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CHIARA FUMAGALLI
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MASSIMO MOTTA

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CHIARA FUMAGALLI
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MASSIMO MOTTA

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European University Institute
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I – 50016 San Domenico (FI)
Italy

Upstream mergers, downstream mergers, and secret vertical contracts

Chiara Fumagalli
Università Bocconi, Milano
Universitat Pompeu Fabra, Barcelona

Massimo Motta
European University Institute, Florence
Universitat Pompeu Fabra, Barcelona

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Abstract

In an industry characterised by secret vertical contracts, we consider a benchmark case where two vertical chains exist, with two upstream manufacturers selling to two downstream retailers, and show that the equilibrium prices are independent of whether upstream or downstream firms have all the bargaining power. We then analyse two alternative mergers, and show that a downstream merger (which gives the downstream monopolist all the bargaining power) is more welfare detrimental than an upstream merger (which gives the bargaining power to the upstream monopolist). We also show that downstream and upstream mergers have the same effects when contracts are observable.

1 Introduction

The study of vertical contracts is probably one of the most interesting areas of research in the recent industrial organisation literature. However, most of the studies assume that it is the upstream firms (or manufacturers) which have the bargaining power, and can make take-it-or-leave-it offers to the downstream firms (or retailers)[1]. In general, economists have presumed that concentration is higher among the manufacturers than among the retailers, and that entry in the retailing sector is characterised by few barriers, so that perfect competition and/or free entry in the retail sector would not be seen as too strong assumptions. Yet, this perspective was probably more justified in the past than in recent times, given the rising market concentration at the retailers' level, as for instance the success of large supermarket chains in many countries would suggest.

The few existing data witness the impressive rise in concentration among retailers. In the UK, the number of grocery retail outlets fell from over 140,000 in 1960 to below 40,000 in 1997, with 2% of the stores controlling 47% of grocery sales [2] (Dobson and Waterson, 1999, pp. 136-139). Similar evolution in retailer concentration has occurred in all the western economies. Even in Italy, which together with Greece has the lowest level of retail concentration in Europe (the top 5 retail firms had 11% of sales in 1997, whereas France and Germany had 31%, the UK 30%, Belgium 43% and Finland 72%)[3], there are clear signs that retail concentration is increasing. For instance, the number of food stores were 339,400 in 1983 but only 287,000 ten years later (Dobson and Waterson, 1999, pp. 139-140).

This development calls for more research on the analysis of vertical contracts under the hypothesis that retailers are the "strong side" of the vertical structure. There are recent studies which have moved in this direction. For instance, Shaffer (1991) considers the case of imperfectly competitive retailers which have the bargaining power and can choose among the offers that many producers make. He analyzes observable contracts and finds that downstream

[1] Most of the classical papers in the literature present this feature, from the seminal paper of Telser (1960), Spengler (1950) to more recent papers as Mathewson and Winter (1984), Bonanno and Vickers (1988), Rey and Stiglitz (1988 and 1995).

[2] At the firm level, the top 5 grocers in the UK had in 1996 64% of national market share, up from 53% just 8 years before.

[3] When considering buyer groups (that is, groups in which two or more retailers join forces to purchase together so as to enhance their bargaining power with respect to manufacturers) instead of retail firms, concentration figures are even more impressive.

firms offer vertical contracts to their suppliers aimed at reducing competition in the product market. This type of strategic contracts is also used by manufacturers when they have the bargaining power[4]. Hart and Tirole (1990), O'Brien and Shaffer (1992), McAfee and Schwartz (1993), and Rey and Tirole (1996) introduce secret (or unobservable) contracts in a setting in which an upstream monopolist sells to many retailers. They show that unobservability of contracts gives room for opportunistic behaviour of the upstream producer and prevents it from achieving the monopoly outcome. Instead, a downstream monopolist buying from many manufacturers does not suffer from this commitment problem, which leads to higher market power in the latter than in the former case. O'Brien and Shaffer (1992) show that the commitment problem faced by the upstream monopolist exists for different distribution of the bargaining power between manufacturer and retailers.

In this paper, we build on the previous literature, and especially the Rey and Tirole (1996)'s paper, to study whether upstream or downstream mergers are the more likely to have an adverse impact on welfare. To do so, we first construct a pre-merger case where two upstream firms supply two downstream firms. The equilibrium outcome of such a situation, with two duopolistic vertical chains (where vertical contracts consist of non-linear pricing schemes, or franchise fee contracts), is the same independently of whether the bargaining power is upstream or downstream, thus providing a useful benchmark case from which mergers at the two different stages of the production process can be analysed. We then carry out a comparative statics analysis, as follows. We study how the equilibrium outcome changes if, first, the two upstream firms merge (thus getting all the bargaining power in the negotiation with the two retailers, a reasonable assumption); and, second, if the two downstream firms merge (and get all the bargaining power). We find that downstream mergers are more likely to be welfare reducing than upstream mergers.

In section 2, the main section of the paper, we analyse the case of unobservable contracts (that is, contracts agreed between a retailer and its supplier cannot be seen by the other agents in the economy) under the assumption that retailers compete in prices (with differentiated goods). We find that a downstream merger leads to higher market prices and lower welfare, whereas an upstream merger would affect neither prices nor welfare with respect to our benchmark situation, the duopolistic vertical chain case. In this sense, downstream mergers are more 'dangerous' than upstream mergers. Our result builds

[4]See for instance Bonanno and Vickers (1988), Rey and Stiglitz (1988, 1995), Gal-Or (1991), Lin (1988) and the survey by Irmen (1998).

on the following intuition (see also Rey and Tirole (1996)). An upstream monopolist which offers unobservable contracts would suffer from a lack of commitment power. Similarly to a durable good monopolist, an upstream monopolist has an incentive for opportunistic behaviour. A durable good monopolist is not able to impose monopoly prices because consumers know that in the following period he would have an incentive to reduce prices to get additional demand; likewise, an upstream monopolist who is not able to commit to a certain and observable contract, is not able to impose monopoly prices because retailers know that after having signed a supply contract with them, the monopolist has an incentive to negotiate a price reduction with the other retailers in order to increase final demand. Because of this lack of commitment, the upstream monopolist would not be able to exploit its monopoly power[5].

