Do Vertical Mergers Facilitate Upstream Collusion?*

Volker Nocke† Lucy White
University of Pennsylvania Harvard Business School

February 17, 2003

Abstract

In this paper we investigate the impact of vertical mergers on upstream firms’ ability to sustain collusion. We show in a number of models that the net effect of vertical integration is to facilitate collusion. Several effects arise. When upstream offers are secret, vertical mergers facilitate collusion through the operation of a foreclosure effect: Cheating uninTEGRATED firms can no longer profitably sell to the downstream affiliates of their integrated rivals. When offers are public, vertical integration also facilitates collusion through a reaction effect: the vertically integrated firm’s ‘contract’ with its downstream affiliate can be more flexible and thus allows a swifter reaction in punishing defectors. Offsetting these two effects is a possible punishment effect which arises only if the integrated structure is able to make more profits in the punishment phase than a disintegrated structure.

Keywords: vertical mergers, collusion
JEL: L13, L42

1 Introduction

Much has been written recently on the potential anti-competitive effects of vertical restraints (see Rey and Tirole 1997 for a survey). But this literature has – until now – taken a strictly static one-shot view of the interaction between firms. In this paper we provide the first investigation of the impact of vertical mergers in dynamic games; in particular, on upstream firms’ ability to sustain collusion. We show that – when upstream offers to downstream firms are secret – vertical mergers facilitate collusion through the operation of an outlets effect. Cheating uninTEGRATED firms can no longer profitably sell to the downstream affiliates of their integrated rivals, and foreclosure from these outlets makes defection from the collusive agreement less profitable. When offers are public, vertical integration also facilitates collusion through a reaction effect: the vertically integrated firm’s ‘contract’ with its downstream affiliate can be more flexible and thus allows a swifter reaction in punishing defectors. Offsetting these two effects is
a possible punishment effect which arises only if the integrated structure is able to make more profits in the punishment phase than a disintegrated structure. We show in a number of cases that the net effect of vertical integration is to facilitate collusion.

The US Non-Horizontal Merger Guidelines anticipate the idea that vertical mergers may facilitate collusion. These guidelines envisage two ways in which this can occur. Firstly, it may be that vertical merger may somehow facilitate upstream collusion by making it easier to monitor downstream prices. This is an old idea which has yet to be formalised, but its informal outline can be found for example in Tosdal’s (1917) description of the operation of the German steel cartel. (See also Jullien and Rey (2001) for the related idea that resale price maintenance may facilitate collusion.) This mechanism is entirely different from the one proposed in this paper. Here we do not impose any ad hoc changes in the ability to observe or punish deviations, but rather consider differences in contracts and incentives to cheat on a collusive agreement which arise endogenously as a result of vertical integration.

The second way in which the Non-Horizontal Merger Guidelines envisage that vertical integration may facilitate collusion is through the acquisition of “disruptive buyer”. The Guidelines state that a disruptive buyer must be one which is substantially different from the others, the idea being that price-cutting to this buyer is particularly attractive, so that the “removal” of this buyer from the downstream market may significantly reduce incentives to deviate from a collusive agreement. This idea has some relation to our theory, but we derive, rather than impose the result that the purchase of a downstream buyer by an upstream firm makes it less attractive for its rivals to cheat by removing an outlet for their cheating (our ‘outlets’ effect). Moreover, it is not clear whether the assertion in the Guidelines that the acquisition of a disruptive buyer will tend to facilitate upstream collusion is indeed correct: the acquiring upstream firm now owns an attractive outlet for cheating, so his own incentive to cheat may increase (in our model this effect shows up as the punishment effect). We also show that the Guidelines may be too restrictive in focusing on buyers which ‘differ substantially’ from other firms in its market: even when downstream firms are symmetric, the removal of a downstream buyer can improve collusion possibilities. Further, our analysis shows that with asymmetric firms downstream, it is not necessarily obvious which buyer is disruptive. For example, if downstream firms’ costs differ, intuition might suggest that the low cost buyer is disruptive, since sales to this firm will be particularly attractive to upstream firms. However, this is not necessarily true - the outlets and reaction effects are greater for the low cost firm, but so is the offsetting punishment effect.

The simplest model we investigate is one where downstream firms’ products are perfect substitutes and they compete in prices à la Bertrand. We consider $M \geq 2$ upstream firms selling a homogenous input to $N \geq M$ downstream firms, where the former would like to collude both to keep total industry output to monopoly levels, and to extract rents from the downstream firms. Downstream firms make sales to consumers every period over an infinite horizon. Upstream and downstream firms face a common discount factor $\delta$. We consider how vertical mergers affect the critical discount factor $\delta$ above which collusion can be sustained. In the collusive arrangement, the wholesale price is set equal the monopoly price and the fixed fee is zero. The optimal deviation by upstream firms from the collusive agreement depends on whether the offers made by upstream to downstream firms are publicly observed by all
parties, or observed only by the offerer and the recipient of the offer, i.e., “secret”. In the latter case, we have to specify what the beliefs of a downstream firm receiving a deviating offer are about the offer received by its rival. With secret offers and passive beliefs, the optimal deviation by an upstream firm is to offer each downstream firm a contract with a wholesale price equal to cost and a fixed fee equal to the monopoly profit. Each downstream firm accepts this contract as he anticipates that his rival’s contract will be unchanged (this is the import of the passive beliefs assumption) and thus that he can slightly undercut the monopoly price. That is, a deviating upstream firm can obtain the monopoly profit from each downstream firm, i.e., \( N \) times the monopoly profit. When one upstream-downstream firm pair integrates, this is no longer true. When the unintegrated firm tries to offer an undercutting contract to the integrated downstream firm, he must leave at least the rent that this integrated firm anticipates from selling the collusive quantity offered to him by his upstream affiliate, i.e., at least half the monopoly profit in this period as well as in all future periods. For the relevant discount factors, it turns out that the unintegrated downstream firm would require a rent of at least the monopoly profit. Hence, the unintegrated upstream firm can earn only \( N - 1 \) times the monopoly profit from deviation under integration. This is the operation of the outlets effect.

When one firm integrates in this scenario, its own incentives to cheat are unchanged, but those of its rivals are diminished, making cheating less attractive overall. When market shares are re-optimised in favour of the integrated firm, integration thus makes collusion strictly easier. This turns out to be true for each successive integration in the industry. Collusion is easier the larger the fraction of firms that are vertically integrated.

