that DuPont proposed not to acquire was a relatively minor supplier to North America, and the non-competition agreement would be an oddity for an anti-trust order. The most critical deficiency was that the proposal did not address the elimination of a competitor that stood in the way of coordinated behaviour. The parties abandoned the transaction in January 1999.

6.5.3   New Holland/Case

In the case New Holland/Case[229] in 1999, the Commission found the parties operating in highly concentrated markets, though the level of concentration varied across the affected markets in terms of products and geographical areas. The parties operated in a number of markets within the agricultural machinery sector. Competition concerns were raised in the markets for large square bailers, combines and standard tractors. The Commission noted that the parties' market position was not likely to be easily challenged due to substantial brand or dealer loyalty and the importance of a dense and well-developed after-sales network. It was found that in the combine harvester market, the parties held symmetric shares with Claas, a third firm that also seemed to have similar cost structures to the merger parties. The Commission raised the concern that this, in combination with price transparency, could lead to coordinated behaviour in the market.

The merger was approved subject to undertakings by the parties. A combination of divestments and other commitments were used to remedy the competition concerns. The parties were required to divest several on-going businesses to third parties, for example one of New Holland's combine ranges including all physical assets, patents, copyrights, confidential information and the brand name. In addition, New Holland was required to allow its dealers to freely sell the products manufactured by the purchaser of all the divested assets.

6.5.4   Staples/Office Depot[230]

A case in which the FTC could not accept the remedies proposed by the parties is Staples' proposed acquisition of Office Depot in 1997. The merger of the two largest office supply superstore chains in the US would have resulted in a monopoly in many geographic markets. In others, there was at most one other superstore competitor, Office Max. The parties offered to

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[229]   *New Holland/Case* Case No Comp/M 1571 28 October 1999.
[230]   This example was adapted from Parker and Balto (2000).

divest stores in local markets where they had direct overlaps; they proposed a divestiture of sixty-three stores, primarily in merger to monopoly markets.

The proposed solution, however, did not address a significant potential competition issue and the creation of a duopoly market even in the case of divestiture. Regarding potential competition, both Staples and Office Depot had been rapidly expanding into each other's geographic markets where they did not already have a store. The evidence in the case clearly showed that prices were lower in markets where there were two competing superstores, rather than a single superstore, and lower still in markets where there were three superstore competitors. The merger would have eliminated the likelihood of lower prices as Staples and Office Depot continued to invade the other's backyard, and the proposed divestitures did nothing to cure that.

In case of divestiture, the most likely purchaser of the divested stores would have been Office Max, which was already in the market and could provide a basis for achieving reasonable scale economies. Therefore, a divestiture to Office Max would result in a duopoly in the overlap markets, increasing the probability of coordinated behaviour. Consequently, the FTC rejected the proposed divestitures. According to the FTC, this decision led to substantial benefits to consumers. Both Staples and Office Depot have expanded at a rapid rate, and within three years after the merger was abandoned each firm has surpassed the size that the merged Staples/Office Depot would have achieved. Both firms are competing aggressively, invading each other's markets and driving prices down to levels not even seen before the merger was proposed. Both firms compete aggressively on the Internet, where Office Depot is the clear leader.

We suggest that these cases, a small sample of those that could be surveyed, well illustrate the range of possible remedies and the problems that can arise in ensuring that effective competition is restored, especially in concentrated markets susceptible to coordination.

6.6 Summary

There appears to be much overlap in the set of remedies that can be used to tackle single and collective dominance. In fact, there is no obvious difference between remedies sought when looking at the cases. The general problems associated with the implementation of remedies such as appropriate asset selection, finding a suitable buyer, strategic behaviour of sellers and detrimental continuing relationships between buyers and sellers of divested assets apply to both forms of dominance.

Collective dominance, however, poses more severe problems to competition authorities aiming to prevent coordinated behaviour after a merger. Because it is not just the elimination of a competitor that causes the competition concern, creating a new competitor which replaces the one that was lost might not be sufficient to restore the level of competition before the merger. This is particularly true if the acquired firm was a maverick firm that prevented successful tacit collusion in the market.

It is therefore necessary that competition authorities faced with a collective dominance case keep in mind the mechanism by which coordinated behaviour of firms can occur. Care is needed to ensure that remedies chosen do not further strengthen the factors conducive to coordination. If

possible, facilitating practices and structural links that could contribute to the sustainability of tacit collusion should be eliminated – though this may not always be possible without action under other parts of the competition law.

