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Vertical Contractual Relations and Bargaining: The role of the Retailing Cost

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Abstract

We study the role of the retailing cost in vertically related markets where the contract terms are determined through negotiations between an upstream supplier and two downstream retailers who compete in quantities in the downstream market. We examine both the cases of linear and non-linear pricing. In each case, we build two different models, concerning the ability of a retailer to react when its rival retailer and the supplier fail to reach an agreement. The ability of the retailer to react to a breakdown of the negotiations, affects, apart from the supplier's disagreement payoffs, the negotiated contract terms and the consumer prices. When the contracts take the form of two-part tariffs, the most efficient retailer is the one that can negotiate better contract terms. Moreover, when there is no reaction to the breakdown of the negotiations, when a retailer becomes more efficient in the production of the final good, it is able to negotiate more favourable contract terms, while the other retailer's terms of trade deteriorate.

Contents

1 Introduction

In modern economies, few are the cases where the various products reach the consumers directly through the manufacturers. In most cases, there is a distribution chain involved which typically has several links. The overall product properties such as its price and quality, in addition with the variety of products available to the consumers, are greatly influenced by the interactions that occur between different links of the distribution chain. In economic theory, those interactions between firms that operate at different stages of the distribution chain are known as vertical relationships. It is evident that vertically related firms exhibit a more complex behavior than firms that interact only with their customers and as a result a more thorough analysis in needed to accurately describe the economic reality. Input prices, and in general the terms of trade between vertically related firms, have received increasing attention in the economic literature, since the way they are determined, as well as the way they affect the competition and the consumer prices and thus the consumers' welfare, are not always obvious. Recent literature employs the tools of modern bargaining theory to analyse such topics. As a result, the way the terms of trade between vertically related firms are determined is often modelled using a framework of bilateral negotiations between the retailers and their suppliers.

An issue of great importance is the understanding of the economic effects of the major changes that have been observed in the retailing industry in the past years such as the rise of the supermarket format and the fact that some retailers have turned into large, international and powerful buyers. It is often argued that those powerful retailers are in position to obtain better contract terms from their suppliers, by exerting buyer power in their negotiations. Evidence from the UK's grocery retail sector have indeed shown

that the largest grocery retail chains enjoy significantly lower prices than smaller chains. Moreover, the largest chains have increased their combined share of the market and have exhibited faster growth in sales during the years compared to the smaller chains. The exercise of buyer power by powerful retailers may have positive or negative effects on the competition, consumer prices and, therefore, consumer's welfare.

In this research, we try to examine the effects of cost differences between the retailers on the terms of trade that they negotiate with their supplier. In order to do this, we build a simple model with one upstream supplier and two downstream competinh firms, who buy an intermediate good from the supplier and, incurring a retailing cost that differs between them, transform it to the final good that they sell to the consumers. We assume that the contract terms and the consumer prices are determined through a two-stage game: At the first stage the upstream firm negotiates separately and simultaneously with the downstream firms over the contract terms and at the second stage the downstream firms compete in quantities. Following Iozzi and Valletti (2010), we examine two modelling options of the disagreement profits of the upstream firm in case of a breakdown of the negotiations with one of the downstream firms. In the first case, labeled "No Reaction", the breakdown of the negotiations between the upstream supplier and one of the downstream firms is not observed by the rival downstream firm who acts at the second stage of the game as if the other firm was present. In the second case, labeled "Reaction", the rival downstream firm observes the breakdown of the negotiations and reacts by making its optimal choice at the second stage knowing that it is now a monopolist in the downstream sector.

The modelling option of the disagreement payoffs changes dramatically the resulting equilibrium values for the contract terms as well as the final

prices and quantities in the downstream sector. When the contracts between the upstream suppliers and the downstream firms take the form of two-part tariffs, as one of the downstream firms becomes more efficient in the production of the final good, its equilibrium negotiated wholesale price decreases. While when there is reaction in a breakdown of negotiations this decrease in the retailing cost does not affect the other donwstream firm's equilibrium wholesale price, in the case of "No Reaction" when one of the downstream firm becomes more efficient in the production of the final good, apart from the discounts that it gets in its negotiations with the supplier, a waterbed effect on the other firm's wholesale price also occurs.

