

Thresholds For The Scrutiny of Mergers and the Problem of Joint Dominance

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1. INTRODUCTION

The New Zealand Commerce Act is designed to promote competition in markets. To achieve this purpose the Act has three key prohibitions, each one associated with a threshold designed to identify situations where there should be concern about the potential to abuse market power. The three prohibitions, with their associated thresholds identified in bold are:

- Section 27 which prohibits contracts, arrangements, or understandings between competitors that have the effect, or likely have the effect of **substantially lessening competition** in a market;
- Section 36 which prohibits the unilateral use of a **dominant position** in a market for exclusionary purposes; and
- Section 47 which prohibits the acquisition or strengthening of a **dominant position** in a market.

The Ministry of Commerce (1999) has issued a discussion paper suggesting that the current threshold in Section 27 does not allow consideration of the potential harm that may result from joint dominance in a market or whether the resultant market structure will be conducive to collusion either explicit or tacit. The concern is that mergers may create oligopolistic markets that facilitate collusion both explicit and tacit.

“In such industries firms can co-ordinate their behaviour by doing little more than observing and anticipating the moves of their rivals. The effect of such oligopolistic co-ordination is parallel behaviour, such as parallel price movements, that approximates the results associated with explicit agreement to set prices, output levels or other conditions of trade (Ministry of Commerce 1999: 14).

The Act has a behavioural mechanism that allows instances of explicit collusion to be addressed. However, no such mechanism exists for tacit collusion.

The Ministry suggests that there are two options to deal with this problem. The first would be to amend section 27 of the Act in a way that captured both tacit collusion and explicit collusion. The Commerce Commission does not favour this because of the difficulties of obtaining

behavioural evidence that demonstrates tacit collusion. The second option is to broaden the terms under which mergers are considered to include an assessment of whether members of the highly concentrated market resulting from a merger are likely to compete (rather than just considering whether the merger creates a dominant position for a single firm).

The Ministry of Commerce (1999: 32) discussion paper states that:

“...it is likely that the current thresholds for mergers, by ignoring the potential for joint dominance, prevents sufficient scrutiny of mergers that fall short of creating single firm dominance, but may nevertheless result in efficiency losses. In particular, mergers are not scrutinised in terms of whether they facilitate tacit collusion in tight oligopolistic industries. A merger creating such an industry can facilitate the change from firms competing to firms colluding.”

One way to allow the Act to respond to the problems associated with joint dominance would be to allow for fuller scrutiny of merger and acquisition proposals. To achieve this, the merger threshold, which has the role of identifying what level of market power is likely to be harmful to the economy, would need to be broadened to focus directly on the impact on competition.

The Ministry of Commerce (1999: 32) suggests replacing the current prohibition with:

“No person shall acquire assets of a business or shares if the acquisition would have the effect, or be likely to have the effect, of substantially lessening competition in a market for goods and services.”

The Ministry claims that this competition test will allow merger scrutiny to encompass joint dominance.

“Adoption of a competition test [as opposed to a dominance test] for mergers would clearly recognise that single firm dominance is not an essential precondition to the abuse of market power. Single firms acting in concert with a limited number of others, can abuse market power and impose significant efficiency losses. Having the [competition] threshold would allow mergers to be scrutinised in terms of the competition and efficiency effects of joint dominance. That is, mergers would be scrutinised in terms of whether the resultant market structure would facilitate collusion, both explicit and tacit. Australian experience suggests that this is unlikely to mean in practice a large increase in the number of illegal mergers. Rather it will mean that the market characteristics that

are conducive to illegal collusion, such as few players and product homogeneity, will also need to be considered in a merger analysis.”

As this quotation suggests, the claim that joint dominance is appropriately addressed by such a test rests to a large extent on claims about the competition legislation and its enforcement in other jurisdictions, especially Australia, Canada and the USA.

In this Report we consider:

1. How the potential for tacit and explicit collusion associated with joint dominance can best be assessed in merger applications.
2. Whether the inclusion in section 47 of the Commerce Act of the competition test proposed above, in place of the existing dominance test, will provide an efficient and effective means of identifying markets where tacit collusion is likely to result from joint dominance.
3. Whether the evidence from Canada and the USA (where a substantial lessening of competition test is applied to mergers) supports the claim that the test proposed by the Ministry of Commerce is superior to one of pure dominance in respect of identifying joint dominance (oligopoly) problems.

2. INTRODUCTION: The Oligopoly Problem and Horizontal Merger Analysis

The approach to concerns about collusion in oligopolistic industries has been a controversial issue for North American antitrust policy for many years. While economists of the Structure-Conduct-Performance tradition took the view that collusion was nearly inevitable in oligopoly market structures, more recent advances in this area clearly show that the ability to engage in collusion is not automatic, and depends critically on the information structure in a particular market. At the same time, though, contemporary economic thinking confirms that an express agreement is often not necessary for collusion and thus, in theory, conspiracy provisions may not be adequate to deal with oligopoly problems. Much of the controversy has been on: (1) whether the oligopoly “problem” is a significant problem in practice; and (2) to the

degree that it is significant, how effectively it can be addressed by traditional antitrust remedies, particular merger policy.

The antitrust approach in North America has roughly paralleled the evolution in contemporary economics, albeit with a lag. While the legal test (e.g. substantial lessening of competition) has remained relatively static, enforcement practice embodied in the agencies' guidelines and in jurisprudence has evolved considerably. While antitrust authorities blocked mergers of relatively small competitors in the 1960s and 1970s based on what were (by today's standards at least) relatively vague theories of concerns about post-merger collusion, the trend was abruptly reversed in cases such as *Waste Management* and *Baker Hughes* as well as the "hypothetical monopolist" test in the 1984 U.S. Horizontal Merger Guidelines. The trend toward requiring a clear theory of anticompetitive effects due to post-merger collusion is further entrenched in the 1992 U.S. Horizontal Merger Guidelines, which explicitly differentiate between market power depending on whether it is grounded in unilateral or coordinated (collusive) conduct.

Even the current, fairly narrow, application of merger provisions to collusive behaviour by oligopolists is open to criticism. While there has been continuing progress in identifying practices that can facilitate collusive oligopoly conduct, the practices tend to have ambiguous welfare effects and would seem to point to an application of a case-by-case approach under abuse of dominance or monopolization provisions rather than an approach which deals with oligopoly problems indirectly under merger provisions. In the meantime, the development of clear thresholds to determine when a merger would likely lessen competition substantially due to coordinated conduct has proved elusive. The remainder of this note is organized as follows. Section 2 discusses the evolution of economic thinking on the oligopoly problem. Section 3 provides a discussion of current thinking on this subject. Section 4 comments on the general approach to the oligopoly problem in the applied antitrust economics literature and in current North American antitrust practices with a particular emphasis on horizontal merger policy.

3. THE EVOLUTION OF ECONOMIC THINKING ON THE OLIGOPOLY PROBLEM

In the 1950 and 1960s, economists of the Structure-Conduct-Performance school of thinking were hostile to horizontal mergers, in part based on a belief that a smaller number of firms would be able to engage in collusive conduct – either express or tacit – and achieve increases in price above competitive levels. Their concern was that a Nash Equilibrium looked to a circumstance where a firm’s strategy was optimal taking the strategies of other firms as given. Economists of the Structure-Conduct-Performance School argued that this was unrealistic, and instead argued that in a real world situation, a small number of competitors would realize that their “competitive” pricing would adversely affect the profits of its rivals, and vice-a-versa, and that mutual restraint from competitive responses would be to the private benefit of all competitors.¹ Thus, they took the view that collusion was inevitable in oligopoly situations and that, as a result, an active antitrust policy was needed to combat oligopolies.

In a seminal article, Stigler (1964) countered this thinking by rigorously modeling the ability of oligopolists to hold together such agreements. Stigler showed that, in order for oligopolists to successfully exercise mutual restraint – i.e. tacit or express collusion – they would not only have to come to an agreement, but enforce that agreement in light of the incentives for a firm to “cheat”. Specifically, they would have to be able to detect when their rivals acted more competitively than the agreement allowed, and be able to punish firms sufficiently so that the short-run gains from cheating were less than the longer-run costs imposed by the punishment strategy. In addition to offering a rigorous model, Stigler showed that tacit collusion is far from inevitable. The ability of oligopolists to maintain an agreement was shown to depend not necessarily on the number of firms, but rather on the information structure of the industry in question. The essential issue was whether a group of oligopolists could overcome the problems inherent in reaching an agreement, detecting deviations from an agreement, and punish deviations in a manner sufficient to overcome the short-run incentives for a firm to deviate.

¹ This view of the strong tendency for such collusive conduct was reflected, for example, in E. Chamberlin, *The Theory of Monopolistic Competition*. 1933. 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 profits, no one will cut, and although sellers are entirely independent, the equilibrium result is the same as though there were a monopolistic agreement between them.” (at p. 48). Bowley, A (1924), *The Mathematical Groundwork of Economics*, Oxford: University Press also takes the view that tacit collusion can occur in a broad set of circumstances.