Limited vertical integration also facilitates collusion when upstream firms’ offers are public, but for a different reason. Here, we restrict attention to optimal collusive offers in two-part tariffs to downstream firms.\(^1\) On-the-equilibrium path offers are as in the secret offers case, but now because of the publicity of offers, a deviating firm cannot expropriate more than the monopoly profit from downstream firms. Under non-integration it is possible to extract exactly that amount by offering one or both downstream firms a contract with wholesale price slightly below the monopoly price offered by one’s upstream rival. An integrated firm can do the same if it chooses to cheat. But an unintegrated firm facing an integrated rival with public offers will find itself completely unable to profit from deviation even in the period of deviation. The reason is that the publicity of offers means that its integrated rival will observe the deviation and immediately react to the end of collusion by pricing just below the deviant offer (or at marginal cost, whichever is higher). We call the integrated firm’s ability to immediately react the reaction effect. Even though offers are public, it does not arise in the unintegrated case because the contracts which must be offered to downstream firms on the equilibrium path are inflexible. When an unintegrated firm observes a deviation by his rival, the former is still bound to the high wholesale price he simultaneously offered, so he cannot react aggressively in response. By contrast, the integrated firm’s ‘contract’ with his downstream affiliate is effectively to set the wholesale price at marginal cost. One could argue that it would be difficult for him to commit to anything else since the downstream unit will act in the upstream unit’s interest.

\(^1\)This is to avoid complications related to contracts involving binding quantity ceilings and Kreps-Scheinkman style outcomes. We conjecture that allowing such ceilings does not affect our main results but it considerably complicates the analysis.
because they share profits; one can alternatively think of the upstream unit as controlling the downstream unit’s decisions. In any case, the integrated firm will maintain monopoly pricing without a high wholesale price, so even if it were possible to commit to one, it would only serve to limit the integrated firm’s ability to react to his rival’s deviations. Interestingly, in this case the optimal collusive market structure is asymmetric; this is in contrast to previous results that asymmetries between firms often make collusion more difficult (see e.g. Compte et al 2002 for a recent investigation). In the stark Bertrand model with unlimited capacity, a single integrated firm is able to punish any deviation as harshly as necessary. Further integrations actually make collusion harder because they do not improve the ability to react, but they do make it easier for firms to deviate secretly - if the wholesale price on the equilibrium path is set equal to marginal cost, a decision to deviate will not be detected until after prices are realised, by which time it is too late to react.

We then move on to investigate more complex variants of the model. In particular, we consider a model where downstream firms compete in quantities. Here, with secret or public offers, the outlets or reaction effects respectively work as before to imply that the nonintegrated upstream firm has less incentive to cheat (relative to the case under nonintegration). However, working against these effects, a punishment effect will now arise as – in contrast to the Bertrand model – the breakdown of collusion upstream will not eliminate all rents in the industry. There will still be rents downstream after collusion has broken down, since downstream competition is relatively soft. This punishment effect tends to reduce the incentive of the integrated firm to collude because it will enjoy a part of these rents in the punishment phase. Given the offsetting effects it is difficult to prove general results here, but we show that the punishment effect is nevertheless offset by the outlets effect with public offers.

The plan of the paper is as follows. In section 2 we begin with our benchmark model of Bertrand competition downstream and secret offers. This model exhibits only the outlets effect. In section 3 we turn to an investigation of how the analysis is changed if offers are public: this model exhibits only the reaction effect. In section 4 we investigate a model with Cournot competition downstream, where the punishment effect arises. In section 5 we compare our results with the policy laid down in the US Non Horizontal Merger Guidelines. Section 6 concludes with a summary of results and policy prescriptions.

2 The Benchmark Model: Bertrand Competition Downstream, Secret Offers, and Passive Beliefs

$M$ identical upstream firms, $U_1, U_2, \ldots, U_M$ produce a homogenous intermediate good at constant and identical marginal cost $c \geq 0$. They sell this good to $N$ identical downstream firms, $D_1, D_2, \ldots, D_N$, who use one unit of the intermediate input to produce one unit of the final homogenous output at no additional cost. We assume that $M \geq 2, N \geq 2$, or else achieving the monopoly outcome is trivial. The downstream firms then compete in prices to sell to consumers in the retail market. Denote by $p_1, p_2, \ldots, p_N$ the (linear) retail prices set by $D_1, D_2, \ldots, D_N$ respectively. The two upstream firms make simultaneous and secret take-it-or-leave-it two-part tariff offers to the downstream firms. $U_i$’s (secret) offer to $D_j$ takes the form $\phi_{ij} = (w_{ij}, F_j)$,
where \( w_{ij} \) is the marginal wholesale price, \( F_{ij} \) is the fixed fee. The fixed fee \( F_{ij} \) has to be paid immediately if the offer is accepted, while the wholesale price \( w_{ij} \) has to be paid for each unit that is ordered and then sold in the retail market to consumers. If \( U_i \) does not make an offer to \( D_j \), then \( \phi_{ij} = \emptyset \).

Time is discrete and indexed by \( t \). Firms have an infinite horizon and share a common discount factor \( \delta \in (0,1) \). Each period an identical set of consumers come to the downstream market to buy the final good. Market demand is given by \( D(p) \).

The timing in each period is as follows:

1. Offer stage: \( U_1, \ldots, U_M \) simultaneously make secret offers to the downstream firms. Let \( \phi_i = (\phi_{i1}, \phi_{i2}, \ldots, \phi_{iN}) \) denote the vector of \( U_i \)'s offers to downstream firms, \( \phi_j = (\phi_{1j}, \phi_{2j}, \ldots, \phi_{Nj}) \) the vector of offers received by \( D_j \), and \( \phi = (\phi_1, \phi_2, \ldots, \phi_M) \) the vector of all offers.

2. Acceptance stage: \( D_1, \ldots, D_N \) simultaneously decide which contract(s) to accept. (If they decide to accept a contract, the relevant fixed fee is paid to the upstream firm.) \( D_j \)'s acceptance decision is denoted \( \alpha_j = (\alpha_{1j}, \alpha_{2j}, \ldots, \alpha_{Mj}) \), where \( \alpha_{ji} \in \{\text{accept, reject}\} \) refers to \( U_j \)'s offer, and let \( \alpha = (\alpha_1, \alpha_2, \ldots, \alpha_N) \).

3. Output stage: \( D_1, \ldots, D_N \) simultaneously set prices (denoted \( p_1, \ldots, p_N \), respectively) in the downstream (retail) market. (Quantities demanded by consumers are then ordered from the upstream firms at the relevant wholesale prices.) Let \( p = (p_1, p_2, \ldots, p_N) \).