Instead, a downstream firm would not suffer from any such lack of commitment effect. Since it sells directly to consumers, it does not have an incentive to change the terms of the contracts negotiated with the upstream suppliers, and it would be able to reap all the monopoly profits at equilibrium.

In section 3, we keep the assumption of unobservable contracts and we show that the same results hold even if retailers would compete in quantities rather than in prices. A downstream merger would lead to monopoly prices and welfare losses, while an upstream merger would not.

In section 4, we briefly review how the results would change if contracts were observable. In such a case, vertical contracts in the duopolistic case would have a pre-commitment value and can be exploited for strategic reasons. Again, the case where there are two vertical chains would provide a common benchmark case, since both upstream and downstream firms will have the same incentive to distort the contract to relax product market competition. However, in this case, both upstream and downstream mergers would have the same adverse effect on competition. Indeed, when contracts are observable, an upstream monopolist would have no incentive to renegotiate a contract with a retailer, and would then be able to fully exploit its monopoly power. Since most of the arguments in this section are relatively familiar in the literature on vertical restraints, we

[5]Of course, in the same way as a durable good monopolist might be able to overcome its lack of commitment power through leasing, building of a reputation, most-favoured-customers clauses and other mechanisms, Rey and Tirole (1996) show that an upstream firm might be able to restore its monopoly power through resale price maintenance, exclusive dealings and other vertical contracts. In this paper, we assume away such contracts, but the reader should be aware that if such contracts are available, then an upstream merger would result in the same adverse competitive effects as a downstream merger.

shall keep the formalisation to a minimum and just briefly present the main results and the main intuitions behind them.

After this short introduction, we can summarise the objectives of the present paper as follows. First of all, we would like to stress the often disregarded adverse effects of market concentration in the retail sector. Further, we have two more divulgative purposes. The first is to make the reader acquainted with a recent literature (on unobservable vertical contracts) which has important policy implications (see the discussions in Rey and Tirole, 1996)[6]. The second is to briefly review the literature on vertical restraints (and especially its strategic effects) in the presence of observable contracts, reminding the reader of its main results.

2 Unobservable contracts: Price competition

We consider an industry in which there are two manufacturers or upstream firms (U_1, U_2); each of them stipulates an exclusive contract with a retailer or downstream firm (D_1, D_2).

All firms are assumed to operate at constant return to scale. For simplicity, we assume that U_1 and U_2 produce at the same constant marginal cost c and that the downstream firms (D_1, D_2) transform the intermediate product into the final one on a one-for-one basis and at zero marginal cost.

We assume that contracts stipulated by a producer and a downstream firm remain *unobserved* by the rival upstream and downstream firms (see section 4 for the case of observable contracts). In this section, we also assume that each chain produces a different final good and that downstream competition is in prices (see section 3 for the case where downstream retailers compete in quantities). We will analyze the equilibrium prices and profits arising before and after a merger occuring either in the upstream sector or in the downstream one.

Let p^i be the final price of good i, with $i = 1, 2$. Goods are substitutes, and

[6]One of the implications of this analysis is that regulators should reduce the presence of market power at the vertical stage closest to final consumers. This has led the UK electricity regulator to create intermediary agents between the companies active in the distribution of electricity and the final users. At the distribution level, the electricity market is highly concentrated, and by obliging the companies to sell through intermediaries, the regulator hopes to create a commitment problem which will result in lower final prices. We are grateful to Natalia Fabra for bringing this case to our attention.

demand for each good is decreasing, concave in its own price and symmetric[7]:

$$D^i\left(p^i, p^j\right) = D^j\left(p^j, p^i\right) \qquad \forall p = \left(p^i, p^j\right) \quad i \neq j = 1,2 \qquad (1)$$

$$\frac{\partial D^i}{\partial p^i} < 0 \qquad \frac{\partial^2 D^i}{\partial p^{i2}} \leq 0 \qquad \frac{\partial D^i}{\partial p^j} > 0 \qquad i \neq j = 1,2 \qquad (2)$$

We first consider the case in which the upstream firms possess all the bargaining power in the negotiation process with the downstream firms. The implicit assumption is that there is a competitive supply of potential downstream firms such that an upstream producer can capture the whole downstream surplus without terminating the relationship. In this setting we compare the equilibria arising before and after a merger between the upstream producers.

2.1 Upstream bargaining power

2.1.1 The pre-merger case

The interaction between the two firms is modelled as follows:

1. in the first stage each U_i secretly offers D_i a franchise fee (or non-linear) contract of the form $T_i(q_i) = w_i q_i + FF^i$.
2. in the second stage the two downstream firms simultaneously set their prices p_i and p_j and then order the quantities of the intermediate good to satisfy demand.