In more recent years, the basic model underlying Stigler's analysis has been considerably refined.² Under the modern approach, the oligopoly is modeled as a repeated "Prisoners' Dilemma" problem where the inherent incentive to "cheat" in a static one-shot setting may be countered by the anticipated long run cost of foregone profits due to threats that other colluding firms will punish it in later interactions.³ Whether an agreement can be sustained in a particular fact situation depends on the ability to overcome difficulties: (1) in reaching an agreement; (2) in detecting deviations; and (3) in establishing credible punishment strategies that are sufficient in magnitude to offset the short-run incentive to deviate.⁴ These difficulties are discussed in more detail below.

Reaching an Agreement

Difficulties in reaching an agreement arise because it is necessary for firms to coordinate on a specific price; that is, firms must achieve a "focal point."⁵ Not only do legal provisions often limit the ability to exchange information, but the literature shows that oligopolists may not have an incentive to provide truthful information necessary for them to successfully coordinate (e.g. individual firm's costs or product demand).⁶ Also, in a related point, various firms interests' may diverge due to cost heterogeneity, differences in their specific demand conditions and product lines, and an agreement must be individually rational for each competitor.⁷ Absent an ability to make side-payments, such divergent interests constrain the ability of oligopolists to achieve a collusive, joint-profit maximizing outcome.

Detecting Deviations From an Agreement

Difficulties in detecting deviations also raise complications for oligopolists attempting to maintain a collusive agreement.⁸ Specifically, firms often have only imperfect information on their rivals' prices or output levels, and thus can only imperfectly monitor whether rivals have

² For a good summary see, for example, Shapiro (1989) and Jacquemin and Slade (1989).

³ Or in other markets where firms compete in several separate product or geographic markets. See Bernheim and Whinston (1990).

⁴ Richer specifications of the underlying game, using signaling equilibria where there are asymmetries in information can give rise to above static one-shot Nash equilibrium pricing due to reputation effects that do not rely so explicitly on punishment strategies (See Tirole (1990), section 6.5).

⁵ The coordination problem is simply that even if the information structure allows for coordination, firms must somehow coordinate which markets and products in respect to which they increase prices above competitive levels, how much they increase prices, and when.

⁶ See Gal-Or, E. (1985), Shapiro (1986) and Malueg and Tsutsui (1997).

⁷ When different firms have different marginal costs, the joint-profit maximizing equilibrium will dictate that firms have different output levels and thus profit levels, and could in some circumstances require some competitors shut down completely. Such outcomes can sometimes be difficult to maintain absent side payments.

lived up to the agreement. Knowing this, each firm has a larger incentive to cheat since the probability of being punished is less than one.

The literature shows that that the effects of imperfect monitoring depend on the variable in regard to which there is uncertainty. Green and Porter (1984) show that where demand is uncertain, firms will have difficulty determining whether an observed low price is due to a rival cheating on an agreement or due to a low realized demand (see also Rotemberg and Saloner (1986)). Similarly, Slade (1990) shows that cost uncertainty can undermine collusion since oligopolists have private information that affects the incentives to adhere to a collusive agreement.

A result of models of imperfect monitoring is that firms are forced to use simple rules based on observable market variables to support collusion. When shocks occur, “price wars” tend to break out punishing firms irrespective of whether they actually cheated or not. Thus, the market is in effect punished in order to impose costs on firms that would otherwise have had an incentive to cheat, gambling that they would not be detected. Thus, in these models, even if collusion can be sustained, it can only be sustained imperfectly.

Imposing Significant Punishments

To sustain any collusive agreement, oligopolists must be able to punish firms that deviate with a punishment strategy which is sufficient to deter them from taking the static one-shot gains to cheating.⁹ When a collusive equilibrium has been established, the mere fact that price is above competitive levels (and thus marginal revenue is above marginal cost) creates an incentive for a firm to enhance its output, and thus violate the agreement. From a individual firm’s perspective, the best of all worlds in a one-shot game is to persuade rivals to cut back output and increase price, and then expand own output and build market share in the more profitable market.

To enforce the agreement, rivals must threaten to impose a cost on firms that cheat that at least offsets this short-run gain – which in the symmetric case exceeds the one-period gain that any one firm obtains from a successful collusive agreement that all firms comply with.

⁸ For a good survey, see Shapiro (1989), section 3.2.4 “Oligopolistic supergames with imperfect monitoring.”

⁹ There are a multitude of punishment strategies that may be employed, the simplest being a simple “trigger strategy” (as in Friedman (1971)) – i.e. a once-and-for-all revision to one-shot Nash (i.e. competition) – or “carrot-and-stick”

Clearly, simple discounting means that collusion is easier to sustain if firms put a very large weight on future returns, since the gains to cheating are immediate while the anticipated punishment is sometime in the future. Similarly, market interactions where there are more numerous sales in the future (repeat purchases as compared to one-off sales) make it more likely that collusion can be sustained. Other firm or market characteristics, discussed in more detail below, have more complex potential effects, since they typically increase (or decrease) the magnitude of the punishment that can be imposed while, at the same time, increasing the gains (or losses) to cheating in the first place.

Credible Punishment Strategies

To sustain a cartel, punishment strategies must also be credible. Once a rival cheats on the agreement (and this behaviour is a bygone event), any ex post punishment cannot by definition affect past cheating on the agreement, and a firm will rationally choose to engage in the profit maximizing strategy looking forward (including effects on its and rivals' behaviour in future periods). Knowing this, working backward, any ex ante claims of future punishment will not be believed by rivals unless they are ex post rational.¹⁰

Generally speaking, punishment strategies are bounded from below by the “competitive” one-shot Nash outcome, and thus the “punishment” is to threaten to withhold the fruits of collusive profits from the cheating firm. The most common strategy in the modeling literature is a “simple trigger-strategy” whereby a prospective collusive oligopolist threatens never to cooperate with rivals if cheating occurs.¹¹ On their face, it is difficult to see how such strategies can be credible since, if collusion is rational in the first period, how could this be changed by in period two by observed cheating in period one (which is a bygone)? However, simple punishment strategies can sometimes be credible (i.e. “renegotiation proof”) if punishing firms expect that if they renege on their threatened action ex post, that they will in turn be punished by other oligopolists.¹²

strategies (as in Abreu (1986)). In experimental applications, however, tit-for-tat -- i.e. a one period punishment and a return to cooperative behaviour -- has proven to be surprisingly effective. See Axelrod (1984).

¹⁰ See Selton (1975).

¹¹ There are a multitude of punishment strategies that may be employed, the simplest being a simple “trigger strategy” (as in Friedman (1971)) -- i.e. a once-and-for-all revision to one-shot Nash (i.e. competition) -- or “carrot-and-stick” strategies (as in Abreu (1986)). In experimental applications, however, tit-for-tat -- i.e. a one period punishment and a return to cooperative behaviour -- has proven to be surprisingly effective. See Axelrod (1984).

¹² However, this restricts the class of super-game outcomes that can be supported. See Shapiro (1989).

Richer models yield credible punishment strategies and thus collusive equilibria in other circumstances. For example, in two-stage games (where rivals have scope to engage in various business practices prior to engaging in oligopolistic competition) the range of credible punishment strategies can be expanded. This can usefully be thought of as “incentive management” as defined in Salop (1986), where firms engage in practices that influence the payoffs in the second-stage oligopoly competition. Also, where firms have private information about important variables (e.g. firm-specific costs, demand characteristics), a signaling equilibrium can emerge where firms charge higher than competitive prices in the oligopoly game because a firm’s action reveals information.¹³

4. COEMPORARY THINKING ON COLLUSION IN OLIGOPOLIES

The evolution of thinking on oligopoly problems has greatly advanced understanding of the underlying issues. However, despite a large volume of practical work, it has proved difficult to isolate easily observable characteristics of firms or markets that make it more likely that a punishment strategy of a large enough magnitude can be imposed. There is some empirical work, but in large part due to the complexity of the underlying relationships being tested, it requires a significant amount of quite detailed microeconomic data which is available only on a sporadic basis across markets and characteristics. Below, we comment on five such characteristics which have been considered: (i) frequency of interaction; (ii) product differentiation; (iii) multi-market contact; (iv) demand or cost fluctuations; and (v) facilitating devices. The latter consists of a collection of various forms of business conduct.

Frequency of Interaction

¹³ For example, as noted by Tirole (1990), in a two-period pricing game with incomplete information, a firm may charge a high price (relative to the myopic profit-maximizing level) in the first period in order to signal that it will charge a high price in the second period. This may be credible because it is costly, and especially costly to firms not of this firm’s “type”. This firm’s “type” may reflect private information about its production cost or the demand curve. In a rather extreme example, a firm might signal a “tendency” to collude, and thus the building of a reputation by itself can be what is signaled (see Tirole at sec. 6.5.1).