4. All actions (e.g., offers, signed contracts, etc.) are publicly revealed.

**Public history vs. private history.** Let \( h^{t-1} = (h^{t-2}, \phi^{t-1}, \alpha^{t-1}, p^{t-1}) \) denote the public history at the end of period \( t-1 \). Since all actions are publicly revealed at the end of the period, \( h^{t-1} \) is also each firm’s private history at the end of period \( t-1 \). At the beginning of each of the stages 1, 2, and 3 in period \( t \), the public history is still \( h^{t-1} \). At the beginning of stage 2 in period \( t \), \( U_i \)'s private history is \( (h^{t-1}, \phi_i^t) \), while \( D_j \)'s private history is \( (h^{t-1}, \phi_j^t, \alpha_j^t) \). At the beginning of stage 3 in period \( t \), \( U_i \)'s private history is \( (h^{t-1}, \phi_i^t, \alpha_i^t) \), while \( D_j \)'s private history is \( (h^{t-1}, \phi_j^t, \alpha_j^t) \).

We adopt the following notation:

- \( p^M = \arg \max_p [p-c]D(p) \) downstream monopoly price of a firm with marginal cost \( c \); \( w^M \) wholesale monopoly price (with marginal cost \( c \)); clearly, \( w^M = p^M \) since downstream firms have no production costs other than costs of input.

- \( q^M = D(p^M) \) monopoly quantity (when marginal cost is \( c \)).

- \( \pi^M = \max_p [p-c]D(p) \) monopoly profit (when marginal cost is \( c \)).

We seek the most collusive Perfect Bayesian Equilibrium that gives all monopoly rents to the upstream firms, assuming that upstream firms sustain collusion through infinite Nash reversion in the event of a deviation. As is common in the literature, if an upstream firm deviates
from its equilibrium offers, then each downstream firm is assumed to hold passive beliefs: the downstream firm obtaining the deviant offer continues to believe that its downstream rivals continue to be offered their equilibrium contracts (i.e., that he is the only firm receiving a deviant offer). For further description and motivation of passive beliefs, see Hart and Tirole (1990); Rey and Tirole (1997); Segal (1999); McAfee and Schwartz (1994).

The advantage of this model (and all the variants we study in this paper), as we will see, is that vertical integration has no effect on the non-collusive outcome. This allows us to isolate the collusive effects of vertical mergers.

3 Benchmark Model: Equilibrium Analysis

Unintegrated case: When none of the firms are integrated, to facilitate collusion, the upstream firms will optimally share the market equally. Throughout the paper, we confine attention to collusive trigger strategies, where all firms revert forever to the non-collusive Nash equilibrium in the subgame following a deviation from the collusive equilibrium. Firms will maintain collusion if:

$$\frac{\pi^M}{M(1-\delta)} \geq N\pi^M$$

On the equilibrium path each upstream firm will receive $1/M$th of the monopoly profit. By deviating, an upstream firm can receive $N$ times the monopoly profit this period, but nothing from then on as the industry reverts to the Nash equilibrium in which there are zero profits. The on-the-equilibrium collusive offer from each upstream firm to each downstream firm is $(p^M, 0)$. The profit from deviation is obtained by making an offer which is designed to allow the downstream firm to slightly undercut his rival in the product market, and so an optimal deviant offer is $(c, \pi^M - \varepsilon)$ for arbitrarily small $\varepsilon$. Given passive beliefs, each downstream firm anticipates that his rival will still be receiving the equilibrium offer and pricing at $p^M$, so will be willing to pay up to $\pi^M$ to slightly undercut. The optimal deviation is of course to make such offers to all downstream firms, so that it is possible to extract $N\pi^M$ in total. The critical discount factor below which firms will be unable to collude is therefore $\delta^{NI} = \frac{NM - 1}{NM}$. For example with two upstream and two downstream firms, this yields a critical discount factor of $\frac{3}{4}$.

Integrated case (e.g., $U1$ and $D1$ vertically integrated):

We now consider what happens to the ability to collude if one upstream-downstream pair - say $U1 - D1$ - vertically integrates. The integrated firm will maintain collusion as long as:

$$\frac{(s_{11} + \ldots + s_{1N})\pi^M}{(1-\delta)} \geq N\pi^M$$

(1)

where we denote by $s_{ij}$ the fraction of total on-the-equilibrium path sales made by $U_i$ to $D_j$. The integrated vertical structure receives a fraction $(s_{11} + \ldots + s_{1N})$ of the monopoly profit in each period, since total sales will optimally be limited to monopoly levels. In deviating with each unintegrated downstream firm, the integrated firm offers each a contract which each
expects (given passive beliefs) will allow him to just undercut his integrated rival, as above; then in fact the integrated rival will finally just undercut each of them. In this way it is possible to extract $N\pi^M$ in total in the deviating period, as above, and there are no profits in the non-cooperative punishment phase.

An unintegrated upstream firm - say $U_2$ - will maintain collusion if:

$$\frac{(s_{22} + \ldots + s_{2N})\pi^M}{(1 - \delta)} \geq (N - 1)\pi^M$$

Obviously the optimal collusive scheme treats all the unintegrated firms $U_2, \ldots, U_N$ symmetrically. Note however that $s_{21} = \ldots = s_{N1} = 0$. The critical point to note here is that the integrated downstream firm will not accept a deviant offer from $U_2$. If it accepts a deviant offer, then collusion will break down and this will lead to a loss of rent for the integrated firm of $(s_{11} + \ldots + s_{12})\pi^M(1 - \delta)$. The most rent that can be offered by $U_2$ in the deviating phase is $\pi^M$, the total expected profit from deviation, so that if $\frac{(s_{11} + \ldots + s_{12})\pi^M}{(1 - \delta)} \geq \pi^M$, there is no profitable deviation for $U_2$. But in the light of equation (1), if the integrated firm does not want to deviate on its own account, it certainly will not wish to accept a (profitable to $U_2$) deviating offer from its rival - if it were going to break down collusion, it would be better off doing this by a deviating offer of its own.

Comparing the incentive to deviate in the integrated case with the disintegrated case, we see that if market shares are unchanged relative to the unintegrated case, then $s_{11} + \ldots + s_{1N} = s_{22} + \ldots + s_{2N} = \frac{1}{M}$, meaning that the incentive to deviate of the integrated firm is unchanged. (For example, with two upstream and two downstream firms, the critical discount factor is $\delta = \frac{3}{4}$.) But the incentive of the each unintegrated upstream firm is reduced (two firm critical discount factor $\delta = \frac{1}{2}$). Clearly with a reoptimisation of market shares in favour of the integrated firm, the incentives of both firms to cheat can be reduced. (In particular, in the two firm case, with $s_{11} + s_{12} = \frac{2}{3}$ and $s_{22} = \frac{1}{3}$, the optimal shares for facilitating collusion, the critical discount factor for the two firms falls to $\frac{2}{3}$). Thus, vertical integration facilitates upstream collusion. To show this formally, note first that it is sufficient to show that the sum of the incentive constraints is less under integration than under non-integration.