Given the tariff $T_i(q_i)$, the downstream firm D_i payoff function is given by:

$$\pi_D^i(p, w_i) = \left(p^i - w_i\right) D^i(p) - FF^i \qquad (3)$$

and the first order condition is:

[7]Symmetry of demand simplifies the presentation but the results extend to more general demand functions. See O'Brien and Shaffer (1992).

$$\frac{\partial \pi_D^i(p, w_i)}{\partial p^i} = \left(p^i - w_i\right) \frac{\partial D^i(p)}{\partial p^i} + D^i(p) = 0 \tag{4}$$

We denote with $p^i = p^i(w_i, p^j)$ the best reply function of downstream firm i obtained from equation (4).

Notice that, being contracts unobservable, the best reply does not depend on the wholesale price established by the other upstream producer. In other words, the upstream producer expects that only the price of *its own* downstream firm responds to changes in its wholesale price (this would not be the case under observable contracts, see section 4). Therefore, there is no commitment effect and the game is played as if $p = (p^i, p^j)$ and $w = (w_i, w_j)$ were determined simultaneously and not sequentially. In particular, since the franchise fee FF^i can be used to extract the whole downstream surplus, it will amount to:

$$FF^i = (p^i(w_i, p^j) - w^i) D^i(p^i(w_i, p^j), p^j) \tag{5}$$

Therefore, the upstream firm i chooses w_i to maximize:

$$\pi_U^i = (p^i(w_i, p^j) - c) D^i(p^i(w_i, p^j), p^j) \tag{6}$$

The first order condition is given by:

$$\frac{\partial \pi_U^i}{\partial w_i} = \frac{\partial p^i(w_i, p^j)}{\partial w_i} \left[D^i(p^i(w_i, p^j), p^j) + (p^i(w_i, p^j) - c) \frac{\partial D^i}{\partial p^i} \right] = 0 \tag{7}$$

Given (4), equation (7) is satisfied iff:

$$w_i = c \qquad i = 1, 2$$

In other words, the unobservability of contracts eliminates any strategic effect associated with the choice of the wholesale price and, for any w_j charged by the rival manufacturer, the best reply of producer i is to set the wholesale price equal to marginal cost. This implies that the payoff of the upstream firm coincides with the one that derives from the direct maximization of $(p^i - c) D^i(p)$. Therefore, if contracts are unobservable, an upstream firm is indifferent between stipulating an exclusive contract with a downstream firm and integrating vertically.

Notice that we have assumed that each upstream firm chooses a two-part tariff (or franchise fee) contract. It can be shown that this is indeed always an equilibrium outcome[8].

In equilibrium each manufacturer choses $w_i = w_j = c$ and the final prices result as the solution to:

$$\frac{\partial \pi_D^i(p,c)}{\partial p^i} = 0 \qquad i \neq j = 1,2 \tag{8}$$

The first order conditions is:

$$D^i(p) + \left(p^i - c\right)\frac{\partial D^i}{\partial p^i} = 0 \qquad i \neq j = 1,2 \tag{9}$$

The symmetric equilibrium prices $p^{1b} = p^{2b} = p^b$ satisfy:

$$\frac{p^b - c}{p^b} = \frac{1}{\varepsilon_1(p^b, p^b)} \tag{10}$$

where ε_1 is the direct price elasticity of demand evaluated at the symmetric equilibrium prices and where the label "b" stands for the "Bertrand" solution (but recall that here retailers are selling differentiated goods, so that p^b does not equal marginal costs at equilibrium).

The profits of each upstream producers are $\pi^{1b} = \pi^{2b} = \pi^b = \left(p^b - c\right) D\left(p^b, p^b\right)$.

In other words, when there are two vertical chains, contracts are unobservable and product market competition is in prices, the equilibrium price is the same as when two manufacturers sell directly to final consumers.

[8]See Rey and Stiglitz (1995). They study the game (under a simple linear demand function) where upstream firms choose in the first stage whether to offer a two-part tariff or a linear pricing contract, the other stages being as before. Unless the two goods are very close substitutes, both firms offering a two-part tariff is the only Nash Equilibrium of the contract game. When products are very close substitutes, both contracts arise as a Nash Equilibrium of the game. The intuition is that adopting a linear tariff the producer necessarily choses a wholesale price higher than the marginal cost, even if contracts are unobservable and no strategic effect is at work. This softens downstream competition and, if the two goods are close substitutes so that the retailer's margin is not relevant and the double marginalization effect is not too strong, the profits of the upstream producer are higher imposing a linear tariff than a two-part tariff.

2.1.2 Upstream merger

Let us now analyse the case where the upstream producers merge. The industry is now characterized by an upstream monopolist and by two downstream firms[9]. The timing of the game is the same, with U secretly offering each D_i a tariff $T_i(q_i) = w_i q_i + FF_i$.

Let us define $p_1^m = p_2^m = p^m$ the prices that maximize total profits:

$$\pi^{TOT} = \left(p^1 - c\right) D^1\left(p^1, p^2\right) + \left(p^2 - c\right) D^2\left(p^2, p^1\right) \tag{11}$$

These prices satisfy:

$$(p^m - c)\frac{\partial D^i(p^m, p^m)}{\partial p^i} + D(p^m, p^m) + (p^m - c)\frac{\partial D^j(p^m, p^m)}{\partial p^i} = 0 \qquad i \neq j = 1, 2 \tag{12}$$

Given our assumption that contracts are unobservable, it is easy to see that the upstream monopolist is not able to achieve monopoly profits. To see this, imagine that it makes the following take-it-or-leave-it offer:

$$\widehat{T}_i(q_i) = \widehat{w}_i + \widehat{FF}_i \qquad\qquad i \neq j = 1, 2$$

where $(\widehat{w}i, \widehat{w}_j)$ are the wholesale prices that suffice to induce the joint-profit maximizing retail prices in the case of observable contracts[10] and the fixed fees transfer the surplus to the upstream producer.