Clearly a divestment which replaces one member of a coordinating group with another will not be effective. It will never be easy to identify whether the acquirer of a divested business or package of assets will be likely to behave in ways that would destabilise any attempts of the other firms tacitly to collude. The analysis in this report of the factors conducive to coordination suggests that the likelihood will be greater where the newcomer has competitive advantages of its own, perhaps springing from its record in R&D and innovation, or a reputation for aggressively competitive behaviour in other markets. Whatever the remedy, there will always be a risk of the newcomer "joining the club". We can only suggest that to be forewarned is to be forearmed.

7   CONCLUSIONS

This report is concerned with the assessment of mergers in oligopolistic markets. This has become an increasing preoccupation of the Commission since confirmation by the CFI in 1998 that the Merger Regulation can be applied to mergers which create or strengthen a position of collective dominance. Moreover there continues to be debate about the interpretation of collective dominance, a debate stimulated by the Commission's decision in the *Airtours/First Choice* case, a decision which Airtours has appealed to the CFI.

The uncertainties arise because oligopolistic markets can operate in ways that tend towards either competition or monopoly. It is important for merger control to be able to distinguish between them. This is inherently difficult. It is a predictive exercise, requiring a consideration of the likely change in behaviour of the firms in the market as a result of the change in the structure of that market brought about by the merger. Under the Merger Regulation, the first stage assessment has to be made in four weeks. This is precious little time in which to decide whether there are "serious doubts" about the compatibility of an oligopolistic merger with the common market. Even in a second stage investigation, time is invariably short.

7.1   Assessment Criteria

The Commission has set out a step-by-step approach to its assessment of mergers in oligopolistic markets, a key step in the process being a consideration of those factors and market characteristics which, in principle, could indicate the likelihood of coordinated conduct following a merger, with detrimental effects on consumer welfare (see Section 4.3 of the report). It is the coordinated action of oligopolists that underlies the legal concept of collective dominance. The coordination does not have to be explicitly collusive, and therefore illegal. A collusive outcome can be achieved by collusion of a more tacit kind. Indeed, this is the behaviour that will most usually give rise to collective dominance in the context of merger control.

The check-list approach to the assessment of oligopolistic mergers can also be found in the practice of the US anti-trust agencies (see the discussion in Section 5) and of other competition authorities, for example in those of Australia, Canada and Germany.

A check-list can be a helpful guide to the factors that should be taken into account. But these still need to be developed into a systematic analysis of how the market characteristics and the oligopolistic market structure created by a merger are likely to result in collusive rather than competitive behaviour. A check-list cannot be applied mechanically, merely "ticking off" what seems a sufficient number of the listed factors. Our review of a number of EU cases where the Commission's concern was with collective dominance suggests that its check-list has not always been applied as analytically as might be hoped (see Section 4.4).

A prime purpose of this project has been to develop the traditional check-list approach to the assessment of oligopolistic mergers. Our starting point is a comprehensive review of the economics literature, particularly the game theory literature which focuses on the oligopoly "problem", namely how firms respond to the mutual interdependence of their actions in the market place. This review is fully reported on in Section 2.

On one point we are clear from our survey of the theoretical literature and a range of empirical studies and cases: there are no *sufficient* conditions for coordination. Collusive-type behaviour can, and does, occur in a variety of market settings. It can also take various forms and can apply to varying degrees. Adverse effects on welfare can follow even where firms are able to coordinate their decision, for example on price, only partially.

However, we have identified a number of *necessary* conditions for coordinated conduct. We have then analysed how market characteristics commonly included in the traditional check-lists relate to these necessary conditions or criteria. These relationships are summarised in the table below and extensively analysed in Section 2 of the report.

Table 7.1
Conditions for Coordinated Conduct in Oligopolistic Markets

	Necessary Criteria	Factors that contribute to the necessary criteria
1	Very few firms	
2	Repeated interaction	no large and lumpy orders
3	Barriers to entry	
4	Capacity to reach a mutually acceptable equilibrium	homogeneous products market transparency symmetry stable demand conditions low buyer power
5	Ease of detection of cheating	homogeneous products market transparency symmetry stable demand conditions low buyer power
6	Enforceability of compliance	symmetry stable demand conditions (no fast growing high-tech market with short product cycles) no/short detection lags multi-market contact excess capacity

A more elaborate formulation of the factors tending to facilitate tacit collusion and of how they relate to the six necessary criteria will be found in Table 2.3 of the report, while Figure 2.1 provides a diagrammatic representation of the interrelationships between the various factors and necessary conditions.