**Lemma 1** Suppose each upstream firm’s maximum payoff from deviating is independent of the firm’s collusive market share. Then, minimising the critical discount factor above which collusion can be sustained is equivalent to minimising the sum of the righthand-side of the collusion incentive constraints.

**Proof.** This is obvious: the relative tightness and slackness of the individual incentive constraints can be adjusted by adjusting relative market shares. So all that matters is the sum.

**Proposition 1** In the Bertrand model with secret offers, vertical integration facilitates collusion.

**Proof:** The sum of incentive constraints given above is reduced by vertical integration.
The intuition for this result is the following. By buying up one of the downstream firms, an upstream firm can foreclose a buyer from potential deviant offers from his rival, while his own incentive to deviate is unchanged. We call this the *outlets effect*. Buying up a downstream firm reduces the number of outlets through which an upstream firm can sell the additional output when cheating by foreclosing access to the integrated downstream unit. One might think that when - as here - downstream firms' products are perfect substitutes, this foreclosure effect would be irrelevant. But with secret offers and passive beliefs it matters because upstream firms can expropriate downstream firms when they cheat on the collusive agreement, taking advantage of the downstream firms’ passive beliefs that they are the only firm with whom the upstream firm has cheated. Of course, this effect would also arise without passive beliefs (e.g., with public offers) if products are differentiated or if there is Cournot competition. We investigate this below. We call this the *foreclosure effect*. Buying up a downstream firm reduces the number of outlets through which an upstream firm can sell the additional output when cheating. One might think that when - as here - downstream firms’ products are perfect substitutes, this foreclosure effect would be irrelevant. But with secret offers and passive beliefs it matters because upstream firms can expropriate downstream firms when they cheat on the collusive agreement, taking advantage of the downstream firms’ passive beliefs that they are the only firm with whom the upstream firm has cheated. Of course, this effect would also arise without passive beliefs (e.g., with public offers) if products are differentiated or if there is Cournot competition. We investigate this below.

**Multiple Integration.** Clearly the intuition associated with the foreclosure effect extends to the case of more than one integrated firm. If \( U_2 \) were to integrate with \( D_2 \), for instance, then \( U_1 - D_1 \)'s incentive to deviate will be reduced, because he will no longer be able to expropriate \( D_2 \) when he cheats. Consider the case when \( 1 < m \leq M \) firms are integrated. Assuming symmetric market shares downstream, the incentive of the integrated firms to cheat is:

\[
\frac{\pi^M}{M(1-\delta)} \geq (N - m + 1)\pi^M
\]  

(2)

And the incentive of the unintegrated firms to deviate is

\[
\frac{\pi^M}{M(1-\delta)} \geq (N - m)\pi^M
\]  

(3)

Clearly each of the expressions on the righthand side of equations (2) and (3) is clearly decreasing in \( m \), the number of integrated firms, integration clearly reduces the critical discount factor below which collusion cannot be sustained. For example, with two upstream and two downstream firms, the critical discount factor with symmetric market shares, falls to \( \delta = \frac{1}{2} \).

**Incentives to Vertically Merge** We have shown that vertical merger makes upstream collusion easier. This in itself provides upstream firms with a reason to integrate downstream. However, it should be noted that in the optimal collusive arrangement of market shares, (where this

\footnote{Instead of multiple vertical integration, we could also achieve the monopoly outcome by having \( U_1 \) take over all the downstream firms, but most likely this would be prevented by anti-trust authorities since it would make monopoly inevitable by completely foreclosing \( U_2 \) and the other upstream firms (if any) from the downstream market.}
is interpreted as the arrangement which minimises the critical discount factor below which collusion cannot be sustained (see Compte et al. 2002) gives a larger market share to integrated firms than to unintegrated ones. If the collusive agreement does indeed distribute market shares in this way, this means that each upstream firm would like to be among the merging firms, as it will gain in market share. The reason is that on integration, a firm’s own incentive to deviate from the collusive agreement remains the same, whereas its rivals have a reduced incentive to deviate. Consequently it is optimal to give more on the equilibrium path to the merged firm to equalise deviation incentives.

4 Bertrand Competition Downstream with Public Offers

As before we suppose that there are $N$ downstream and $M < N$ upstream firms. The difference with the previous case is that it is now no longer possible to expropriate the downstream firms while cheating as offers are public, so firms will not accept offers which give them negative profits given the offers of the other downstream firms. Thus the maximum profit that can be extracted in a period of deviation is $\pi^M$.

**Unintegrated case:** Firms will maintain collusion if:

$$\frac{\pi^M}{M(1 - \delta)} \geq \pi^M$$

On the equilibrium path each upstream firm will receive $1/M$th of the monopoly profit. By deviating, an upstream firm can receive the whole monopoly profit this period, but nothing from then on as the industry reverts to the Nash equilibrium in which there are zero profits. The on-the-equilibrium collusive offer from each upstream firm to each downstream firm is: a wholesale price per unit $p^M$, and no fixed fee. In the symmetric collusive equilibrium - where collusion is easiest - each of the upstream firm supplies $1/M$th of the upstream output on the equilibrium path. For simplicity consider the case where each upstream firm sells his output to only one of the $N$ downstream firms, i.e. $U1$ sells to $D1$ and $U2$ to $D2$, etc (this means that some of the downstream firms will receive no input on the equilibrium path). There are a number of ways to obtain the monopoly profit from deviation. The equilibrium wholesale price offer is $p^M$, so the deviant offer is $p^M - \varepsilon$. This strategy allows a deviating firm to capture the whole monopoly profit for one period, and since offers are now public, it is not possible to extract more than this since no expropriation of downstream firms is possible. (Thus note that public offers, as one’s intuition suggests, make collusion easier.) This yields a critical discount factor: $\delta \geq \frac{1}{2}$ for the $M = N = 2$ firm case.

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3One could also use price per unit $c$ plus quantity ceiling $\frac{1}{2}q^M$ or resale price maintenance (price floor) $p^M$. We do not consider these instruments because resale price maintenance is *per se* illegal in most industries, and it may be difficult to credibly commit to binding quantity ceilings. However, the same type of analysis could be carried out when binding quantity commitments are possible, and we conjecture that the results will be similar except that there will be positive profits in the non-collusive equilibrium and hence a punishment effect of integration - see next section.
**m-firm Integrated case (m ≥ 1):** Note first that it will be optimal to give all integrated firms the same market share. Denote the market share of the sales of all the integrated firms together by α. Each integrated firm will maintain collusion if:

\[
\frac{\alpha \pi^M}{m(1 - \delta)} \geq \pi^M
\]

Note that the equilibrium ‘contract’ between the integrated upstream firm and its downstream affiliate can be simply to set the wholesale price equal to marginal cost. Since the downstream firm is now ‘controlled’ by the upstream firm, it will not deviate if this is not in the interest of the joint structure. This is in contrast to the unintegrated firms, whose On the equilibrium path each upstream firm will receive \(\frac{\alpha}{m}\) of the monopoly profit. In deviating, the integrated upstream firm simply prices just below the monopoly price at \(p^M - \varepsilon\). In this way it is possible to extract \(\pi^M\) in total in the deviating period, as above, and there are no profits in the non-cooperative punishment phase.