If contracts are unobservable, each downstream firm would find this offer not credible. Imagine D_i accepts $\widehat{T}_i$. It can be shown that the upstream monopolist has the incentive to make make D_j undercut D_i. Anticipating this, D_i will not accept $\widehat{T}_i$. To see this point more precisely, write the joint profit of U and D_j as:

$$\pi_{U+D_j} = \left(p^j - c\right) D^j\left(p^j, p^m\right) + \left(\widehat{w}_i - c\right) D^i\left(p^m, p^j\right) + \widehat{FF}^j \tag{13}$$

The first order condition with respect to p^j is:

[9]The monopolist might wish to keep both retailers because they offer differentiated services or are located in different locations.

[10]See Mathewson and Winter (1984).

$$\left(p^j - c\right)\frac{\partial D^j\left(p^j, p^m\right)}{\partial p^j} + D^j\left(p^j, p^m\right) + \left(\widehat{w}_i - c\right)\frac{\partial D^i\left(p^m, p^j\right)}{\partial p^j} = 0 \qquad (14)$$

Recalling that p^m satisifies condition (12) and the assumptions made on demand, at the joint-maximizing retail price the previous expression is negative:

$$\left(\widehat{w}_i - p^m\right)\frac{\partial D^i\left(p^m, p^m\right)}{\partial p^j} < 0 \qquad (15)$$

This implies that, assuming that the objective function is quasi-concave, the supplier and retailer j will negotiate a contract that induces a retail price cut, if retailer i sets $p^i = p^m$.

Notice that, since retailers order quantities of the intermediate good after learning sales, granting a secret price-cut to a retailer could backfire on the monopolist: the recipient would cut its output price, reducing demand of the other retailer's output and hence its intermediate good order. In spite of this feedback effect, which does not exist when orders are placed before demand is realized[11], the monopolist has an incentive to divert customers toward the product of retailer j, given that the other retailer chooses a price equal to p^m. The intuition is that that the monopolist margin from selling to retailer i $(\widehat{w}_i - c)$ is less than the retail margin in case of joint maximization of profits $(p^m - c)$. Hence, the loss of the monopolist from lower sales through the injured retailer is less than it would be under joint-maximization and U has an incentive to induce $p^j < p^m$ given $p^i = p^m$.

In the case of secret contracts, the contracts actually offered in equilibrium depend on the nature of each downstream firm's conjectures about the contract offered to its rival. Therefore, there are many possible Perfect Bayesian Equilibria. One of them assumes *passive conjectures*[12]*:* when a downstream firm receives an unexpected offer it does not revise its beliefs about the offer made to its rival. In other words, D_i expects D_j to set the same candidate equilibrium price p^j, regardless of the contract T_i offered by U.

It is easy to see that any Perfect Bayesian Equilibrium with passive beliefs must yield contracts $\left(T_i^*, T_j^*\right)$ and retail prices induced by these contracts (p^{i*}, p^{j*}) such that $\forall i = 1, 2$ T_i^* maximizes the bilateral profit π_{U+D_i}, taking T_j^*

[11] See Section 3.

[12] For a complete discussion of why passive conjectures are plausible, see Rey and Tirole (1996).

and $p^{j\star}$ as given. Since U offers two-part tariffs[13], given the candidate equilibrium $p^{j\star}$, w_i^* maximize the bilateral profit:

$$\pi_{U+D_i} = \left(p^i\left(w_i, p^{j\star}\right) - c\right) D^i\left(p^i\left(w_i, p^{j\star}\right), p^{j\star}\right) + \left(w_j^* - c\right) D^j\left(p^{j\star}, p^i\left(w_i, p^{j\star}\right)\right) + FF^{j\star} \tag{16}$$

where $p^i\left(w_i, p^{j\star}\right)$ is the best reply of retailer i, obtained from the FOC of $D_i's$ maximization problem. Since the payoff function of the downstream firm is the same as in the pre-merger case, $p^i\left(w_i, p^{j\star}\right)$ satisfies condition (4):

$$\frac{\partial \pi_D^i}{\partial p^i} = \left(p^i\left(w_i, p^{j\star}\right) - w_i\right)\frac{\partial D^i}{\partial p^i} + D^i\left(p^i\left(w_i, p^{j\star}\right), p^{j\star}\right) = 0 \tag{17}$$

Therefore, the FOC for maximizing (16) with respect to w_i taking $p^{j\star}$ as given is:

$$\left[\left(p^i\left(w_i^*, p^{j\star}\right) - c\right)\frac{\partial D^i}{\partial p^1} + D^i\left(p^i\left(w_i^*, p^{j\star}\right), p^{j\star}\right) + \left(w_j^* - c\right)\frac{\partial D^j}{\partial p^2}\right]\frac{\partial p^i\left(w_i^*, p^{j\star}\right)}{\partial w_i} = 0 \tag{18}$$

Combining (18) and (17), we obtain the following condition:

$$\left(w_i^* - c\right)\frac{\partial D^i}{\partial p^i} + \left(w_j^* - c\right)\frac{\partial D^j}{\partial p^j} = 0 \qquad i \neq j = 1, 2 \tag{19}$$

The previous system of two equations with two unknowns is satisfied only by $w_i^* = w_j^* = c$. Intuitively, at $w_i^* = w_j^* = c$ the monopolist earns zero profit at the margin from additional sales to each retailer and has no incentive to offer secret price cuts.