As noted above, collusion is easier to sustain if firms put a very large weight on future returns, or where there are more numerous sales in the future (repeat purchases as compared to one-off sales). Thus the frequency of interaction is sometimes cited as a factor that indicates that collusion is more likely. However, the predictive power of this factor is questionable. The logic underlying this factor is merely a restatement of the proposition that the game has to be repeated in order to sustain collusion. No relative comparisons, e.g. across industries, can be made on the basis of these results, and indeed they are highly sensitive to if (or with what probability) interactions will end.¹⁴

Product Differentiation

Many have argued that product differentiation would tend to hamper cartel stability. However, Ross (1991) employs a super-game theoretic model of collusion to analyse the effects of different levels of product differentiation on cartel stability. Using the traditional “address” model of product differentiation (where consumers are uniformly distributed along a line upon which producers locate their products) and the quadratic utility representation (e.g. Dixit (1979)), Ross calculates the critical discount¹⁵ rate for various parameter values. Specifically, he shows that product differentiation, by itself, need not hamper cartel stability, but that differentiation of products can impede tacit collusion if it reflects some asymmetry between firms that makes defining the agreement more difficult.

Multi-market Contact

It has sometimes been argued that firms that compete with each other in many markets may be less willing to compete vigorously because of the prospect that they will be punished in other markets – i.e. that a collusive outcome is easier to maintain in a given market when firms have interactions in other markets, because there is more scope for punishing deviations. Using a theoretical model, Bernheim and Whinston (1990) are fairly successful in confirming this result by isolating conditions in which multi-market contact facilitates collusion. They also cite a

¹⁴ Of course all collusive equilibria are subject to the qualification that it can unravel in a finitely repeated game, no matter how often it is repeated. But here “repeat purchases” are nothing more than counting the number of repetitions for a certain discounting period.

¹⁵ That is, the extent to which firms must value future returns in order that short-run gains to cheating can be offset by long-run punishment effects. According to the approach used by Ross, a cartel is considered to be “stable” when firms can (exogenously) discount the future more heavily and in spite of that, the underlying parameters allow successful collusion.

number of previous empirical results (e.g. Mueller (1977), Scott (1982), Rhoades (1985)) that are consistent with their results.

The welfare effect of collusion facilitated by multi-market contact is, however, less clear. The Bernheim and Whinston results depend on other asymmetries as well – i.e. they show that when firms are identical and technology is constant returns to scale, then multi-market contact does not facilitate collusion. While differential costs and scale economies allow increased scope for collusion, they do so in a manner that may enhance total welfare since collusion increases productive efficiency, or because price increases in some markets are accompanied by price decreases in others.

Demand or Cost Fluctuations

As noted above, (unanticipated) variation in costs or market demands tend to work against cartel stability because they make it more difficult to monitor. In the abstract, if cheating is detected with a less than 100 percent probability, the magnitude of punishments would have to be increased proportionally. Building on this theory, several authors have looked to the extent of demand or cost fluctuations as an industry characteristic to explain cartel stability.

Applied tests of Green and Porter (1984), Porter (1983) and Slade (1992) have used empirical techniques to consider tacit collusion where there is imperfect monitoring. The theoretical prediction is that this should lead to stable (collusive) prices during normal-demand periods, and price wars when there are exogenous demand or cost shocks. Slade (1992) uses a uniquely disaggregated data set, consisting of daily observations on price, variable cost, and sales volume for three types of gasoline sold at ten service stations in an particular part of the city of Vancouver,¹⁶ Canada during a three-month price-war during the summer of 1983.¹⁷ In contrast to Porter (1983), the Slade (1992) study does not look at the timing of price wars (the data was selected to cover only the price war period) and instead considers whether (and how) prices deviate from the non-cooperative norm. The study uncovers evidence consistent with the notion that rather simple strategies capture the essence of pricing behaviour. The results also

¹⁶ Specifically, a heavily travelled five-mile strip known as the Kingsway region.

¹⁷ Slade notes that, with the exception of unanticipated demand shocks, there is little uncertainty in the market. Prices are posted and posted prices are the same as transaction prices. In addition, rival sales can be monitored by counting the number of customers a rival supplier supplies. The market therefore bears little resemblance to the theoretical price-war model of Green and Porter (1984) where the choice variable cannot be directly observed. The product sold is physically homogeneous, although the variety and scope of services offered by various stations, and their location, provided a degree of product differentiation from the consumers' point-of-view.

lend support for the notion that firms respond asymmetrically to price increases and decreases of their rivals.

Facilitating Devices

The clearest result to come out of attempts to specify market or firm characteristics that promote collusion is in the area of facilitating devices. Using more structured “two-stage” games, where oligopolists have scope to choose to implement various business practices prior to engaging in oligopolistic competition, the literature indicates that the difficulties facing oligopolists attempting to achieve a collusive outcome can be reduced by engaging in certain business practices – often called “facilitating devices”. There is no simple way to characterize the role of these devices in maintaining the incentives to collude as they vary significantly depending on the device in question.

A number of facilitating devices are selectively listed below. First, oligopolists may exchange information, for example through advance notice of price changes, or make market interactions more transparent through uniform pricing practices. Second, oligopolists may engage in a number of practices, discussed in more detail below, which alter the short-run incentives to cheat and/or the scope for detecting and punishing deviations in the multi-period oligopoly game. The latter can usefully be thought of as “incentive management” as defined in Salop (1986).¹⁸

A business practice that can promote tacit collusion by “managing” incentives is most-favoured-customer clauses. A most-favoured-customer clause provides a buyer with a form of insurance against the prospect that the seller may offer a lower price to another customer. Cooper (1986) shows that such clauses create a disincentive for oligopolists to compete aggressively in future periods (or with other buyers) because this would require them to provide rebates to customers with most-favoured-customer clauses in their contracts. In essence, the most-favoured-customer clause provides for a penalty for cheating which a buyer has an

¹⁸ Many of these practices can be most effectively implemented through contracts with buyers. But as Salop (1986) notes, this raises a question – why would buyers agree to such contracts with anticompetitive effects that adversely affect their interests? The answer, of course, is that the anticompetitive effect is often external to a single contract viewed in isolation. More generally, while there are usually counterstrategies available to buyers, in some circumstances (particularly where buyers are small and diffuse) buyers may rationally accept contracts with anticompetitive effects.

incentive to detect and enforce in the courts.¹⁹ Meeting-competition clauses can also promote tacit collusion. A meeting-competition clause (or sometimes called meet-or-release clause) acts in a manner similar to a most-favoured-customer clause in that it allows buyers to enter into long-term supply contracts with an assurance that it can obtain the benefit of any price reductions its competitors may receive in the future from competitors. Such clauses provide an information transmission role, and allow an oligopolist to quickly defeat a rivals attempt to cheat and build up market share. Some authors have considered the prospect that resale price maintenance, and various forms of vertical structure (e.g. delegating pricing decisions to downstream retailers) can also facilitate coordinated conduct. Long-term contracts with liquidated damages can also be used in supplier-buyer contracts to, in effect, conspire against entrants. Facing the prospect of future entry, a buyer and seller may be able to enter into a mutually beneficial contract which imposes switching costs which, in effect become the price of entry facing a new competitor.²⁰

Grether and Plott (1981) have tested the notion that facilitating practices can increase prices, by looking at the Ethyl case. They compare the pricing performance of the industry where most-favoured-customer clauses, public price posting, and advance notice of price increases are employed to one, constructed through an experimental method. Their results show significant increases in price due to these practices, used together. Davis and Holt (1998) use laboratory methods to evaluate factors affecting the success of collusion markets with posted prices. Three types of experimental markets are examined and their results are compared against those of baseline posted-offer markets, where sellers set prices independently and then buyers make purchases from the sellers at posted prices on a take-it-or-leave-it-basis. The results show that when sellers have opportunities for explicit communications, they are almost always able to maintain prices at or near monopoly levels.

Ultimately, though, these results again provide ambiguous welfare conclusions -- while these practices may play a role as a facilitating device, at the same time they are often motivated by other business reasons and can be procompetitive. It has been shown, for example, that most-favoured customer clauses can function to prevent post-contractual opportunism in licensing arrangements, and thus to allow a licensor to commit to an efficient

¹⁹ Perhaps surprisingly, Cooper shows that in some circumstances the unilateral adoption of MFC clauses may be optimal.

²⁰ See Aghion and Bolton, AER (1992).

licensing regime.²¹ In regard to long-term contracts with customers, while there may be a strategic element to the use of these contracts in some cases, such contracts can also be necessary to provide necessary incentives to engage in relation-specific investments. An incentive to price-discriminate (which generally has ambiguous welfare effects) can also underlie these practices.

Additionally, numerous efficiency arguments have been articulated for resale price maintenance, and Mathewson and Winter (1984) develop an integrated theory which explains resale price maintenance, vertical territorial restrictions, quantity forcing and fixed franchise fees as operating as both substitutes and complements that correct retailer incentive distortions arising from various market imperfections. Corts (1985) argues that price-matching and price-beating policies are more appropriately viewed as a means of price discrimination and develops a model that demonstrates their use as such. The analysis shows that, in contrast to the facilitating practices literature, price-matching and price-beating may raise or lower equilibrium prices.