The unintegrated firms, on the other hand, now find it impossible to deviate profitably from the collusive equilibrium at all. They are already extracting all the rent from the downstream firm to which they sell on the equilibrium path and obtaining \(\frac{(1-\alpha)}{m}\pi^M\) from there. An unintegrated cannot make a profitable deviant offer which will be accepted by the other downstream firm, for the same reasons outlined above. So the only way to deviate is to offer a lower wholesale price to one of the unintegrated downstream firms. But since offers are now public, this deviation will be immediately detected and the integrated firm(s) can react to it, pricing slightly below the defector and stealing the market from him. They can do this as unlike the unintegrated firms, they are not limited by wholesale contracts pricing at \(p^M\), so they can change their pricing in response to observed deviations. And any deviation by the unintegrated firm is public. So the unintegrated firms will not deviate as long as:

\[
\frac{(1 - \alpha)\pi^M}{(N - m)(1 - \delta)} \geq 0
\]

which is always satisfied. Thus **in the Bertrand model with public offers, vertical integration makes upstream collusion easier.** But the reason why this is so is different from the private offers case. Here the reason is due to what we may call the **reaction effect.** This is that with public offers, firms can react to any deviation from the expected collusive contracts. However, upstream firms’ ability to punish observed deviations is limited because they have already posted their take it or leave it contract offers, and are committed to these. Nevertheless, an integrated firm can react in this way because it does not need an inflexible contract to ensure that its downstream affiliate toes the collusive line. This is why vertical integration is helpful in maintaining collusion - because the integrated firm has more flexibility to react. Note that in this particular case, vertical integration by a single firm is sufficient to achieve the maximum upstream collusive potential, because it is possible for a single integrated firm to inflict the maximum punishment on any deviating firm. Further integrations are not helpful, because they do not improve the ability to punish (the reaction effect is the same as before), and may even make collusion harder if they dilute the market share of the first integrated firm. We
conjecture that in a more general model of public offers with price-setting with differentiated products, multiple integration may be desirable to allow maximum punishment.

5 Cournot Competition Downstream with Public Offers

We now consider the case of Cournot competition downstream. With public offers, we will still have a reaction effect for integrated firms, as in the Bertrand case. However, in contrast to Bertrand case, under Cournot competition, there will be rents downstream in the non-collusive equilibrium, and an integrated firm may capture these. We denote the non-collusive profit of the $N$ downstream firms by $\pi^{NC}(N)$. We assume for simplicity that when collusion breaks down, one-shot Nash-Cournot behaviour ensues forever (i.e., we do not derive the optimal punishment, which may be more severe than Nash reversion). Other things being equal, the existence of rents in the non-cooperative phase tends to make integration less helpful to collusion. We will also specialise to the case where upstream marginal cost is zero in order to avoid any non-cooperative strategic commitments resulting from the public offers (along the lines of Bonnano and Vickers). Consequently, vertical integration has no effect on the noncollusive equilibrium, which allows us to isolate the collusive effect of vertical mergers.

Unintegrated case: With symmetric market shares, firms will collude as long as:

$$\frac{\pi^M}{M(1-\delta)} \geq \pi^M$$

or $\delta \geq \frac{M-1}{M}$. The on-the-equilibrium path collusive offers are now wholesale prices (between marginal cost and monopoly price) which, given the double-marginalization problem, induce the firms in equilibrium to produce just the monopoly output, and fixed fees to extract the remaining monopoly profit.\(^4\) The optimal deviation is to just undercut the fixed fees offered by one’s upstream rivals by $\varepsilon$, so gaining the whole downstream market and earning monopoly profit.

Single Integration: If the integrated firm has market share $\alpha$, it will not deviate as long as:

$$\frac{\alpha \pi^M}{(1-\delta)} \geq \pi^M + \frac{\delta}{1-\delta}\pi^{NC}(N)$$

The difference with the Bertrand public offers case above arises from the last term, which represents the punishment effect. The punishment effect arises when the non-cooperative equilibrium yields some profits downstream and makes it more tempting for an integrated firm to deviate, since it will capture some of those rents in the future non-cooperative phase. This means that, for a fixed market share, vertical integration actually increases the integrated firm’s incentives to deviate. The incentives of the unintegrated firm(s) to deviate will as before shrink

\(^4\)To achieve this, the wholesale price is set such that the total Cournot output of $N$ firms with this input cost would be exactly the monopoly output of a structure facing the true marginal cost. Specifically, suppose $D_j$ produces a quantity of $q_j$ along the collusive equilibrium path. Then, the marginal wholesale price is $w_j = P(Q^M) + q_j P'(Q^M)$. 

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due to the reaction effect, however, so these two effects must be set against one another. An unintegrated firm will continue to collude as long as:

\[
\frac{(1 - \alpha)\pi^M}{(M - 1)(1 - \delta)} \geq \max_{1 \leq n \leq N-1} n\pi^{NC}(n + 1)
\]

The rationale behind this expression is as follows. There are \(M - 1\) unintegrated upstream firms, each receiving a fraction \(\frac{1 - \alpha}{N-1}\) of the monopoly profit each period of collusion. When deviating, an unintegrated firm can choose to how many downstream firms it wishes to sell, except that it cannot sell to the integrated downstream firm. This is for the usual reason that the integrated firm has a flexible contract (wholesale price equal to marginal cost) so that rather than accepting any offer which leaves positive profits for the deviating unintegrated firm it would be better off deviating on its own account and getting all of the profits rather than leaving some to its deviating rival. If the unintegrated firm chooses to deviate by selling to \(n\) downstream firms, then the resulting profit will be \(n\pi^{NC}(n + 1)\). The reason why it may choose to sell to more than one firm when deviating is that this commits it to a larger output relative to the integrated firm. However, the more firms with which it deviates, the lower the profits of each of these firms, so there is a trade-off and the optimal number of firms with which an unintegrated firm chooses to deviate - which we will denote by \(n^*\) will be limited. (For example with linear demand \(p = 1 - Q\), \(n^* = 2\). Notice that we are assuming that when the deviation becomes public, all firms revert to playing the one-shot Nash equilibrium, given the contracts they face.