Therefore, for passive conjectures, the equilibrium wholesale price equals marginal cost and the unique equilibrium yields

$$p^{1b} = p^{2b} = p^b < p^m$$

Since the upstream producer posess all the bargaining power, the franchise fees absorbes the downstream surplus and the upstream firm's profit is:

$$\pi_U^b = 2\pi^b < \pi^m$$

To conclude, when contracts are secret the upstream merger has no impact on consumers while the merging firms obtain exactly the sum of the pre-merger

[13]Without loss of generality because the franchise fee enables U to extract $D_i's$ profit and the choice of the wholesale price suffices to control the downstream unit's quantity choice.

profits[14]. In other words their profits do not increase as a consequence of their increased market power. This is because of the lack of commitment problem we have explained above.

2.2 Downstream bargaining power

In this section we assume that the downstream firms posess all the bargaining power and we compare the equilibrium arising before and after a merger occuring downstream.

2.2.1 The pre–merger case

The only difference with respect to the previous setting is that in the first stage each D_i secretly offers U_i a tariff $T(q_i) = w_i q_i + FF^i$.

A retailer D_i can use the franchise fee FF^i (in this case the fee is negative: it is a slotting allowances) to extract the whole upstream surplus ($FF^i = -(w_i - c) D^i(p^i, p^j)$) and choses w_i to maximize its profit:

$$\pi_D^i = \left(p^i\left(w_i, p^j\right) - c\right) D^i\left(p^i\left(w_i, p^j\right), p^j\right) \tag{20}$$

where $p^i(w_i, p^j)$ is $D_i's$ best reply in the downstream game and satisfies condition (4).

Since contracts are unobservable, D_i knows that the other downstream firm does not react to a change in its wholesale price and it has no incentive to precommit to a wholesale price higher than marginal cost, with the strategic purpose to soften downstream competition. Therefore, the FOC of $D_i's$ maximization problem is:

$$\frac{\partial \pi_D^i}{\partial w_i} = \frac{\partial p^i(w_i, p^j)}{\partial w_i}\left[D^i\left(p^i\left(w_i, p^j\right), p^j\right) + \left(p^i\left(w_i, p^j\right) - c\right)\frac{\partial D^i}{\partial p^i}\right] = 0 \tag{21}$$

Taking into account that $p^i(w_i, p^j)$ satisfies (4), equation (21) is satisfied iff:

$$w_i = c$$

[14]Given this result, one might wonder why an upstream merger should occur at all. The answer might lie in possible efficiency gains achieved through the merger.

Therefore, for any w_j charged by D_j, $D_i's$ best reply is to set the wholesale price equal to marginal cost[15]. This implies that the downstream firm maximizes $(p^i - c) D^i(p)$; in other words, D_i is indifferent between stipulating an exclusive contract with the upstream firm and integrating vertically. Notice that, if the upstream sector is competitive, the downstream firm's objective function is the same, since the intermediate input would be sold at the marginal cost.

In equilibrium each downstream firm chooses $w_i = w_j = c$ and the equilibrium final goods price and profits are:

$$p^{1b} = p^{1b} = p^b$$

$$\pi_D^{1b} = \pi_D^{2b} = \pi^b$$

which are exactly the same solutions as in the case of duopolistic vertical chains with upstream bargaining power.

2.2.2 Downstream merger

When the downstream producers merge, the industry will be characterized by two upstream firms serving a downstream producer. Since D directly faces the final market, the inability of the monopolist to exert fully its monopoly power does not appear. D can make a take-it or leave-it offer to U_1 and U_2 imposing them to sell their input at the marginal cost c. This implies that D manages to charge to final consumers the prices that maximize its aggregate profit:

$$\pi_D = \left(p^1 - c\right) D^1\left(p^1, p^2\right) + \left(p^2 - c\right) D^2\left(p^2, p^1\right) \tag{22}$$

In equilibrium, $p^1 = p^2 = p^m$ and $\pi_D^* = \pi^m > 2\pi^b$.

Therefore, differently from an upstream merger, a downstream merger decreases the welfare of consumers and increases the profits of the merging firms, relative to the pre-merger situation. This suggests that competition authorities should put extra caution before allowing merger proposals by firms operating in the retail or distribution sectors.

[15]Notice that the downstream firms cannot do better using linear pricing: also in such a case they would choose $w_i = c$.

3 Homogeneous goods (Cournot Competition)

In this section we prove that the results obtained still hold goods when assuming that the final product is homogeneous and that downstream producers compete in quantities. The inverse demand is decreasing and concave: $p = P(Q)$. As before, we first consider the case of upstream bargaining power (and upstream merger) and then the case of downstream bargaining power (and downstream merger).

3.1 Upstream Bargaining Power

3.1.1 The pre-merger case

The interaction between the two firms is modelled as follows:

1. in the first stage each U_i simultaneously offers D_i a tariff $T_i(q_i) = w_i q_i + FF^i$; each D_i orders a quantity of intermediate product q_i and pays $T_i(q_i)$.
2. in the second stage, D_1 and D_2 transform the intermediate product into the final one and compete in quantities.

The downstream firm's payoff is given by:

$$\pi_D^i(q_i, q_j, w_i) = (P(q_i + q_j) - w_i) q_i \tag{23}$$

and the first order condition is:

$$\frac{\partial \pi_D^i}{\partial q_i} = P(q_i + q_j) - w_i + q_i \frac{\partial P(Q)}{\partial q_i} = 0 \tag{24}$$

Equation (24) defines $D_i's$ reply function $q_i = q_i(w_i, q_j)$.