Summary: Can Market Conditions Conducive to the Oligopoly Problem be Identified?

In sum, there have been considerable advances in the understanding of the oligopoly problem at a positive level, i.e. understanding the underlying incentives. Developments in game theoretic modeling of the problem have played an important role in showing that collusion is not inevitable in oligopolies, and providing a framework for understanding it in cases where it occurs. However, the normative policy question remains – i.e. what observable market or firm characteristics are likely to give rise to tacit collusion that significantly adversely affects economic welfare? The answer is that the economics literature does not support that claim that there will automatically be welfare losses from oligopolistic behaviour, and this is because both the size of any losses and the direction of effect on social welfare are ambiguous (see the Appendix for a detailed treatment of the issue).

On the question of substantiality, current thinking establishes plausible theoretical conditions under which the joint-profit maximizing outcome can be supported as an equilibrium, but it is only one of numerous equilibriums that can be supported.²² The basic supergame model cannot distinguish between collusion that raises prices to the monopoly level and

²¹ See McAfee and Schwartz, AER, (1992).

collusion that raises prices only by a fraction of this amount, an amount that may not be regarded as “substantial” under the usual antitrust test. Also on this issue, models of multi-market interactions and demand fluctuations (which have met with some empirical success) have the property that prices in some periods or markets are high, while others are not. This raises a practical difficulty in establishing substantial adverse effects in that only some periods or markets are likely to be observed.

On the question of the direction of the effects, other characteristics (such as cost heterogeneity) or the use of facilitating devices (including various contracts with customers) have ambiguous welfare implications. Anytime cost differentials are postulated, a horizontal merger gives rise to a “rationalization effect” (as in Perry and Porter (1985)) -- i.e. whereby the reallocation of output from high marginal cost firms to relatively low marginal cost firms enhances productive efficiency of a given output level.

It has been widely recognised (for example, OECD 1999) that many practices may have the effect of either increasing or decreasing competitive disciplines in any market. For example, in regard to signaling games and reputation effects, the same sorts of “reputation” that gives rise to pricing above competitive levels can also give rise to beneficial effects (e.g. a reputation for producing high quality products). We believe, however, that studies such as OECD (1999) have often not appreciated how just how ambiguous the welfare effects of the oligopolistic behaviours studied in the academic literature actually are.

5. THE ANTITRUST APPROACH TO OLIGOPOLY PROBLEMS IN NORTH AMERICA

The modern approach to the oligopoly problem, with its origins in Stigler (1964), poses a challenge to antitrust. Specifically, it indicates that with or without an agreement, the ability to maintain prices above competitive levels depends on the scope to share truthful information so as to establish an agreement, to detect deviations, and to punish cheating sufficiently. Thus,

²² Refinements to the Nash equilibrium concept narrow permissible equilibrium, but do not in general lead one to uniqueness.

conspiracy provisions are likely to be an imperfect instrument to deal with tacit collusion.²³ As a result, there is an increased burden on abuse of dominance and merger provisions to address such conduct.

The application of these provisions to the potential for tacit collusion needs to take into account the result from the economics literature that tacit collusion is difficult to differentiate from competitive pricing, and thus the use of a refined model to assess the effect of particular practices is required. First, as discussed above, some practices that facilitate tacit collusion have ambiguous welfare effects, and thus while they may not accord with a textbook description of perfect competition, they may not from an economic perspective be a concern of antitrust policy. Second, even in cases where welfare effects are unambiguous, attempts to infer deviations from competition with price/cost margins (particularly if based in historic accounting cost information) are, as is well-known, problematic (see, for example, Demsetz (1968)). As discussed above, the pursuit of other observable indicators has proved elusive.

Currently, the primary focus of the economics and applied antitrust literature in North America is on the prospect that a horizontal merger might increase unilateral market power – i.e. an increased ability to profitably increase price taking the potential reactions of competitors as given.²⁴ A selective discussion of the antitrust approach in North America is provided below.

The Antitrust Approach in the United States

Prior to the early 1980s, U.S. antitrust policy was vigorously applied based largely on concerns that increased concentration would lead to collusion, either tacit or express. Specifically, horizontal mergers were blocked in a number of cases where, in retrospect, evidence of a likely adverse competitive effect were somewhat weak,²⁵ and the U.S. Federal Trade Commission (unsuccessfully) tested the limits of the application of monopolisation theories to the oligopoly theory in the RTE Breakfast cereal case. This trend was abruptly reversed by the 1984 U.S. Merger Guidelines (which emphasised unilateral market power

²³ See in particular, Baker (1993).

²⁴ See, e.g. Salant, Switzer and Reynolds (1983), Porter and Perry (1985), Deneckere and Davidson (1985), Farrell and Shapiro (1990), Willig (1991).

²⁵ Notable cases include *Falstaff* (1973) and *U.S. v. Philadelphia National Bank* 374 U.S. 321 (1963) discussed in Mueller (1996) and Baker (1993).

through the so-called “hypothetical monopolist” test²⁶ and the 1984 *Ethyl* decision²⁷ which led the courts to require a more onerous standard of “parallelism plus”.²⁸

The current approach is articulated in the 1992 Horizontal Merger Guidelines and clearly distinguishes between unilateral and coordinated market power. While the hypothetical monopolist approach in the 1984 Guidelines re-focused the analysis on unilateral effects, there remained considerable scope for the analysis of coordinated effects in the “other factors” the Guidelines listed (Willig 1991). Specifically, the 1992 Guidelines provide a clear definition of “coordinated effects” and provide a detailed discussion of the information structure necessary to sustain it.²⁹ In explicitly adopting this approach as the basis for models of oligopoly problems to be dealt with by merger policy, the 1992 Guidelines complete the move to a merger policy that fully incorporates the approach of Stigler (1964), and refined in the literature in the 1980s (see Baker (1993) in particular).

The 1992 Guidelines (updated in 1997) do not provide clear market characteristics that make coordinated effects more plausible. Several factors are noted, including product differentiation, cost heterogeneity (i.e. so-called “maverick” firms) and various characteristics of transactions. In each case, though, the language is flexible enough to reflect that the direction of effects might be ambiguous. Also, the Guidelines note that the ultimate test is the effect on the scope for coordination on the whole, rather than due to a particular factor in isolation.

While the characterisation in the Guidelines is consistent with the positive results of contemporary thinking, the guidelines, like the economic theory they embody, do not appear to provide operational normative standards. The extent to which this adds to merger policy (as compared to dealing with these practices under monopolisation provisions) is an open question.

Merger Enforcement Practices at the FTC in 1998

²⁶ And cases such as *U.S. v. Waste Management Inc* 743 F 2d 976 (1984) and *U.S. v. Baker Hughes, Inc.* 908 F 2d 981 (1990)

²⁷ *E. I. Du Pont de Nemours & Co. v. FTC* 729 F 2d 128.

²⁸ See Baker (1993). While noting this trend, Baker points out that a broad reading of the scope of “unfair competition” under section 5 of the FTC Act could plausibly lead one in the other direction from a legal point of view.

²⁹ Importantly, the Guidelines state: “A merger may diminish competition by ... coordinated interaction that harms consumers” (emphasis added). Thus, one could argue that practices that enhance coordination but enhance welfare may not qualify as factors that diminish competition under the guideline’s test.

Merger enforcement has been particularly active in the U.S. recently, as major cases such as *Staples*³⁰ reflect. It is instructive to consider the enforcement record in more detail during this active period to see the trend in merger enforcement in regard to unilateral as compared to coordinated effects cases. In the first nine months of 1998, the FTC undertook 23 merger actions, four of which were premised, at least in part, on concerns about coordinated conduct.³¹ Of course, numbers alone may be misleading as some cases, such as *Staples* for example, may have a disproportionately large effect not only directly (due to the absolute size of the markets involved) or indirectly (due to the number of other cases where business conduct may have been affected by the precedent). By either measure, four out of twenty-three (three of which were consent orders) does not appear to be a large fraction.

It is also instructive to note that, in all four cases, remedies obtained based on coordinated effects theories were sought in light of evidence of facilitating devices. In the contested case,³² the FTC noted that one of the largest hospital GPOs,³³ negotiated contracts with three of the four firms which contained certain provisions that not only guaranteed its members a favorable price, but also set a floor on the price offered to other hospitals and GPOs. The contracts established a common pricing matrix guaranteeing that members of the above mentioned GPOs would receive the same price from each of the three wholesalers. The contracts also included a most-favoured-customer clause which functioned to guarantee that no other customer would be charged a price lower.

During this same period, in non-merger actions, the FTC imposed behavioural remedies in at least two instances.³⁴ *Stone Container Corporation*, a U.S. producer of linerboard used in

³⁰ *FTC v. Staples, Inc.*, 970 F. Supp. 1066, 1070 (D.D.C. 1997).