Economic theory does not provide a clear ranking of the factors, but does offer guidance on which are essential and which play a secondary role. Thus it is an essential condition that there be "very few" firms in the market if coordination is to be achieved and sustained though theory does not suggest any "magic number" at or below which there will always be a collusive outcome. Given the significance of high concentration, we can see advantages in the use of concentration data as an initial screen to identify problematic mergers as in the US Guidelines. We suspect that it would be possible to devise sensible threshold levels from a study – which we have not carried out for this report – of concentration and market shares in cases where the Commission has had "serious doubts" about a merger, whether on single or collective dominance grounds.
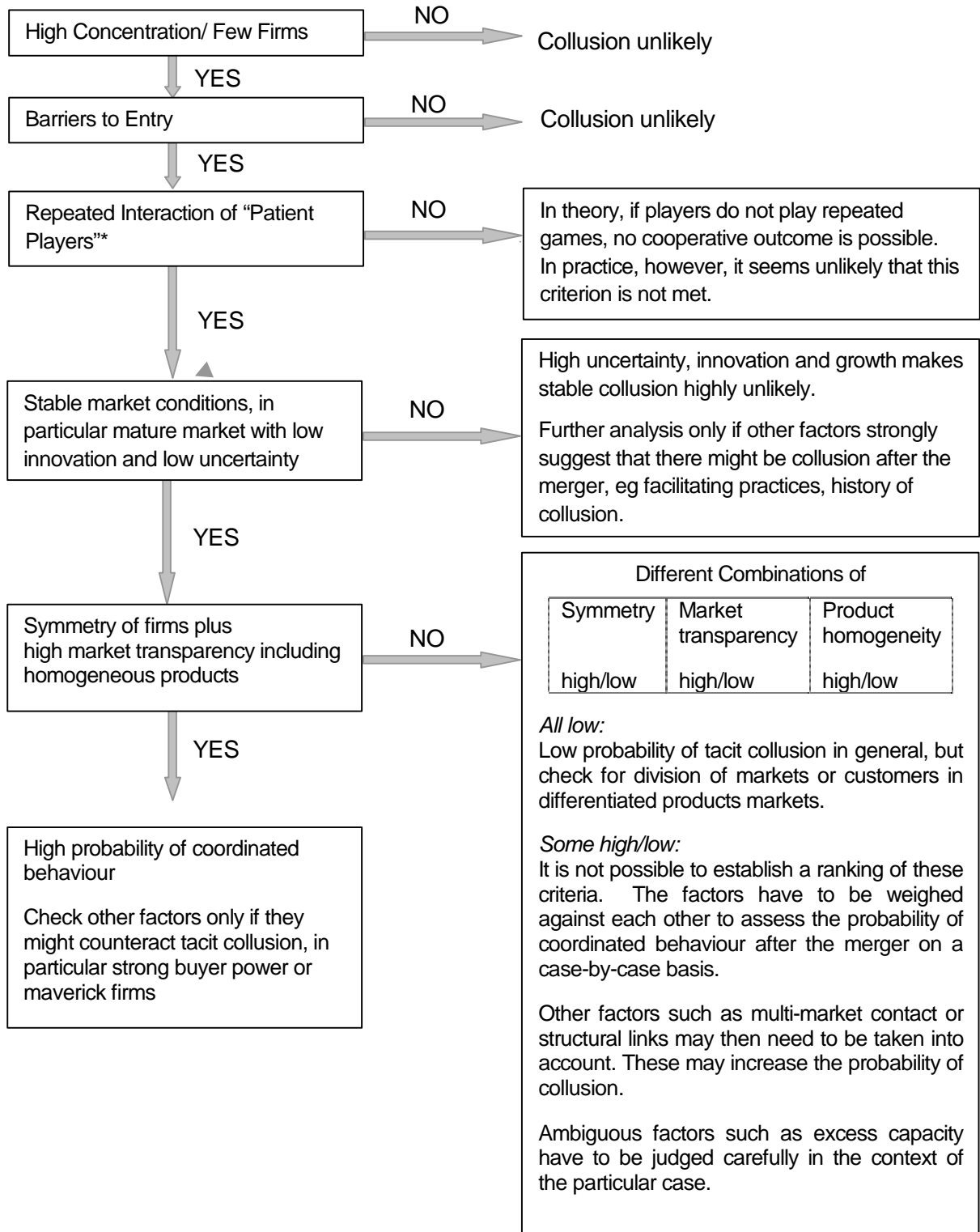
It is also an important, if obvious, point that a merger in an oligopolistic market will be of no concern if entry into that market is easy. The assessment of entry barriers should therefore be an early step in the examination of any merger in an apparently oligopolistic market.