The upstream firm U_i can use the franchise fee to extract all the downstream firm's profit and, for a given w_j it maximizes:

$$\pi_U^i = (P(q_i(w_i, q_j) + q_j) - c) q_i(w_i, q_j) \tag{25}$$

The first order condition is given by:

$$\frac{\partial \pi_U^i}{\partial w_i} = \frac{\partial q_i\left(w_i, q_j\right)}{\partial w_i}\left[\frac{\partial P(Q)}{\partial Q} q_i\left(w_i, q_j\right) + P(Q) - c\right] = 0 \tag{26}$$

Given (24), equation (26) is satisfied iff $w_i = c$.

As in the previous section, for any w_j charged by the rival manufacturer, the best reply of producer i is to set the wholesale price equal to marginal cost. This implies that the payoff of the upstream firm coincides with the one that derives from the direct maximization of $\left[P\left(q_i + q_j\right) - c\right] q_i$. Therefore, if contracts are unobservable, an upstream firm is indifferent between stipulating an exclusive contract with a downstream firm and integrating vertically.

In equilibrium each manufacturer choses $w_i = w_j = c$ and the Nash equilibrium quantities (denoted with the label "c" which stands for Cournot) are the solution to:

$$\frac{\partial \pi_D^i\left(q_i, q_j, c\right)}{\partial q_i} = P\left(q_i + q_j\right) - c + q_i \frac{\partial P}{\partial q_i} = 0 \qquad i = 1, 2 \tag{27}$$

In the symmetric equilibrium, $q_1^c = q_2^c = q^c$ and $\pi_U^{1c} = \pi_U^{2c} = \pi^c$.

3.1.2 Upstream merger

Consider the case where the industry is characterized by an upstream monopolist and by two downstream firms. The timing of the game is unaltered.

Let us define p^m and Q^m the solution of the maximization of

$$\pi = \left(P(Q) - c\right) Q \tag{28}$$

and π^m the monopoly profits.

Similarly to the case of price competition, given that contracts are not observable, the monopolist cannot fully exert its monopoly power and gets the monopoly profits. For instance, it would not be credible for the monopolist to offer the contracts $\widehat{T}_i\left(q_i\right) = \widehat{w}_i q_i + FF^i$ with $i = 1, 2$ that, in the case of observability, suffice to induce each retailer to buy $\frac{Q^m}{2}$.

To see this, notice that if D_i accepts the offer, the monopolist has incentive to change the offer to D_j. The maximization of the joint profit of D_j and U requires to offer to D_j to buy more than $\frac{Q^m}{2}$:

$$\pi_{U+D_j} = \left(P\left(\frac{Q^m}{2} + q_j\right) - c\right) q_j \tag{29}$$

From the first order condition, the optimal amount of intermediate good that retailer j should be induced to order, $q_j = q_j(q_i, c)$, satisfies:

$$P\left(\frac{Q^m}{2} + q_j\left(\frac{Q^m}{2}, c\right)\right) - c + q_j\left(\frac{Q^m}{2}, c\right)\frac{\partial P}{\partial q_j} = 0 \tag{30}$$

Since $P(Q)$ is assumed to be decreasing and concave, $\frac{\partial q_j(q_i,c)}{\partial q_i} = \frac{(P\ +qP'\ )}{2P\ +qP'} \in (0,1)$ This implies that $q_j(0,c) - q_j\left(\frac{Q^m}{2}, c\right) < -\frac{Q^m}{2}$, or equivalently, that $\frac{Q^m}{2} < q_j\left(\frac{Q^m}{2}, c\right)$.

Therefore, U has the incentive to offer D_j to buy more than $\frac{Q^m}{2}$ and, anticipating this D_i does not accept its offer.

As in the previous section, we analyze the Perfect Bayesian Equilibrium that assumes : when receiving an unexpected offer, D_i assumes that D_j still produces the candidate equilibrium quantity q_j. Similarly to the case of downstream price competition, any Perfect Bayesian Equilibrium with passive conjectures must yield contracts $\left(T_i, T_j\right)$ and quantities induced by these contracts $\left(q_i, q_j\right)$ such that T_i maximizes the bilateral profit π_{U+D_i} taking T_j and q_j as given.

Since the franchise fee is used to absorbe the downstream surplus, w_i is chosen in order to maximize:

$$\pi_{U+D_i} = \left(P\left(q_i\left(w_i, q_j\right) + q_j\right) - c\right) q_i\left(w_i, q_j\right) + \left(w_j - c\right) q_j + FF^j \tag{31}$$

where $q_i\left(w_i, q_j\right)$ is the best reply of retailer i and satisfies equation (24).

The FOC of this maximization problem is:

$$\left[P\left(q_i\left(w_i, q_j\right) + q_j\right) - c + q_i\left(w_i, q_j\right)\frac{\partial P}{\partial Q}\right]\frac{\partial q_i\left(w_i, q_j\right)}{\partial w_i} = 0 \tag{32}$$

Combining (24) and (32) we obtain the following conditions:

$$\left(w_i - c\right)\frac{\partial q_i\left(w_i, q_j\right)}{\partial w_i} = 0 \qquad i \neq j = 1, 2 \tag{33}$$

The previous system is satisfied by $w_i^* = w_j^* = c$[16].

The intuition behind this result is tha passive beliefs imply that a retailer's decision about downstream output is not affected by unobserved changes in the wholesale prices to rivals. Therefore, in its dealing with any retailer, the monopolist acts as if the two are integrated and face a given residual downstream demand. Maximization involves setting wholesale price equal to the monopolist marginal cost.