³¹ He began his remarks on recent coordinated effects cases by noting that unilateral effects cases continue to have the highest profile. He then noted two, closely related contested cases, *FTC v. Cardinal Health, Inc. and Bergen Brunswick Corp* and *FTC v. McKesson and Amerisource* (<http://www.ftc.gov/os/1998/9807/98cv0595.htm>), as well as three consent orders: *FTC v. Shell Oil Company and Texaco Inc.* (Analysis of Proposed Consent Order to Aid Public Comment. <http://www.ftc.gov/os/1997/9712/shelltex.pdf>), *FTC v. Exxon Corporation The Shell Petroleum Company Limited and Shell Oil Company* (See Analysis of Proposed Consent Order to Aid Public Comment. <http://www.ftc.gov/os/1998/9808/9710007.ana.htm>) and *FTC v. Degussa and Dupont*. See *Trends in Merger Enforcement and Litigation*, Richard Parker, Senior Deputy Director, Bureau of Competition, U.S. Federal Trade Commission, September 16, 1998. <http://www.ftc.gov/speeches/other/parker.htm>.

³² It is a single decision involving two closely related transactions by two different pairs of firms (thus one could plausibly call it two cases).

³³ GPO's are public health services delivery areas in the USA.

³⁴ See *Report from the Bureau of Competition*, William J. Baer, Director, Bureau of Competition, Federal Trade Commission, April 2, 1998. <http://www.ftc.gov/speeches/other/baeraba98.htm>.

corrugated boxes, surveyed its competitors to determine the size of their inventories.³⁵ It then offered to purchase these inventories, and at the same time notified its competitors that it was curtailing its own production. The FTC objected that these actions were an invitation to linerboard producers to collude in raising their prices, and obtained a consent decree forbidding these practices. In another case, Sensormatic Electronics and Checkpoint Systems had agreed not to run advertisements attacking each other's products.³⁶ These two firms controlled over 70 percent of total worldwide sales of electronic article surveillance (EAS) systems. These systems are used by retailers to deter and detect shoplifting via tags attached to clothing and other merchandise. The FTC objected that negative advertising could provide consumers (the retail stores that buy EAS systems) with valuable information. Restricting such information is anti-competitive and harmful to consumers. The FTC obtained a consent decree that prohibited the agreement restricting negative but truthful ads.

The implication is that, in reported cases in the first part of 1998, the focus in regard to the so-called "oligopoly problem" at the U.S. FTC has been on cases where facilitating devices have supported claims that tacit collusion raised antitrust concerns. The FTC has relied on a mix of merger and non-merger reviewable practices provisions to deal with concerns. Over this period, the focus of merger enforcement has remained on unilateral effects cases – i.e. the majority of cases (including the high profile Staples case) involved unilateral effects.

The Approach in Canada

Canadian competition law has attempted to grapple with the so-called oligopoly problem for many years, mostly through debates on conspiracy law.³⁷ There have been several, unsuccessful, attempts to introduce specific amendments explicitly to extend the reach of "joint dominance" provisions in Canada.³⁸ The first attempt at reforming conspiracy law took place in June 1971. At the time, there were questions raised about the effectiveness of competition law with respect to oligopolistic interdependence,³⁹ and in particular the conspiracy provision, which

³⁵ See *Analysis of Proposed Consent Order to Aid Public Comment*.
<http://www.ftc.gov/os/1998/9802/9510006.ana.htm>.

³⁶ See *Analysis of Proposed Consent Order to Aid Public Comment*.
<http://www.ftc.gov/os/1998/9801/sensorma.pkg.htm>.

³⁷ For discussion of the evolution of conspiracy law in Canada, see Hughes and Sanderson (1998).

³⁸ See Howard and Stanbury (1990).

³⁹ This concern came about in part, as a reaction to the *Large Lamps* case (*R. v. General Electric Co.* 29 CPR 1 (1976)), in which three suppliers of large electric bulbs, who collectively supplied 95 percent of the Canadian market were found guilty of both price fixing and monopolization. However, the Judge was not willing to determine whether

required a showing that an agreement harmed competition “unduly”. In response, the Economic Council of Canada proposed a provision specifying a per se violation for agreements between competitors to fix price, allocate markets or prevent entry. A second attempt was undertaken in 1977 to deal with joint monopolization through a civil provision that would have applied without a requirement to prove that an agreement existed between the parties. These proposals were not reflected in amendments to competition law. Instead, in the reform of Canadian competition law in 1986, a civil provision dealing with Abuse of Dominance was established, which has scope to deal with Abuse of Dominance by more than one firm.⁴⁰

The outcome of this extended debate is that Canada currently relies primarily on a case-by-case approach under the Abuse of Dominance provisions to deal with concerns of tacit collusion by oligopolists. The one exception is resale price maintenance (RPM). RPM could facilitate tacit collusion; it is treated under a per se criminal standard. However, there is a broad consensus that, at a policy level, economic efficiency would be best served if resale price maintenance was judged according to a rule-of-reason or even a per se legality standard. Any potential for facilitating co-operative pricing could be dealt with under the price conspiracy sections (section 45) of the Competition Act.

Oligopolistic coordination can also be addressed under the merger provisions. The Canadian *Competition Act* provides for a “substantial prevention or lessening of competition” standard, and the Competition Bureau’s *Merger Enforcement Guidelines* distinguish between transactions where the concern is unilateral market power as compared to cases where market power may arise from coordinated conduct.⁴¹ The experience in Canada in applying the merger provisions is provided in McFetridge (1998). As McFetridge notes, with few exceptions, mergers raising competition concerns in Canada have been considered on the basis of single firm dominance. The Competition Bureau has recognised that appropriate evidential standards for the identification of joint dominance, and in particular about tacit collusion, can rarely if ever be met.

conscious parallelism in and of itself, without evidence, such as of an agreement, that the firms involved knew that their parallel or identical behaviour amounted to joint control.

⁴⁰ Specifically, the phrase “one or more persons” in the pre-1986 criminal provision were preserved. For discussion see Church and Ware (1998).

⁴¹ In the latter case, it is recognized that: “high concentration levels in themselves do not imply that a merger will increase the likelihood of the exercise of market power through interdependent behaviour. In addition to high levels of concentration, interdependent behaviour requires the ability to reach an understanding and to detect and deter deviations from the cooperative understanding.” See, Competition Bureau, *Merger Enforcement Guidelines as Applied to a Bank Merger*, paras 65-70.

6. THE MINISTRY OF COMMERCE EVIDENCE ON THE SIGNIFICANCE OF JOINT DOMINANCE

The Ministry of Commerce cites a number of studies from New Zealand and overseas to support the claim that joint dominance, and in particular, tacit collusion, are sufficiently common to warrant a change to the Commerce Act. Our assessment is that the Ministry of Commerce evidence does not support the claim that joint dominance is a common problem, and (perhaps more importantly) that does not demonstrate appropriate regard for the quality of the evidence required to demonstrate joint dominance. Indeed, if the courts and the Commerce Commission take the view of the evidential requirements for joint dominance that are implicit in the Ministry of Commerce discussion paper, there is a high probability that large numbers of efficiency-enhancing mergers will be prohibited.

The Ministry of Commerce (1999) cites a range of studies from the USA relating to the 1920s, 1930s and 1960s, and from the UK relating to the 1960s and 1970s. Even presuming that these studies (which we have not reviewed) provide plausible evidence of tacit collusion, their relevance to contemporary markets in New Zealand is very limited. This is because heavy-handed regulation and high regulatory barriers to entry characterised markets in the UK and US during these periods, while contemporary New Zealand markets operate under a framework of light-handed regulation and low barriers to entry. It is well established the heavy-handed regulation promotes co-operative behaviour among incumbents in a market, in part because of the sharing of information and the coordination that the regulatory mechanism provides. This distinction between regulatory policy with respect to markets in New Zealand and Europe, and in particular our focus on low regulatory barriers to entry, mean that by comparison with the conclusions set out in, for example OECD (1999), quite a different emphasis in competition policy will be appropriate in New Zealand.

The Ministry of Commerce (1999) cites the NZIER (1996) in support of its claim that (until recently) tacit collusion in petrol prices presented a major problem. We have reviewed the NZIER report, and our conclusion is that it does not provide plausible evidence of tacit collusion in the retail petrol market in New Zealand. We hold this view because:

- (i) The NZIER Report's consideration of non-price competition is inadequate. The NZIER (1996: 6) state that:

Our experience is that competition on fringe features such as service levels rather than on the price of the principal product is likely to indicate a lack of vigorous competition. In a highly competitive industry, one would expect to see differentiation in service levels and prices offered.

These statements are, however, inconsistent with modern microeconomic theory. The balance between price and non-price competition will be determined by the market. Under vigorous non-price competition excess profits may be competed away, and (so long as consumers value the higher service levels) there may be no loss of consumer welfare. In addition, as we have pointed out above, homogenous prices and service levels are consistent with perfect competition as well as with co-ordination (Ordover and Saloner, 1989, Sec. 3.2)

- (ii) The NZIER (1996) do not provide any evidence that they considered the large literature on the welfare-enhancing effects of vertical restraints and vertical integration, yet these are important features of the retail petrol industry.
- (iii) The NZIER (1996) data provide no evidence that either explicit or tacit collusion was actually occurring, and they do not provide the sophisticated evidence that would be required to make a claim of joint dominance plausible under competition law in Canada and the USA. The NZIER provide some empirical evidence that could be consistent with joint dominance, but is equally consistent with perfect competition in the presence of non-price rivalry.
- (iv) More generally, the NZIER (1996) do not consider whether the retail petrol market displayed evidence of reductions in dynamic efficiency. Subsequent evidence of entry which has reduced petrol prices is at least consistent with dynamic efficiency in this market.