Given a small number of firms and significant entry barriers, theory suggests that collusion will be highly likely in markets characterised by homogeneous products, stable demand and mature technology, and market transparency.

Section 2.6 reviewed the role that facilitating practices and structural links between parties has on the likelihood that firms tacitly collude. We suggest that such a role can be an important one but underline that where the Commission meets these practices, it should review them in light of how they contribute towards the necessary criteria listed in Table 7.1.

The fuller analysis in Section 2 of the report has led us to suggest an elaboration of the step-by-step approach as set out in the diagram below. The diagram attempts to incorporate the various factors that theory has suggested, with a reasonable degree of empirical support, to be conducive to coordination in a logical and sequential way. At the very least, this should help to give a clearer focus to any Commission investigation of possible coordinated behaviour.

**Figure 7.1
A Step-Wise Approach**

| High Concentration/ Few Firms | NO → | Collusion unlikely |

YES ↓

| Barriers to Entry | NO → | Collusion unlikely |

YES ↓

| Repeated Interaction of "Patient Players"* | NO → | In theory, if players do not play repeated games, no cooperative outcome is possible. In practice, however, it seems unlikely that this criterion is not met. |

YES ↓

| Stable market conditions, in particular mature market with low innovation and low uncertainty | NO → | High uncertainty, innovation and growth makes stable collusion highly unlikely.

Further analysis only if other factors strongly suggest that there might be collusion after the merger, eg facilitating practices, history of collusion. |

YES ↓

| Symmetry of firms plus high market transparency including homogeneous products | NO → | Different Combinations of |

Different Combinations of

Symmetry	Market transparency	Product homogeneity
high/low	high/low	high/low

All low:
Low probability of tacit collusion in general, but check for division of markets or customers in differentiated products markets.

Some high/low:
It is not possible to establish a ranking of these criteria. The factors have to be weighed against each other to assess the probability of coordinated behaviour after the merger on a case-by-case basis.

Other factors such as multi-market contact or structural links may then need to be taken into account. These may increase the probability of collusion.

Ambiguous factors such as excess capacity have to be judged carefully in the context of the particular case.

YES ↓

| High probability of coordinated behaviour

Check other factors only if they might counteract tacit collusion, in particular strong buyer power or maverick firms |

* The term "patient players" refers to market participants who value profits in future periods enough such that the loss of these profits could serve as a punishment for deviating from the collusive equilibrium. See Section 2.3.1 for details.

Of course, as with the simpler style of check-list, this can be no substitute for a rigorous, fact-intensive analysis of the particular case. We agree with the head of the Merger Task Force when he says:

> "*The interpretation of economic theory against real life situations has made us understand that oligopoly analysis is not a mechanical process*".[231]

But theory does provide a framework for that analysis.

Do our six conditions and discussion on the role of the factors behind them stand up to empirical scrutiny? Our review of the relevant empirical studies did not yield robust answers. However, it should be noted that such empirical exercises are plagued by fundamental methodological problems. Inevitably, such studies have drawn on either cases of explicit collusion or on cases of tacit collusion that have been detected by the competition authorities. Either strategy introduces sampling problems that are likely to bias the results obtained.

It appeared to us that the Commission relied too heavily on going through a check-list of factors rather than drawing a map of how the factors would influence the likelihood of coordinated behaviour. Of those cases we reviewed, *Exxon/Mobil* and *Airtours/First Choice* were the exception to this. In these cases, care was taken to assess a menu of factors in light of a set of conditions similar to those we identified.

The Commission appears to apply an initial screening based on numbers of firms and/or level of concentration in the market. This is justifiable. On the other hand, the Commission has not been consistent in applying a test based on existence or not of barriers to entry. We suggest that an assessment of the conditions of entry be a further screening test

The Commission has, rightly, placed considerable weight on the symmetry of firms as a factor contributing to the likelihood of tacit collusion. On the other hand, we feel the Commission should be rather cautious in the relevance it attaches to evidence on multi-market contact – any merger between large corporations will bring this factor to the fore.

The Commission does not appear to have placed the factors in a clear hierarchy. This is a justifiable approach as each case brings with it its own peculiarities and the relevance of factors varies from case to case.