Hence, under passive conjectures, the equilibrium quantities are the ones arising before the merger:

$$q_1^c = q_2^c = q^c$$

The profit of the upstream producer is:

$$\pi_U^c = 2\pi^c < \pi^m$$

To conclude, when contracts are secret the upstream merger has no impact on consumers while the merging firms obtain exactly the sum of the pre-merger profits.

3.2 Downstream bargaining power

3.2.1 The pre-merger case

In this case, in the first stage each D_i simultaneously offers U_i a tariff $T_i = w_i q_i + FF^i$; each D_i orders a quantity of intermediate product q_i and pays $T_i(q_i)$. In the second stage, D_i and D_j transform the intermediate product into the final one and compete in quantities.

The downstream firm D_i can use the franchise fee (slotting allowances, in this case) to extract all the upstream firm's profit ($FF^i = -(w_i - c) q_i$) and, for a given w_j it maximizes:

$$\pi_D^i = [P(q_i(w_i, q_j) + q_j) - c] q_i(w_i, q_j) \tag{34}$$

where $q_i(w_i, q_j)$ satisfies condition (24).

[16]Hart and Tirole (1990) show that the same outcome emerges when the monopolist can employ more general contracts than two-part tariffs.

The first order condition of $D_i's$ maximization problem is given by:

$$\frac{\partial \pi_U^i}{\partial w_i} = \frac{\partial q_i(w_i, q_j)}{\partial w_i}\left[\frac{\partial P(Q)}{\partial Q} q_i(w_i, q_j) + P(Q) - c\right] = 0 \tag{35}$$

Given (24), equation (35) is satisfied iff $w_i = c$.

In other words, for any w_j charged by the rival manufacturer, the best reply of producer i is to set the wholesale price equal to marginal cost. This implies that the upstream firm maximizes $[P(q_i + q_j) - c]\, q_i$. Therefore, if contracts are unobservable, an upstream firm is indifferent between stipulating an exclusive contract with a downstream firm and integrating vertically.

In equilibrium each manufacturer choses $w_i = w_j = c$ and symmetric Nash equilibrium quantities and profits are $q_1^c = q_2^c = q^c$ and $\pi_D^{1c} = \pi_D^{2c} = \pi^c$.

3.2.2 Downstream merger

Consider now the case where the industry is characterized by two upstream firms serving a downstream producer. Since D directly faces the final market, it does not face any credibility problem and manages to make a take-it or leave-it offer to U_1 and U_2 imposing them to sell their input at the marginal cost c. This implies that D manages to sell the quantity that maximize its aggregate profit:

$$\pi_D = (P(Q) - c)\, Q$$

In equilibrium, $q = Q^m$ and $\pi_D^* = \pi^m > 2\pi^*$.

Therefore, differently from an upstream merger, a downstream merger decreases the welfare of consumers and increases the profits of the merging firms, relative to the pre-merger situation. This confimrs the results obtained under price competition.

4 Observable contracts: How the analysis would change

In this section, we briefly review the results that would arise in the game if firms could offer *observable* vertical contracts. In the case of competing vertical

chains, observability of contracts implies that an upstream (resp. downstream) firm which has the bargaining power can use the contract to its retailers (resp. supplier) as a pre-commitment device to strategically manipulate product market equilibria in a proftable way. As we shall see, the optimal contract will crucially depend on the type of strategic interaction in the market place (i.e. strategic complements or strategic substitutes), rather than whether the bargaining power is on upstream or downstream firms[17].

4.1 Price competition

Consider first the case where there are duopolistic vertical chains and the bargaining power is on upstream firms. If goods are strategic complements (a reasonable assumption if firms are competing in prices) and contracts are observable, the upstream firm i knows that increasing w_i will shift the best reply function of the retailer upwards and to the right, which implies raising not only p^i but also p^j, given w_j. Therefore, for any w_j charged by upstream firm j, setting $w_i > c$ is a commitment to a best reply function with higher prices, that is, a commitment to soften downstream competition (see Figure 1a). This effect explains why, when contracts are observable, it is optimal to set the wholesale price higher than the marginal cost. Since being vertically separated and adopting a two-part tariff allows to exploit this strategic role associated with the choice of the wholesale price, it is more profitable than being vertically integrated, which is equivalent to setting $w_i = c$, $FF^i = 0$ and maximizing directly $(p^i - c)\, D\,(p)$ [18].

Insert Figure 1

[17] We keep the analysis informal to save space and because these results are relatively well know. The main references here are: Bonanno and Vickers (1988), Rey and Stiglitz (1988), Lin (1988), Gal-Or (1991). See also the survey by Irmen (1998).

[18] It can be shown in this setting that linear pricing is more profitable than a two-part tariff when the loss in sales due to double marginalization is not relevant. This is the case when goods are close substitutes (Rey and Stiglitz (1995) and Gal-Or (1991)) or when industry demand is sufficiently inelastic (Irmen (1997)). The further question of which contract would be chosen in a game in which firms choose in the first stage whether to offer a two-part tariff or a linear pricing has been addressed by Rey and Stiglitz (1995), Gal–Or (1991) and Irmen (1997) adopting linear demands. The first paper shows that franchise fees will always be the equilibrium outcome in the absence of retail fixed costs. In the other two papers retailers incur a fixed cost in addition to a franchise fee. Linear prices arise as the equilibrium contract when goods are very close substitutes or when industry demand is sufficiently inelastic.

The same kind of strategic effect also arises when downstream firms have the bargaining power in the vertical chain and for the same intuition. The downstream firm's optimal contract is to offer the upstream firm a supplying contract under which the latter sells at a wholesale price higher than its marginal cost, but pays a slotting allowance ($FF < 0$) to the retailer (see Shaffer, 1991).