Overall, the evidence cited by the Ministry of Commerce (1999) is quite inadequate to justify the proposed changes to the Commerce Act given the nature of the regulatory environment in New Zealand. It is important that low quality and implausible evidence on joint dominance is not used to block efficiency-enhancing mergers.

7. CONCLUSION

We have substantial reservations about the proposal by the Ministry of Commerce to introduce a competition test for mergers that it designed to allow consideration of the potential for joint dominance, including tacit collusion. While similar language to that proposed by the Ministry exists in Canadian and US competition law, in respect of joint dominance its application has narrowed over time. This evolution of the interpretation of the competition law mirrors the development of the economics literature, which now recognises the extreme difficulties associated with meeting high standards of evidence of co-ordination, especially where the collusion is tacit. The development of clear thresholds to determine when a merger would likely lessen competition substantially due to coordinated conduct has proved elusive.

The current North American approach therefore recognises that:

- (i) evidence on market prices rarely provides a basis for distinguishing co-ordinated action from perfect competition.
- (ii) Market practices and structures that have the potential to facilitate collusive oligopoly conduct have been the focus of the small number of cases in which joint dominance issues have been considered; and
- (iii) These practices and structures tend to have ambiguous welfare effects.

Our view is that neither the evidence from competition law enforcement in Canada and the USA nor the claims made in the Ministry of Commerce document provide plausible support for the claim that joint dominance, including tacit collusion, is so widespread or so important that an amendment to the Commerce Act is required. Almost all cases in North America are dealt with

under single firm dominance, and tacit collusion has rarely been considered. We expect that in the New Zealand commercial environment, where there are low regulatory barriers to entry and heavy-handed regulation is rarely used, the joint dominance is even less important than it is in North America. In the light of this evidence, we are concerned that the approach recommended by the Ministry of Commerce will result in a significant number of mergers being blocked on the basis of claimed evidence of joint dominance when in fact neither that evidence nor the presumption that welfare has been reduced can withstand serious economic analysis.

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APPENDIX: Welfare Effects of Coordination in Asymmetric Oligopolies

As noted in the paper, the welfare effects of coordination can be ambiguous in some circumstances. This appendix uses examples to explain this result in more detail.

A point we made in the body of the paper is that contemporary oligopoly theory has forwarded our understanding of coordinated behaviour at a positive level, but much less so in the normative direction. The reason is that the concept of a Nash Equilibrium in a repeated game gives rise to a multitude of equilibria. First, starting from the one-shot Nash, the level of prices is indeterminate – and thus even if coordination was highly likely (or even “known” on a balance of probabilities based on an examination of past conduct), that in itself cannot reveal whether coordination caused monopolistic price levels, or price levels that are insubstantially above the levels that would otherwise occur. Thus we have a difficulty establishing substantiality.

A second result is that, starting from a one-shot Nash equilibrium, the coordinated outcome can shift firms’ relative market shares for a given price level. Sufficiently large punishments can support one firm constraining competition significantly and the other constraining competition by only an insignificant amount. This can affect productive efficiency and thus give rise to the possibility that the direction of the effect on welfare is ambiguous.

Undifferentiated Bertrand

Following Bernheim and Whinston, we begin with the case of undifferentiated Bertrand. While this is not a very realistic set of assumptions for practical application, it has the advantage of simplicity from a modelling standpoint. We assume there are two firms, firms 1 and 2, which compete in two markets, denoted A and B. The discount rate is denoted δ . The profit level in monopoly is denoted π_A^{mon} or π_B^{mon} depending on the market, the coordinated equilibrium is denoted π_A^* or π_B^* , again depending on the market, where the price in the coordinated outcome is at or above the one-shot Nash (i.e. $P = \text{marginal cost}$). Also, denote firm 1’s share of market A as λ_A (and thus $1 - \lambda_A$ is firm 2’s share). Then looking at a single market, and noting that the profit of the one-shot Nash is zero, cartel stability depends on:

$$(1) \quad \pi_A^* \leq [1/(1-\delta)] \lambda_A \pi_A^* \text{ and } \pi_A^* \leq [1/(1-\delta)] (1-\lambda_A) \pi_A^*$$

One can quickly see that the π_A^* terms cancel out, and thus multiplicity issue re-emerges, not only can any number of prices between the Bertrand-Nash and monopoly levels be sustained, but it also doesn’t matter to the incentive constraint, a higher price affects both the incentive to cheat and the punishment in proportion. So we have:

$$(2) \quad (1-\delta) \leq \lambda_A \text{ and } (1-\delta) \leq (1-\lambda_A)$$

Given λ_A is a fraction between zero and one, the market share that meets these two constraints for the lowest level of δ is $\lambda_A = 0.5$. Other λ_A can be Nash equilibria for sufficiently large δ .

Turning attention to the two market case, we have:

$$(3) \quad \pi_A^* + \pi_B^* \leq [1/(1-\delta)] [\lambda_A \pi_A^* + \lambda_B \pi_B^*] \text{ and}$$

$$\pi_A^* + \pi_B^* \leq [1/(1-\delta)] [(1-\lambda_A) \pi_A^* + (1-\lambda_B) \pi_B^*]$$

where the coordinated equilibrium, denoted by asterisks, is supported by Nash reversion in both markets simultaneously. If the two markets are identical, and thus $\pi_A^* = \pi_B^* = \pi^*$, again the profit terms cancel and we have:

$$(4) \quad (1-\delta) \leq [1/2] [\lambda_A + \lambda_B] \text{ and } (1-\delta) \leq [1/2] [(2-\lambda_A - \lambda_B)]$$

These two constraints can be met for the lowest possible level of δ for $\lambda_A + \lambda_B = 1$, e.g. each individually equal to 0.5. The point is that multimarket contact does not add to the circumstances where coordination can be sustained. $\delta \geq 0.5$ remains necessary.

One can show that multi-market coordination can be efficiency enhancing relative to single market coordination. Consider the case where firm 1 operates more efficiently in market A, while firm 2 operates more efficiently in market B. We denote this relationship as: $\pi_{A1}^* > \pi_{A2}^*$ and $\pi_{B1}^* < \pi_{B2}^*$. Then, in the single market case, we have:

$$(5) \quad \pi_{A1}^* < [1/(1-\delta)] \lambda_A \pi_{A1}^* \text{ and } \pi_{A2}^* < [1/(1-\delta)] (1-\lambda_A) \pi_{A2}^*$$

and as before the profit terms cancel out. But in the multi-market context,

$$(6) \quad \pi_{A1}^* + \pi_{B1}^* \leq [1/(1-\delta)] [\lambda_A \pi_{A1}^* + \lambda_B \pi_{B1}^*] \text{ and}$$

$$\pi_{A2}^* + \pi_{B2}^* \leq [1/(1-\delta)] [(1-\lambda_A) \pi_{A2}^* + (1-\lambda_B) \pi_{B2}^*]$$

If we impose $\lambda_A = \lambda_B = 0.5$, then the profit terms cancel as before, and $\delta \geq 0.5$ is necessary to sustain the collusive outcome. But other values for the share term allow the constraint to be relaxed. Consider the case of $\lambda_A = 1$ and $\lambda_B = 0$. Then (6) becomes:

$$(7) \quad \pi_{A1}^* + \pi_{B1}^* \leq [1/(1-\delta)] [\pi_{A1}^*] \text{ and}$$

$$\pi_{A2}^* + \pi_{B2}^* \leq [1/(1-\delta)] [\pi_{B2}^*]$$

which juggling terms reduces to $1 - [\pi_{A1}^* / (\pi_{A1}^* + \pi_{B1}^*)] \leq \delta$, the right hand side of which is, by definition of π_{B1}^* less than 0.5. And of course the analogous simplification can be done for firm 2. The point is twofold. First, multi-market contact can loosen the incentive constraint, and that

it does so because of asymmetries across markets that would often be associated with efficiency gains relative to coordination in each market individually.

Overall efficiency effects of coordination have to be measured relative to the Nash equilibrium. In the undifferentiated Bertrand case, welfare effects are straightforward. The one-shot Nash is clearly optimal, since any lower cost firms produce all output, and if there are fixed/avoidable costs, they are only incurred once. So productive efficiency is maximized. And price is at the lowest possible level, so allocative efficiency is maximized. Coordination cannot improve on this initial first-best solution.