7.2   Coordinated and Unilateral Effects

Section 3 of the report considers the distinction between coordinated and unilateral effects in merger analysis. It is the coordinated effects of a merger that are relevant when the issue is one of collective dominance. We show how unilateral effects become relevant when oligopolists do not behave in a coordinated or cooperative fashion but instead adjust their prices (or outputs) individually in the light of the new market structure brought about by the merger. Analytically the coordinated and unilateral effects of a merger are distinct and mutually exclusive. A merger

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[231]   Drauz (2000).

enables oligopolists to achieve a collusive equilibrium or it does not. In the former case the assessment is of coordinated effects, in the latter case it is unilateral effects that are relevant. We analyse unilateral effects in Section 3 in a number of oligopoly models that do not generate collusive outcomes.

In practice, competition authorities may consider both types of effect with respect to the same merger as our survey of US experience in Section 5 reveals. The likeliest circumstance is where the analysis of unilateral effects, which can often be empirically based, would suggest that a significant increase in price is likely, even without coordination, and when the basis for a finding of coordination is more speculative. Such "pleading in the alternative" is clearly more feasible under the US system of merger control, where the test is whether a merger would substantially lessen competition, than under the Merger Regulation with its dominance test. However, an alternative scenario, put forward by the head of the Merger Task Force, is where a merger leads first to unilateral effects, for example if the acquired firm is a maverick or the closest competitor of the acquirer, with coordinated effects emerging later should the remaining firms find it profitable to collude.[232] But, whatever the plausibility of this scenario, it is difficult to see, in the EU context, absent a clear likelihood of coordinated effects of a merger, that there can be any question of collective dominance. This suggests a gap in the Merger Regulation as far as the control of mergers in oligopolistic markets is concerned.

7.3   Explicit Collusion and the Assessment Criteria

The criteria that we have formulated for the assessment of mergers in oligopolistic markets are designed to help to pin-point those situations where coordination by tacit collusion is a likely outcome of the structural change brought about by a merger. They also define those market characteristics which are most conducive to explicit collusion.

The assessment of the effects of a merger has to be forward-looking. We have seen, however, from our reviews of both EU and US cases, that evidence of past collusive behaviour, whether tacit or explicit, in the same market as that affected by the merger, or even in a closely related market, has been used to reinforce the analysis of the coordinated effects of a merger. It is understandable that the competition authorities should put weight on any such evidence on the notion that what has happened before can be expected to happen again, especially when the reduction in the number of firms by virtue of the merger makes coordination that much easier. Nevertheless, it is important that the authorities should not be diverted from a thorough analysis of the conditions that we have suggested are necessary for successsful coordination. It is that coordination that gives rise to the position of collective dominance. Changes in market conditions or technology can suggest that patterns of past behaviour are unlikely to be repeated, for example if they lead to greater demand uncertainty or reduce entry barriers. In such circumstances the evidence of past behaviour would be less relevant.

Of course, it is a high priority of the Commission, as of other competition authorities, to eliminate cartels. A question that has been raised is how the Commission should react to a merger in an oligopolistic market which appears not to meet the conditions for coordinated behaviour but

where there is evidence of past explicit collusion, or well-founded suspicions of on-going collusion. Clearly suspected unlawful collusion should be investigated and dealt with under Article 81 of the EC Treaty, but again one can understand an authority's reluctance to clear a merger of competitors in such circumstances. The question is whether, rather than reinforcing the assessment of likely future coordination as in the usual case, information about past or suspected collusion could replace the assessment.

The test under the Merger Regulation has to be whether the merger would lead to or strengthen a position of collective dominance. As we see it, this requires that the merger can be shown to be likely to lead to collusion (which will invariably be tacit) among the remaining oligopolists. Should the structure and other characteristics of the market have few of the features which we have identified as necessary for coordinated conduct, then it would be difficult to argue that the merger would lead to collective dominance, even if there indications of past collusion. However, we believe it would be most unlikely in the circumstances described that the conditions that facilitate coordination would not be present. It would be incumbent upon the authority to show how, in the absence of some of the necessary conditions, coordination would still be possible. The evidence of past collusion would then again be a reinforcement of that analysis. For example, it might be that in a particular case, structural links between some of the key parties, the adoption of facilitating practices such as advanced notice of price changes, or meeting competition or most-favoured customer contractual clauses, and multi-market links would allow a larger number of firms than "very few" to coordinate successfully. But such factors as stable demand, mature technology and market transparency would likely still be necessary if coordinated conduct was to be sustained in the face of the temptation for any of the firms to cheat on their competitors.