To determine whether the aggregate incentive to deviate is greater or smaller with single integration than with no integration, we can sum the two incentive constraints and substitute in the critical discount factor from the unintegrated case above \(\delta = \frac{M-1}{M}\), to give:

\[
M\pi^M \geq \pi^M + \frac{\delta}{1 - \delta}n\pi^{NC}(N) + (M - 1)n^*\pi^{NC}(n^* + 1),
\]

where

\[
n^* = \max_{1 \leq n \leq N-1} n\pi^{NC}(n + 1).
\]

Simplifying, we obtain

\[
\pi^M \geq \pi^{NC}(N) + n^*\pi^{NC}(n^* + 1)
\]

which, since \(\pi^{NC}(N) \leq \pi^{NC}(n^* + 1)\) and \(\pi^M > n\pi^{NC}(n)\) for any \(n \geq 2\), clearly holds. So since the sum of the incentive constraints is less under single integration than under no integration, vertical integration reduces the critical discount factor below which collusion cannot be sustained. In other words, (single) vertical integration facilitates collusion under Cournot

\[\text{Note that the assumption of zero marginal costs plays a role here, otherwise the deviating firm might do better by selling to fewer firms but giving them aggressive contracts (wholesale price below marginal cost) to cause the integrated firm to shrink its output (strategic substitutes). We rule out these kind of commitments because with negative wholesale prices (i.e. below cost), downstream firms would simply buy an infinite amount, extracting all the rent from upstream firms. We conjecture that the analysis would be similar but more complex if we allowed for strictly positive costs. As it is, the most aggressive action that the deviating firm can take is to set wholesale price equal to marginal cost (zero) to all the firms with which it deviates.}\]
competition with public offers. The reaction effect is sufficiently large to offset the punishment effect.

6 Asymmetries downstream: The ‘Disruptive Buyer’ and Competition Policy on Vertical Mergers

The US 1984 Non Horizontal merger guidelines (section 4.22) contain remarks pertaining to vertical mergers which may facilitate collusion. As in our analysis, these are entirely concerned with the idea that vertical integration downstream may facilitate upstream collusion. The first set of remarks (4.221) pertains to the idea that vertical integration may facilitate the monitoring of price if downstream prices are more visible than upstream prices. The second set (4.222) is more closely related to our work and states:

4.222 Elimination of a Disruptive Buyer

The elimination by vertical merger of a particularly disruptive buyer in a downstream market may facilitate collusion in the upstream market. If upstream firms view sales to a particular buyer as sufficiently important, they may deviate from the terms of a collusive agreement in an effort to secure that business, thereby disrupting the operation of the agreement. The merger of such a buyer with an upstream firm may eliminate that rivalry, making it easier for the upstream firms to collude effectively. Adverse competitive consequences are unlikely unless the upstream market is generally conducive to collusion and the disruptive firm is significantly more attractive to sellers than the other firms in its market.

The Department is unlikely to challenge a merger on this ground unless 1) overall concentration of the upstream market is 1800 HHI or above (a somewhat lower concentration will suffice if one or more of the factors discussed in Section 3.4 indicate that effective collusion is particularly likely), and 2) the allegedly disruptive firm differs substantially in volume of purchases or other relevant characteristics from the other firms in its market. Where the stated thresholds are met or exceeded, the Department’s decision whether to challenge a merger on this ground will depend upon an individual evaluation of its likely competitive effect.

We have already seen that the emphasis on the idea that integration is damaging only when the integrated downstream firm differs substantially from its rivals is misplaced: we showed that adverse competitive consequences could arise in models with symmetric downstream firms. In the next two subsections we introduce asymmetries into our models of Bertrand competition with private and public offers to investigate whether vertical integration into downstream industries with asymmetries is likely to be more or less damaging than integration into symmetric industries, and to consider how one might identify a ‘disruptive buyer’.

6.1 Private Offers

We now reconsider Bertrand competition downstream but suppose that the downstream firms have asymmetric marginal costs. We simplify to the case of just two upstream and two down-
stream firms. Moreover, we assume for simplicity that $U_1$ and $U_2$ have marginal cost 0 and that $D_1$ uses one unit of input to produce one unit of output at marginal cost 0, while $D_2$ is less efficient and has marginal cost $\eta \in (0, p^M)$. Thus in the non-collusive equilibrium $D_1$ makes profit $\eta D(\eta)$, while $D_2$ makes no profit. Denote by $R^M$ the profit which the inefficient downstream firm could make if he just undercut the efficient downstream firm at the monopoly price, $R^M \equiv (p^M - \eta)D(p^M)$. Note that along the equilibrium path for efficient collusion, no sales should be made through the inefficient downstream firm, so $s_{12} = s_{22} = 0$. We first consider the case when offers are secret.

**Non-integrated case:** As before, the on-the-equilibrium path collusive offers take the form of pricing at $p^M$, where $p^M$ now denotes the monopoly price of the integrated structure with the costs of the efficient downstream firm. Note that all on-the-equilibrium path sales must now take place through the efficient downstream firm. An optimal deviating offer is to set the wholesale price at upstream marginal cost and charge a fixed fee to extract all downstream profits. With passive beliefs, the inefficient downstream firm will expect to make $R^M$ on accepting a deviant offer, whereas the efficient firm can expect to make $\pi^M$, where $\pi^M$ now denotes the monopoly profit of a firm with the efficient level of downstream costs. If no firms are integrated, and market shares are symmetric, the collusion incentive constraint is:

$$\frac{\pi^M}{2(1 - \delta)} \geq \pi^M + R^M.$$  

Hence, the critical discount factor under nonintegration is given by

$$\hat{\delta}_N = \frac{\pi^M + 2R^M}{2(\pi^M + R^M)} = \frac{3p^M - 2\eta}{2(2p^M - \eta)},$$

which is decreasing in the marginal cost of the inefficient downstream firm, $\eta$.

**Vertical Integration with the inefficient downstream firm.** Suppose now that one upstream firm, $U_2$, say, integrates with the inefficient downstream firm, $D_2$. Denoting by $s_{21}$ the fraction of the downstream market served by the integrated upstream firm under collusion, the integrated firm will continue to collude as long as:

$$\frac{s_{21}\pi^M}{(1 - \delta)} \geq \pi^M + R^M \quad (4)$$

As usual, the integrated firm’s incentive to cheat does not change. When cheating it will offer a two-part tariff with wholesale price equal to marginal cost and fixed fee equal to the monopoly profit to the efficient unintegrated downstream firm $D_1$. $D_1$, with passive beliefs, continues to price at $p^M$, and so $U_2 - D_2$ is able to just undercut it and earn $R^M$. However, $U_1$ with market share $s_{11}$ now has a reduced incentive to cheat because the integrated firm will not accept a deviating offer from him. The reason is as before that if collusion were to break down, $U_2 - D_2$ would rather that this occurred though its own deviation than through its acceptance of its rival’s offer; so given that it does not want to cheat on its own account it will not accept a deviating offer. Thus the collusion incentive constraint for the unintegrated firm becomes:

$$\frac{s_{11}\pi^M}{(1 - \delta)} \geq \pi^M \quad (5)$$
Thus in aggregate, the two upstream firms have less incentive to cheat than without integration, as would be expected from the examination of the symmetric case above. It can be shown that the optimal market shares are such that \( s_{11} = 1 - s_{12} = \frac{\pi^M}{2\pi^M + R^M} \), and so the critical discount factor is

\[
\delta_{U2-D2} = \frac{\pi^M + R^M}{2\pi^M + R^M} = \frac{2p^M - \tau}{3p^M - \tau}
\]

which is again decreasing in the \( D2 \)’s marginal cost \( \tau \).