More generally, though, the initial Nash equilibria under asymmetric firms or markets (e.g. differentiated Bertrand or Cournot) will tend to be inefficient. High cost firms often produce too much, or there is too much entry, or there are too many brands. The increased scope for coordination in multi-market situations gives rise to an incentive to eliminate exactly the sorts of inefficiencies that arise in such an initial non-cooperative one-shot oligopoly equilibrium. Some possibilities are as follows:

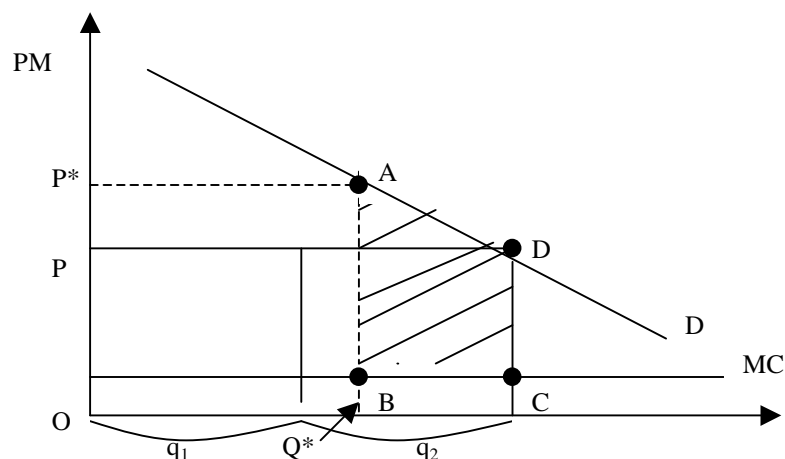
Symmetric Oligopolistic Coordination

In this section of this appendix, we consider oligopolistic coordination between symmetric firms. Here, relative shifts in output levels are unimportant because consumers (and thus total welfare) are agnostic as to which firm supplies how much. In this case, differences in the relative amount that firms restrict output affects the division of private surplus, but not total welfare.

Consider an oligopoly made up of n firms, and denote their output level in the initial one-shot Nash Equilibrium as q_i . Consider first the case where products are homogeneous, and thus consumers are indifferent as to which oligopolist supplies them. In this case, equilibrium price is a function of $\sum q_i$ which we denote Q . Each firm's profit in the initial equilibrium is denoted π_i . In an infinitely repeated game, an equilibrium can be supported using punishment strategies. We denote variables in the coordinated equilibrium with asterisks. As noted above in the body of the paper, the equilibrium of this game is not unique. Any price between the one-shot Nash and the joint-profit maximizing solution can be supported. Similarly, for any given Q in the coordinated equilibria, the individual levels of q_i^* are indeterminate. All that we know is that π_i^* must be greater or equal than π_i for all i .

The Cournot-Nash case

Under Cournot competition, for example, we graphically represent the duopoly situation. We denote P_m as the joint-profit maximizing price and show $P^* > P_m$ to remind ourselves that the equilibrium is not unique, but the results hold equally for $P^* = P_m$. Marginal costs are assumed to be constant and equal across firms and are denoted as MC . Technology is assumed to be constant returns to scale, and thus there are no fixed costs. Then we have:

Figure 1

The welfare loss is shown by the shaded trapezoid (ABCD). The result is unambiguous, there is no tradeoff of positive and negative effects.

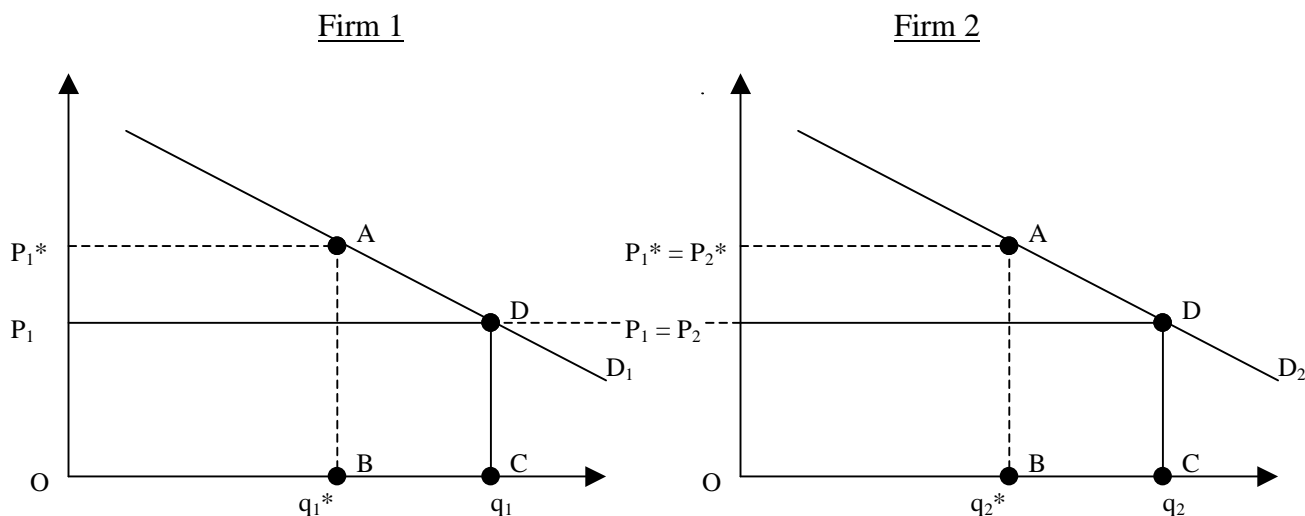
Importantly, notice that the welfare effect is the same for all q_i^* that satisfy Q^* , including for example, $q_1=0$, $q_2 = q_i^*$ (which is analytically equivalent to a merger). Some relative output dispersions can be ruled out by the fact that individual firm profits are not enhanced (absent the possibility of allowing side-payments) but since price increases, there is a range of relative output levels that can be sustained. The fact that industry profits have been increased is a sufficient condition for welfare reducing coordinated conduct. Rent transfers between the oligopolists do not affect welfare, and thus coordination remains unambiguously welfare reducing.

The Bertrand-Nash Case

Under differentiated Bertrand competition, we can show the equivalent case. Here, market demand cannot be written so neatly as the summation of individual demands, so we denote $D_i(q_i^*) = P_i$ as the i th firm's demand curve. In the graph below, we represent the firms in two different graphs, but this is merely to aid in graphing the problem, they are assumed to compete in the same (though differentiated) market. Consider the case where each firm's demand curve is identical and marginal cost curve is identical and constant (zero without loss of generality). We first consider the case where the two firms symmetrically restrict competition – i.e. they raise price by an equal amount. This is shown by:

Figure 2

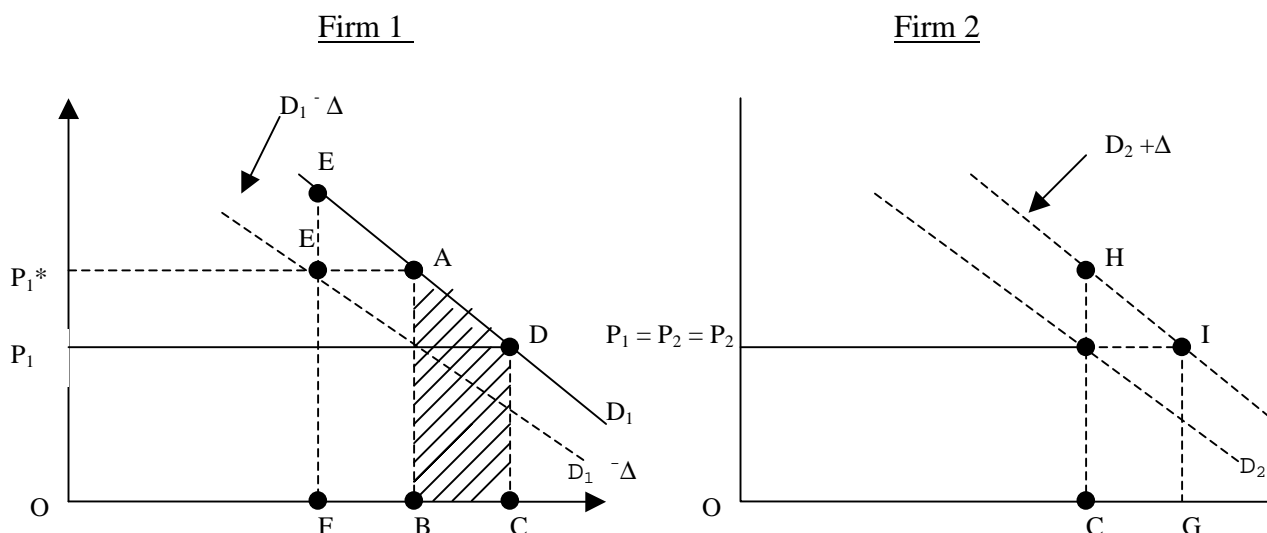
Two firms selling differentiated products in a single market are shown below:



The welfare loss is shown by the shaded trapezoid (ABCD). The result is unambiguous, there is no tradeoff of positive and negative effects.