At the equilibrium with two vertical chains, therefore, the price would be p^{FF}, with $p^m > p^{FF} > p^b$ (see Figure 1b).

If contracts were observable, the upstream monopolist could support the joint-maximization outcome in a subgame perfect equilibrium. Two-part tariffs suffice: a vector of wholesale prices is sufficient to induce the desired vector of retail proces, while fixed fees transfer the surplus[19]. No lack of commitment effect arises here and an upstream merger would result in the upstream monopolist being able to fully exploit its monopoly position.

The same would happen with a downstream monopolist. It would make a take-it-or-leave-it offer where the wholesale price equals the marginal cost, and both upstream firms would accept it. The downstream monopolist would then set the monopoly price.

4.2 Quantity competition

Consider first the case of vertical chains with the upstream firms having the bargaining power over the retailers. When market interaction gives rise to strategic substitutability, if contracts are observable each upstream firm's best strategy will be to set $w_i < c$ for any given w_j, so as to shift the own retailer's best reply function to the right (see Figure 2a). Other things being equal, being more aggressive in the market place would induce the rival retailer to reduce its quantity and raise the own retailer's profit. However, both upstream producers would have exactly the same incentives to strategically use the vertical contract, and the final outcome would be higher equilibrium quantities and lower profits than in the case of vertical integration (see Figure 2b).

If the bargaining power was on the downstream firms, they would have the same incentive to pre-commit by offering a contract to the supplier which makes them (credibly) more aggressive in the downstream competition.

Insert Figure 2

[19] See Mathewson and Winter (1984).

If contracts were observable, the upstream monopolist could easily sustain the monopolistic outcome, for istance making the following take-it-or-leave-it offers to D_1 and D_2 :

$$(q_i, T_i) = \left\{ \frac{Q^m}{2}, \frac{p^m Q^m}{2} \right\} \qquad i = 1, 2$$

Both downstream firms would accept this contract and they together would sell the quantity Q^m at price p^m. No lack of commitment effect arises here and an upstream merger would result in the upstream monopolist being able to fully exploit its monopoly position.

The same outcome would arise in the case where there is a downstream monopolist.

To conclude, if contracts were observable, then both upstream and downstream mergers are equally welfare detrimental, as they would allow the merging parties to fully enjoy their monopoly power.

As a way of summary, the following table illustrates all the results obtained in the different cases analysed in this paper.

Table 1: Summary of results - price competition

	ObservableContracts	**Secret Contracts**
Duopolistic Vertical Chains	$w > c \quad p^{FF} \in \left(p^b, p^m\right)$	$w = c \quad p^{FF} = p^b$
Upstream Merger	$w > c \quad p^{FF} = p^m$	$w = c \quad p^{FF} = p^b$
Downstream Merger	$w = c \quad p^{FF} = p^m$	$w = c \quad p^{FF} = p^m$

Summary of results - quantity competition

	ObservableContracts	**Secret Contracts**
Duopolistic Vertical Chains	$w < c \quad q^{FF} > q^c$	$w = c \quad q^{FF} = q^c$
Upstream Merger	$w > c \quad q^{FF} = \frac{Q^m}{2}$	$w = c \quad q^{FF} = q^c$
Downstream Merger	$w = c \quad q^{FF} = \frac{Q^m}{2}$	$w = c \quad q^{FF} = \frac{Q^m}{2}$

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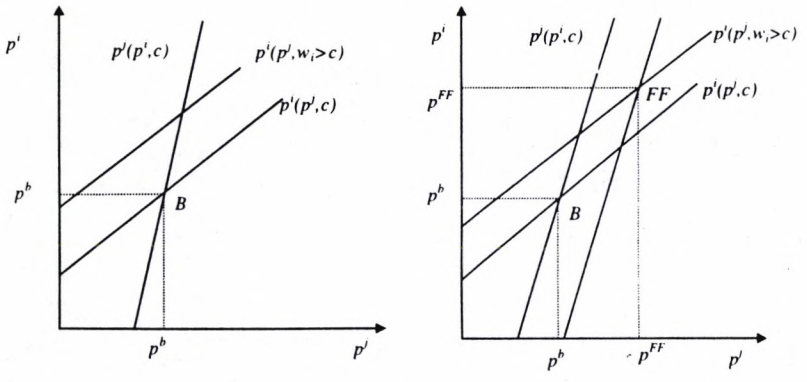

(a) Figure 1 (b)

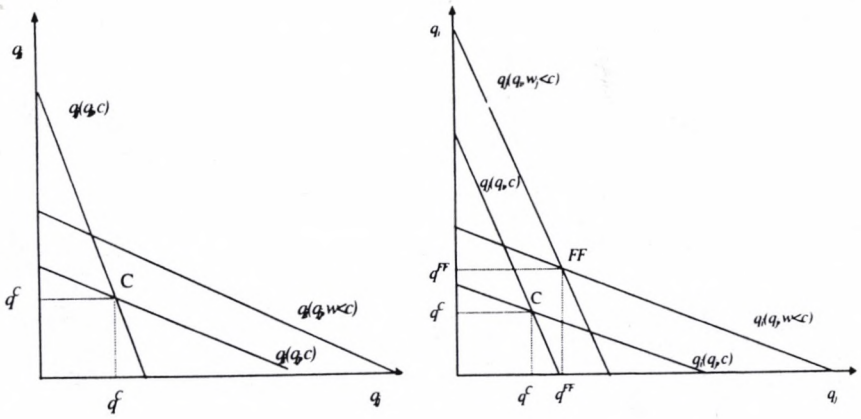

Figure 2

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