The question posed illustrates the point that the assessment cannot be made by merely ticking off whether this or that of the necessary conditions are met in a particular case. The factors have to be melded into a coherent analysis of why coordinated rather than competitive behaviour is likely after the merger. Evidence of past collusion or suspicions of present collusion will clearly reinforce the analysis. But if there are no grounds other than the evidence or suspicions - unlikely scenario as that may be - it is hard to see how the merger could be prevented as leading to, or strengthening, a position of collective dominance, or allowed only subject to remedial commitments. However, it is hard to imagine how collusion could be sustained in markets which did not display other conducive characteristics.

7.4 Remedies

Section 6 of the report turns to the question of remedies, particularly remedies short of the prohibition of a merger. The Commission's recent Notice on remedies does not deal separately with remedies for mergers that create or strengthen a position of collective dominance. We do not find this surprising. In general, the same considerations apply to remedies for collective as for single firm dominance. Structural remedies are generally to be preferred to behavioural remedies, and the key requirements, if competition concerns are to be resolved, are that the

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assets to be divested provide the basis for a viable business, and that the purchaser of the assets is capable of running a competitive business independently of the merger parties.

However, the task of finding a purchaser who will restore the degree of competition to that prevailing before the merger is inevitably more difficult in collective dominance cases. Because it is not just the elimination of a competitor that causes the competition concern, creating a new competitor by divestment to replace the one that was lost through the merger might not be sufficient to restore the previous degree of competition. Divestment to one of the other oligopolists runs the risk that the purchaser will be content to coordinate his behaviour with the other oligopolists. Even if the divestment is to an outsider, there can be no guarantee that the purchaser will not seek to "join the club", especially if there are continuing relationships with the seller, for example through licensing or supply agreements. This suggests that the ideal is a purchaser with quite dissimilar characteristics and objectives to the established firms. But while this may reduce the risk of continuing coordination, it may, as the FTC's divestiture study shows, increase the risk of failure of the divested business.

Remedies that are directed at coordinated behaviour itself are unlikely to be effective. It is impracticable to require firms not to take account of their interdependence after a merger. And the factors that are conducive to coordination will usually be beyond the reach of any remedy in a merger case, though it may be possible to loosen structural links or to strike down certain facilitating practices.

These issues are discussed in more detail in Section 6 of the report, but the conclusion has to be that, while the general problems associated with the choice and implementation of remedies apply to both forms of dominance, they will be more difficult to resolve with collective dominance.

APPENDIX 1: UK EXPERIENCE

The UK system of merger control is markedly different from that of the European Community (or that of the US). A merger can be prohibited, or allowed only on certain conditions, including restructuring, if an investigation by the Competition Commission (until 1999, the Monopolies and Mergers Commission) has concluded that it would, or might be expected to, operate against the public interest. Mergers can be referred to the Competition Commission if they 'qualify' on either of two criteria:

a)   the gross assets acquired are £70m or more;

b)   a 25% share in the UK, or in a substantial part of it, of the supply or acquisition of a good or service of any description would be created or increased by the merger.

The OFT scrutinises all mergers that appear to qualify and its Director General advises the Secretary of State whether a reference to the Competition Commission would be justified. The Commission reports to the Secretary of State and makes recommendations to remedy any adverse effects of the merger. It is for the Secretary of State to decide what remedial action, if any, to take.

Despite the breadth of the public interest test, both reference policy and the Competition Commission assessment is driven by the effects of a merger on competition. Nevertheless, other considerations can be, and occasionally are, taken into account.

The Government proposes to change this system when Parliamentary time can be found for the necessary legislation. The main changes are first to 'depoliticise' the system, in that the Secretary of State would only have a role where a merger raised a matter of major importance to the national interest, eg. national security, and second, to substitute a competition test for the present public interest test. As to the latter, the 'substantial lessening of competition' formulation found in the US system (and the system of some other countries) is preferred to the dominance formulation of the Merger Regulation.

It is thought that one reason is that the substantial lessening of competition formulation may be better suited to dealing with mergers in oligopolistic markets. It is a feature of the present UK system that there is little difficulty in bringing such mergers within the scope of the control.

Our impression is that the issue of oligopolistic interdependence has come more to the forefront in UK merger control in recent years. We have not attempted any statistical analysis for the purpose of this report but we can refer to a number of recent reports of the Competition Commission (or its predecessor) which dealt with the issue.