The interesting question, however, is whether from the point of view of sustaining collusion, it is more beneficial to integrate with the efficient firm than with the inefficient firm.

**Vertical Integration with the efficient downstream firm.** Suppose \( U1 - D1 \) integrate. Now, the incentive of the integrated firm to defect from the agreement changes because of the punishment effect (as well as if its market share changes). Denoting by \( s_{21} \) the fraction of the market served by the upstream firm under collusion, the integrated firm will continue to collude as long as:

\[
\frac{s_{11} \pi^M}{1 - \delta} \geq \pi^M + R^M + \frac{\delta}{1 - \delta} \pi D(\tau)
\]

Again, the unintegrated upstream firm \( U2 \) with market share \( s_{12} \) will have a reduced incentive to cheat because the integrated firm will not accept a deviating offer from him. The reason is as usual that if collusion were to break down, \( U1 - D1 \) would rather that this occurred though its own deviation than through its acceptance of its rival’s offer; so given that it does not want to cheat on its own account it will not accept a deviating offer. Thus the collusion incentive constraint for the unintegrated firm becomes:

\[
\frac{s_{12} \pi^M}{1 - \delta} \geq R^M
\]

By deviating, the unintegrated seller can earn rents only from offering the unintegrated buyer a contract which allows him to slightly undercut his rival. By contrast, the term \( s_{12} \pi^M \) does not appear on the right hand side of this constraint: the unintegrated upstream firm will be unable to make profits from selling to the integrated buyer in the deviating period, even though he must extract such rents on the equilibrium path. (For full efficiency all sales must occur through the low-cost buyer.) This is achieved by ensuring that the unintegrated firm extracts his share of rents on the equilibrium path from the integrated downstream firm through a contract which does not involve a fixed fee. Instead, the colluding firms should optimally have \( U2 \) sell to \( D1 \) using a contract with a marginal price \( p^M \). Then, when \( U2 \) writes a contract with \( D2 \) that allows \( D2 \) to slightly undercut \( D1 \), \( D1 \) will sell nothing and so in the absence of any fixed fee in the equilibrium contract, \( U2 \) earns no rents from selling to \( D1 \) if he does not also modify his contract with \( D1 \). Clearly this form of contract minimises \( U2 \)’s incentive to cheat.\(^6\)

But \( D1 \) will not accept any deviation from the equilibrium contract if we assume that this leads

\(^6\)One might ask what happens if \( U2 \) deviates from the equilibrium wholesale price \( p^M \) and offers \( D1 \) a contract with wholesale price \( c \), quantity ceiling \( s_{21} \) and fixed fee \( \frac{1}{2} \pi^M \). This contract offers \( D1 \) exactly the same rents as under the equilibrium contract, but it allows \( U2 \) to expropriate \( D1 \) if the former chooses to deviate by excess sales to \( D2 \). We assume that if such a deviant contract is offered and accepted, this will trigger Nash reversion from next period onwards. These strategies clearly reduce \( U2 \)’s incentive to defect from the collusive agreement.
to Nash reversion, for the usual reason (that if $U_1 - D_1$ were tempted to end collusion, it would be more profitable to deviate on their own account rather than to accept a deviant offer). And clearly the easiest way to sustain collusion is to have the upstream firms play strategies such that any deviation from the equilibrium contract will trigger Nash reversion in the following period.

Summing up the incentive constraints, we obtain that the critical discount factor is given by
\[
\tilde{\delta}_{U_1-D_1} = \frac{2R^M}{\pi^M + 2R^M - \overline{\sigma}D(\overline{\sigma})} = \frac{2(p^M - \overline{\sigma})}{3p^M - \overline{\sigma}(2 + D(\overline{\sigma})/D(p^M))}.
\]

We thus obtain the following result.

**Proposition 2** Vertical integration with the inefficient downstream firm is more collusive than vertical integration with the inefficient firm in that $\tilde{\delta}_{U_2-D_2} < \tilde{\delta}_{U_1-D_1}$.

**Proof.** This follows directly from comparing $\tilde{\delta}_{U_2-D_2}$ and $\tilde{\delta}_{U_1-D_1}$. ■

Whether vertical integration of $U_1 - D_1$ is better than no integration at all depends on the cost differential between the two downstream firms: $U_1 - D_1$ integration makes collusion easier if this difference is small.

**Double Integration.** Let us now consider the case of double integration, where two pairs of vertically integrated firms, $U_1 - D_1$ and $U_2 - D_2$. To show this, note that if both pairs are integrated, $U_1 - D_1$ (the efficient pair) will be willing to collude if:
\[
\frac{s_{11}^M}{(1-\delta)} \geq \max(\pi^M - F_{21}, \overline{\sigma}D(\overline{\sigma})) + \frac{\delta}{(1-\delta)}\overline{\sigma}D(\overline{\sigma})
\]

To understand the right hand side of this equation, notice that in the current period, the efficient firm can deviate in two ways. Either he can continue to accept the equilibrium offer made to him by $U_2$, in which case he can slightly undercut the monopoly price and earn $\pi^M$, but must still pay the fixed fee $F_{21}$ to $U_2$. Or he can reject the offer made by $U_2$, saving the fixed fee, but alerting $U_2$ to the deviation from the collusive equilibrium. In this case play will revert to the non-collusive equilibrium immediately, so that $U_1 - D_1$ can earn only $\overline{\sigma}D(\overline{\sigma})$ this period and forever after. A similar argument can be made for $U_2 - D_2$, which will collude as long as:
\[
\frac{s_{12}^M}{(1-\delta)} \geq R^M + F_{21}
\]