This result holds up reasonably well to the case of asymmetric P_1^* , including for example, the situation where firm one increases price while firm holds its price constant.⁴²

Figure 3



⁴² One could consider a price decrease as well, but that would simply add additional complications that are not necessary for our purposes.

By itself, the price increase by one firm gives rise to the familiar welfare loss trapezoid (ABCD). Then the relative price dispersion causes some fraction of consumers, denoted Δ , to move to the lower price market. The welfare of this shift depends in the comparison of trapezoid (ABEF) minus trapezoid (HCGI). Absent restrictions on the functional form of the demand curves, this is difficult to do in general, but one can see that the taller loss trapezoid would tend (all other things equal) to lead to additional welfare losses.

Welfare Effects Under Asymmetric Oligopolistic Coordination

In this section of this appendix, we consider oligopolistic coordination between asymmetric firms. Here, shifts in the relative amount that each firm restricts competition mean that the direction of the welfare effect of coordinated conduct is ambiguous. In addition to shifting social surplus, output shifts among asymmetric firms affects welfare. This does not mean that coordination is any less (or more) of a concern in the abstract when firms are asymmetric. Output shifts can either magnify or mitigate the basic inefficiency generated by an overall restriction of competition. But it makes the task of delineating reliable rules to distinguish harmful coordination even more difficult, if not intractable. To illustrate this issue, we focus on two special cases in section II where output shifts not only mitigate effects, but potentially offset them, reversing the effect of the overall restriction of competition.

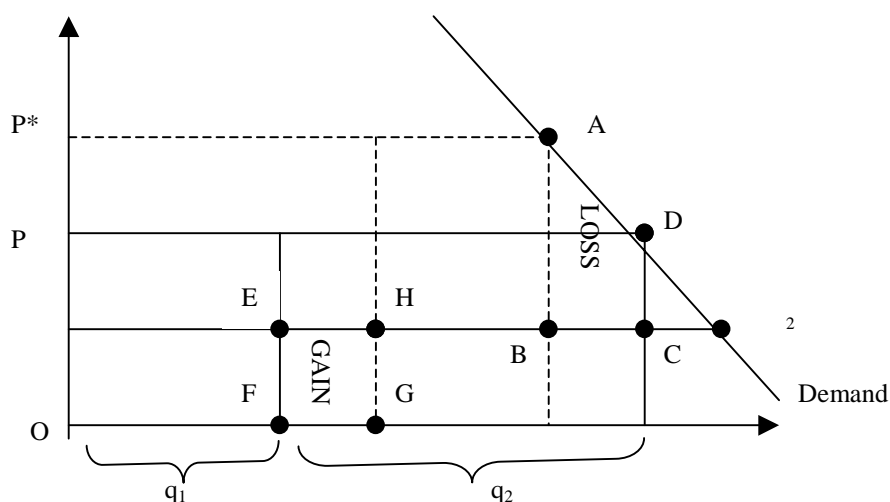
First, coordination can “rationalize” industry output if in the coordinated outcome, high cost firms reduce output by even more than the total industry does, and at the same time low cost firms actually increase output. In the initial one-shot Nash equilibrium, the ability of low cost firms to be able to earn a positive price over cost margin allows less efficient firms to produce more output than would be efficient from a cost minimization point of view. In this case, the effect is to, in essence “transfer” production to low cost firms. This effect is analogous to the rationalizing effect of horizontal mergers shown by Farrell and Shapiro, Perry and Porter and other authors of unpublished work too numerous to list (including Hazledine and Hughes (1991)). Second, coordination can shift consumers to higher value consumption goods. If one firm is able to achieve a sizable markup of price over cost relative to rivals in the one-shot Nash equilibrium, consumers will tend to shift away to competing products (which may for those consumers have lower total surplus). This initial inefficiency of the one-shot Nash equilibrium is akin to a “double-markup” problem, but here affecting final consumers rather than “retailers”. If the coordinated outcome is characterized by low value firms increasing price and contracting output relatively more, coordinated conduct offsets the initial “double markup-type” distortion.

Bernheim and Whinston (1990), it is shown that multi-market contact does not facilitate collusive behaviour in the following case: (i) markets are identical; (ii) firms are identical; (iii) technology is constant returns to scale. As we will show below, these are precisely the conditions one needs to get the unambiguous results in the classic case.

Asymmetric Cournot-Nash

Purely for ease of illustration, assume firm 1 has lower constant marginal cost equal to zero, while firm two has a positive marginal cost denoted c . Assume we have the non-trivial case where both firms produce output in the non-cooperative equilibrium.

Figure 4



Using the same notation, we depict q_1 and q_2 as the output of each individual firm. q_1 will be greater than q_2 , because of the cost asymmetry, but q_2 will be greater than zero. Now, consider a coordinated increase in industry price where $q_2^* < q_2$. Firm 2's profit can be higher than the one-shot Nash because while total output is lower, the margin on each unit is higher. Firm 1's profit is obviously higher than one-shot. The price level (between P and P_m is indeterminate) and so too is the individual levels of q_i , subject to the increasing profit constraint. In this depiction, trapezoid (ABCD) is again the welfare loss, but rectangle EFGH is a cost savings. The net of these two effects is ambiguous.⁴³ An increase in the low cost firm's output is a necessary but not sufficient condition for a welfare gain under cooperative conduct under asymmetric marginal costs (and no fixed costs).

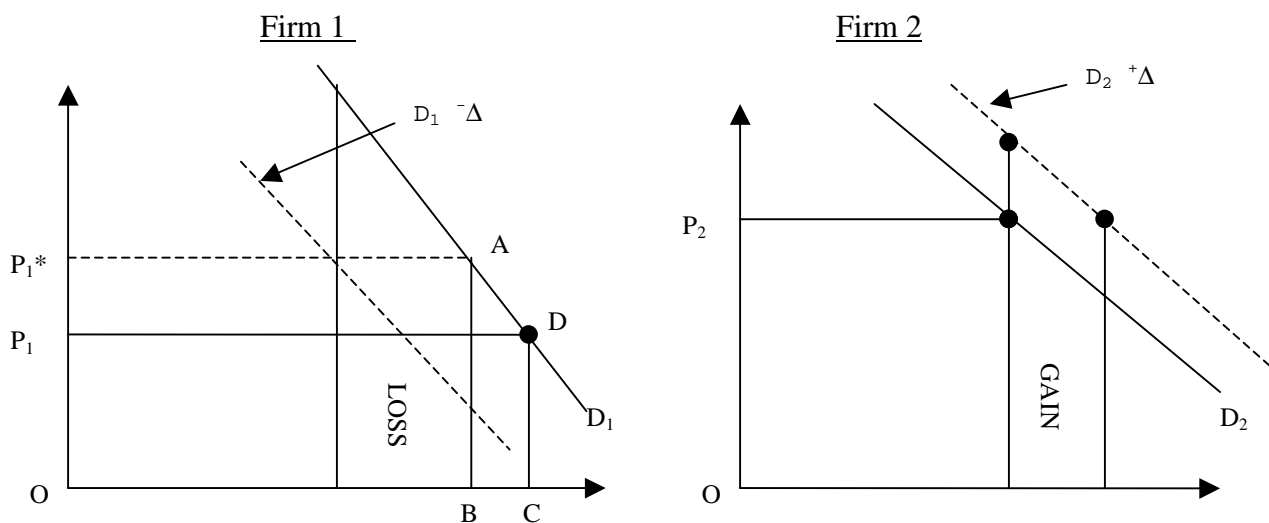
Of course, with avoidable fixed cost of operating in a market, and multiple markets, even with equal marginal costs (say zero, for ease of exposition), for some coordinated outcomes, firms could choose zero output in various markets and have the offsetting effect of saving fixed costs.

Asymmetric Bertrand-Nash

⁴³ Consider further, in the spirit of Bernheim and Whinston (1990), where firm 1 has a "home" market with cost equal to zero, and a "distant" market where marginal cost equals c . Then let each firm exit its "distant" market, setting $q_i = 0$. Then multi-market collusion is analytically equivalent to a "rationalizing" merger in the sense of Farrell and Shapiro et al, and is potentially welfare enhancing if the reduced avoidable fixed costs exceed the deadweight loss triangle.

This the most complicated case, where numerous cases of ambiguous effects can be illustrated. Consider the case where, in the initial one-shot equilibrium, price/cost margins vary. Then, consider the coordinated equilibria where the firm with the low price/cost margin increases price while the firm with the higher price cost margin maintains a constant price. (we set marginal cost equal to zero for ease of illustration) This causes some amount of a shift of both demand curves denoted Δ . This could be profit increasing for the firm increasing price since, even if some customers choose to exit the market, and others choose to switch to the other product, the price is higher. Also, this could be profit increasing for the firm with the constant price because its sales at this output level are higher.

Figure 5



In regard to welfare, we note that we get the same welfare loss trapezoid as always ($ABCD$). But there is a demand reallocation from the low margin to high margin market. The width of these rectangles has to be the same, but by construction, the rectangle in the constant price market has more height. The net gain in the rectangle comparison can offset the trapezoid, depending on parameter values.