A1.1   Littlewoods/Freemans[233]

This was a merger of companies with the second and third largest shares of the agency mail order market. After the merger, Great Universal Stores, the market leader with a 41 per cent share, and Littlewoods would have over 80 per cent of the market. The next largest shares would be Grattans with 10 per cent and Empire Stores 8 per cent. The MMC said: "we would expect this increase in concentration to reduce the level of existing competition significantly".[234] It added:

> *"in a concentrated market, we expect companies to assess not only the immediate costs and benefits of any competitive strategy but also the reactions of competitors. With two companies responsible for over 80% of sales, the latter is likely to be an important factor. We have no reason to assume or predict that any form of collusion would occur between the two leading companies which would exist in this market after the merger and we have discounted the possibility in our reasoning. But the existence of two companies, each with over 40% of the market would, in our view, be likely to create some reticence on their part about adopting vigorous competitive strategies against each other which, if successful, would be very likely to invoke an equally strong competitive response".[235]*

The MMC did not think that competition from Grattans and Empire Stores, or from other types of retailer, would be sufficient to prevent this outcome, and therefore the risk of higher prices and lower efficiency. The recommendation was that the merger be prohibited.

A1.2   P&O/StenaLine[236]

This merger was a joint venture between P&O and StenaLine. The competition concerns arose in the passenger vehicle rather than the freight short sea crossing market. The joint venture would give it 46 per cent of the market in 1996 creating an 'effective duopoly' with Le Shuttle which had a 39 per cent market share. The MMC said: "we take the view that in general such duopolies tend to settle down into a pattern of parallel behaviour, particularly on pricing policies".[237] They were strengthened in this view by their finding that the operating costs of the ferries and Le Shuttle were broadly similar[238] and that Le Shuttle's capacity was constrained.[239] The MMC included that competition from the other operators would be insufficient to prevent a higher level of fares (after the abolition of duty-free sales) than was necessary to sustain a ferry alternative to the Tunnel.

The majority of the MMC's members recommended that the merger should nevertheless be allowed if the parties gave a set of undertakings designed to restrain any attempt to raise prices. A minority report recommended prohibition.

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[233]   *The Littlewoods Organisation plc and Freemans plc* Cm 3736 November 1997.
[234]   Ibid para 1.11.
[235]   Ibid para 2.116.
[236]   *Peninsular & Oriental Steam Navigation Company and StenaLine* AB Cm 366 November 1997
[237]   Ibid para 1.13.
[238]   Ibid para 2.159.
[239]   Ibid para 2.160.

A1.3   CHC Helicopter/Helicopter Services[240]

The parties to this merger were Canadian and Norwegian companies. The British subsidiary of the former was Brintel Helicopter Ltd and of the latter Bond Helicopter Ltd. The market affected was for helicopter services to off-shore oil and gas installations. The merger would create a duopoly, the merging companies having 44 per cent of the market (in the first half of 1999) and the remaining company, Bristow Helicopters Ltd, 56 per cent (market shares fluctuate according to which company wins particular contracts).

Notwithstanding the complete duopoly that would be created by the merger, the MMC concluded "we see no reason to believe that Brintel/Bond and Bristow will not engage in independent pricing".[241] They did not think that 'full collusion' would be possible, despite evidence of a close relationship between the three companies, given that the market was unstable and contestable.

A second possibility was that the two companies might simply 'stand-off' in competition terms, setting their prices by reference to the prices of the other. Having examined the implications of the degree of product heterogeniety and of price transparency in the market, and the extent of excess capacity as well as entry conditions, the MMC concluded that the reduction of competition was not likely to lead to any stand-off in competition. They also noted the considerable buyer power of customers.

The merger was found not to be against the public interest.

A1.4   Cendant/RAC[242]

Cendant, a US company, owned Green Flag Group Ltd., a breakdown organisation which had 12 per cent of the market (for light vehicles) in 1998. RAC Motoring Services Ltd had 29 per cent. The Automobile Association was the market lender with 46 per cent, no other company having more than 3.5 per cent. (Shares differed somewhat according to the sales channel – direct retail, through intermediary insurance companies, schemes of motor vehicle companies and so on.)

In view of the removal of a significant competitor in an already concentrated market, the MMC concluded:

> *"we expect that in the longer term the relationship between the AA and the merged group would become duopolistic and that the AA and Cendant would be likely to find themselves more evenly matched and operating under similar conditions. Further gains in market share for either of them would have to come mainly from the other. In the absence of a strong third force, we would expect that their shared interest in maintaining a high-priced market would be likely to prevail".[243]*

They recommended that the merger be prohibited.

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[240]   *CHC Helicopter Corporation and Helicopter Services Groups ASA* Cm 4556 January 2000
[241]   Ibid para 1.10.
[242]   *Cendant Corporation and RAC Holdings Ltd* Cm 4196 February 1999.
[243]   Ibid para 2.112.