To determine the aggregate incentive to deviate, let us first argue that the case where $\max(\pi^M - F_{21}, \overline{\sigma}D(\overline{\sigma})) = \overline{\sigma}D(\overline{\sigma})$ can be discarded. For if so, then the fixed fee $F_{21}$ affects only $U_2 - D_2$’s incentive to deviate, and so should be set to zero. But in this case $\max(\pi^M - F_{21}, \overline{\sigma}D(\overline{\sigma})) = \pi^M - F_{21}$, a contradiction. Thus $U_1 - D_1$’s collusion incentive constraint can be simplified, to
\[
\frac{s_{11}^M}{(1-\delta)} \geq \pi^M - F_{21} + \frac{\delta}{(1-\delta)}\overline{\sigma}D(\overline{\sigma})
\]

and it can be seen that the sum of the two incentive constraints (8) and (9) is less than the sum of the two incentive constraints under $U_1 - D_1$ integration, (6) plus (7), so double
integration does better than \( U1 - D1 \) integration. In fact, the critical discount factor under double integration is given by

\[
\frac{\delta^{DI}}{\delta} = \frac{RM}{\pi^M + RM - \delta D(\bar{\pi})} = \frac{p^M - \bar{\pi}}{2p^M - \bar{\pi}(1 + D(\bar{\pi})/D(p^M))}
\]

Double integration does, however, not necessarily do better than \( U2 - D2 \) integration. We have \( \delta^{DI} < \delta_{U2-D2} \) if \( \bar{\pi} \) sufficiently small, but the reverse inequality if \( \bar{\pi} \) is sufficiently close to \( p^M \). To see this, note that

\[
\delta^{DI} < \delta_{U2-D2} \quad \text{if and only if} \quad \varphi(\bar{\pi}) = \left( p^M \right)^2 D(p^M) - (2p^M - \bar{\pi})\bar{\pi}D(\bar{\pi}) > 0.
\]

We have \( \varphi(0) > 0 \), and therefore \( \delta^{DI} < \delta_{U2-D2} \) for small \( \bar{\pi} \). On the other hand, we have \( \varphi(p^M) = 0 \) and \( \varphi'(p^M) < 0 \), and so \( \delta^{DI} > \delta_{U2-D2} \) for \( \bar{\pi} \) close to \( p^M \). In fact, if \( pD(p) \) is weakly concave in price \( p \), then \( \varphi''(\bar{\pi}) < 0 \) for all \( \bar{\pi} \in (0, p^M) \), and so there exists a unique \( c^* \) such that \( \delta^{DI} < \delta_{U2-D2} \) if and only if \( \bar{\pi} < c^* \).

### 6.2 Public Firms

We now reconsider the same model of asymmetric downstream firms but assume that upstream firms are public.

*Unintegrated Case.* With symmetric market shares, the collusion incentive constraint is:

\[
\frac{\pi^M}{2(1-\delta)} \geq \pi^M
\]

*U1-D1 Integration.* The efficient integrated pair will collude if

\[
\frac{s_{11}\pi^M}{(1-\delta)} \geq \pi^M + \delta \frac{\bar{\pi}D(\bar{\pi})}{(1-\delta)}
\]

They can make \( \pi^M \) this period from cheating and \( \frac{\delta D(\bar{\pi})}{(1-\delta)} \) thereafter in the punishment phase. The unintegrated upstream firm is again subject to the reaction effect: any defection can be immediately and severely punished by the integrated efficient pair. Thus it cannot profitably deviate, and its collusion incentive constraint becomes:

\[
\frac{s_{21}\pi^M}{(1-\delta)} \geq 0
\]

*U2-D2 Integration.* For the integrated firm, in the absence of a punishment effect, there is as usual no effect of integration on its incentive to deviate.

\[
\frac{s_{21}\pi^M}{(1-\delta)} \geq \pi^M
\]
For the unintegrated firm, 

\[ \frac{s_{12}\pi^M}{1 - \delta} \geq \tau D(\tau) \]

Here we have only a limited reaction effect since the integrated firm is unable to punish defection so effectively by reacting through its inefficient downstream affiliate. The sum of the incentive constraints is the same, but after reorganisation of market shares in favour of the efficient firm in the case when that firm is integrated can reduce the critical factor below what is possible with inefficient firm integration. So in this case with public offers, the disruptive buyer is the efficient buyer because this buyer allows the strongest reaction effect.

6.3 Anti-Trust Policy

As is evident from the preceding results in this section, it is not straightforward to identify a “disruptive buyer” - which is to say, a buyer whose presence particularly disrupts collusion, and with whom vertical merger particularly enhances collusive possibilities. When upstream offers are public, then - intuitively - it is the efficient buyer who is ‘disruptive’. But the reason is not so much that price-cutting to this buyer is particularly desirable, but rather that integration with this buyer is desirable because it allows more flexible contracts with this buyer and hence a strong ‘reaction effect’. On the other hand, when offers are secret, it is, perhaps somewhat counterintuitively, the inefficient buyer that is most ‘disruptive’. Whilst upstream firms are not anxious to sell to this buyer on the equilibrium path, the relative gain from cheating by selling to this buyer can be large. The contrast between the secret and public offers cases highlight the fact that simply integrating with a buyer does not entirely remove the incentive to cut prices to him in the simple way suggested by the merger guidelines. Though the ‘outlets effect’ means that non-integrated sellers will now find price cutting to this buyer undesirable, the seller which integrates with this buyer now has an even greater incentive to cheat on the agreement in the form of the punishment effect: an efficient firm cannot be severely punished, and this makes it hard to sustain collusion. Integration with an inefficient firm will have both a smaller outlets effect and punishment effect (in our homogenous Bertrand model, there is no punishment effect at all), and so can have more effect in enhancing collusion.

7 Conclusion

Our analysis has highlighted three effects of vertical merger on the ability to collude. The outlets effect facilitates collusion and arises because when a downstream firm becomes vertically integrated, it is no longer an outlet through which a cheating firm can expect to sell when it deviates from collusion. We have shown that this effect arises when offers are secret; and conjecture that it arises more generally if upstream firms need to deviate with the integrated downstream firm in order to obtain the maximum profits from defection (e.g. because products are differentiated). The reaction effect occurs only when offers are public (or, presumably, have some chance of becoming public) because limited vertical integration improves the ability of firms to react to deviations by their rivals, so facilitating collusion. Acting against these effects is the punishment effect, which arises because the Nash reversion profits of an integrated firm
are larger than those of an unintegrated upstream firm, so the former suffers less from potential punishment and hence is more inclined to cheat.

In the examples we studied, the punishment effect is always offset by either the outlets or reaction effect, so that vertical merger facilitates collusion. In general, one can suggest the following tentative policy conclusion. Vertical merger is more likely to be harmful in facilitating collusion when: the downstream industry is less concentrated (higher \( N \)); more competitive (e.g. less differentiated, price not quantity setting) because the punishment effect will be smaller. We also show that identifying a disruptive buyer - one whose presence particularly disrupts collusion, and with whom vertical would particularly facilitate collusion - is not a trivial exercise, but depends on the detailed features of the market.

References