A1.5   Interbrew/Bass[244]

Interbrew, a Belgian company, having acquired the brewing interests of Whitbread in June 2000 followed with the acquisition of Bass' UK brewing interests. This gave Interbrew a market share in brewing in 1999 of 33 per cent (when the contract under which Whitbread brewed Heineken-owned brands in the UK came to an end) and a similar share of the distribution market. Scottish & Newcastle (later Scottish Courage) had a 26 per cent share of the brewing market (and of the distribution market), Carlsberg-Tetley 11 per cent and a number of other brewers smaller shares. The Competition Commission said that the merger would lead to a duopoly in UK brewing, that Interbrew and Scottish & Newcastle had a shared interest in raising margins and that "conditions of the market work to facilitate [this]".[245]

Interview had argued strenuously that there could be no basis for concluding that the merger would lead to co-ordinated or parallel behaviour. Among their arguments was that beer was not a homogeneous product, there was only limited price transparency, buyers were not fragmented nor without buyer power, the companies were likely to pursue different competitive strategies, not least because Scottish & Newcastle was now the only vertically integrated brewer, and excess brewing capacity was more likely to encourage competitive than co-ordinated behaviour.

The Competition Commission's assessment recognised that they could not reach a conclusion on the basis of market shares alone and further that a number of the factors suggestive of co-ordinated behaviour were not wholly present. Nevertheless, and in spite of the presence of a significant competitor in Carlsberg-Tetley, the Competition Commission were satisfied that there was a sufficient risk of tacit collusion between Interbrew and Scottish & Newcastle to recommend that the merger be prohibited and Interbrew be required to divest themselves of Bass Brewing. This recommendation was accepted by the Secretary of State, but Interbrew has challenged this decision on the grounds that a divestment of the whole Bass business would be a disproportionate remedy.

The Interbrew/Bass merger fell within the scope of the Merger Regulation, but had been 'repatriated' to UK jurisdiction as far as its effects on the market for beer in the UK was concerned. This may have influenced the way arguments about the effects of the merger were put to the Competition Commission.

A1.6   Comment

It needs to be remembered, when considering the UK experience, that the merger control system is an administrative one and that the decision making role (at present) lies with a Minister. The latter feature is one reason for the absence of any guidelines to indicate circumstances in which a merger might be referred to the Competition Commission. The Commission's reports do not establish precedents in the legal sense and are not subject to any appeal or review process (other than judicial review of alleged procedural and similar irregularities). Each case on its merits' sounds a cliché but is the essence of the UK system. It helps to explain why the approach

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[244]   *Interbrew SA and Bass plc* Cm 5014 January 2001.
[245]   Ibid para 1.8.

of the Competition Commission to oligopolistic mergers may appear less systematic than that of the Commission.

Nonetheless the UK competition authorities are clearly well aware of the potential adverse affects of mergers in concentrated markets. They have been particularly concerned where a merger would lead to a duopoly or near duopoly. Our impression is that the MMC, in the past, has given more weight to the structural effects of a merger than to the other factors commonly suggested as facilitating co-ordinated behaviour in an oligopolistic market.

Recent reports contain a more extensive analysis of such factors, with the Interbrew/Bass merger (which fell within the Merger Regulation but was 'repatriated' to UK jurisdiction in so far as it affected the beer market in the UK) the prime example so far. But it is difficult to draw any clear pointers as to which of those factors might be considered decisive. The Competition Commission would say that it is only after an intensive investigation of the particular case that they can decide whether the degree of or price transparency, say, or excess capacity in a market would suggest co-ordinated or competitive market behaviour.

It is also worth noting that the OFT published in 1999 a consultants' report on merger appraisal in oligopolistic markets[246] which includes a familiar style of check-list of factors to be looked at where there are concerns about coordinated effects of mergers. However, there has been no indication how the OFT has responded to the consultants' suggestions.

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[246] NERA (1999).

APPENDIX 2: EU CASE REVIEW SUMMARY

The table overleaf presents a summary of relevant EU cases where collective dominance was discussed. While it is not an exhaustive sample, care was taken to review those cases where concerns of collective dominance were significant and particular attention was given to review those cases that most contributed to the evolution of the Commission's analysis of collective dominance.

The summary of each case identifies the factors singled out by the Commission as relevant in its assessment of the likelihood of coordinated behaviour. Blank cells should be interpreted to imply that the Commission did not explicitly consider the relevant factor in the given case - this is not to say that the factor is irrelevant.

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