The structure of the thesis is as follows. In section 2 we give a brief introduction to the theory of vertical contractual relations and the tools from bargaining theory that are used for the description of models in which the contract terms between the suppliers and the retailers are determined through negotiations among them. In section 3 we present a literature review on vertical contractual relations. In section 4 we describe the model, determine the equilibrium and present some results, and in section 5 we conclude.

2 Vertical Contractual Relations

2.1 Vertical Restraints

Vertical relationships are transactions between firms that operate at different stages of a vertical supply chain. Such relationships may involve input producers and final good manufacturers, wholesalers and retailers and, in general, "upstream" and "downstream" firms. Upstream firms do not trade directly with final consumers, but their goods reach final consumers through the downstream firms. The downstream firms are customers of the upstream firms but the relations between them are more complex than those between a firm and its consumers. The downstream firms make some further decisions (transformation of the intermediate good, determination of final price, promotion efforts), after the intermediate good is sold by the upstream firms, that affect the profits of all firms in the vertical chain as well as the price, the quality and the variety of the products that reach the final consumers.

Since the upstream firms' profits are affected by the downstream firms' decisions, the upstream firms have an incentive to control the downstream sector. An upstream firm is vertically integrated if it can control all the decisions made by the vertical structure. In this case, the profit that the vertical structure obtains is the maximum aggregate profit that can result. Full vertical control can be achieved either by means of vertical integration or through the contracts signed between the upstream and the downstream firms. These contracts apart from a linear price that the downstream firm pays to the upstream firm to purchase the intermediate good , may also include more complex arrangements, called vertical restraints.[1] The simplest form a vertical restraint can take is that of the two part tariff which consists of

[1] A detailed analysis on vertical restraints can be found in Tirole (1988), Katz (1989), Gal-Or(1991) and Milliou et. al (2009).

a franchise fee F and a linear wholesale price w proportional to the quantity bought by the downstream firm. The downstream firm in this case, pays a total of $T(q) = F + wq$ for the purchase of the intermediate good. Such a contract, allows for the maximization of the joint profit of the upstream firm and the downstream firms. Under a simple linear wholesale price contract this would not be possible. For example, let's assume a very simple setting with a monopolist supplier who produces a good at a constant marginal cost c and sells it to a retailer at a constant wholesale price w. The supplier in this case will choose the wholesale price w to maximize its own profits: $(w - c) D(p)$, with $D(p)$ denoting the product's demand. The retailer, after purchasing the monopolist's product, will choose the final price p to maximize its own profits: $(p - w) D(p)$, assuming he has no extra costs apart from the cost of acquiring the product. The vertically integrated chain would maximize the joint profits: $(p - c)D(p)$. The resulting price would be the monopoly price p^m. The final price p that the vertically separated chain would choose exceeds this monopoly price and the profits that the non-integrated chain makes are less than those of the integrated chain. The reason is the externality that arises because the retailer does not take into account the supplier's marginal profit when choosing the final price. As a result two successive mark-ups take place and two margins are earned: $(w - c)$ for the supplier and $(p - w)$ for the retailer. This vertical externality is known as the "double marginalization" effect[2]. Since integration is not always feasible, and when it is it may be too costly, the other way for the correction of this externality is the imposition of vertical restraints in the contract signed among the two firms. A two-part tariffs pricing scheme with $w = c$ would result in a final price equal to the monopoly price. In addition, the supplier could set the franchise fee equal

[2]Spengler (1950).

to the vertical chain's profit (the monopoly profit) transferring this way the total profits upstream. More complex contracts may include other vertical restraints such as:

Resale Price Maintenance (RPM) : An RPM contract, apart from specifying the wholesale price of the intermediate good, restricts the price at which the retailer can sell his product. This restriction can take the form of a price floor ($p \geq p^o$), a price ceiling ($p \leq p^o$), or both simultaneously specifying this way the exact final price of the product ($p = p^o$).

Quantity Fixing : The quantity of the intermediate good that the retailer will buy from the supplier is specified in the contract. This restraint can take the form of of quantity forcing ($q \geq q^o$), quantity rationing ($q \leq q^o$) or both ($q = q^o$).

Price-Quantity Bundle : Such a contract specifies the total quantity of the intermediate good that will be sold to the retailer along with its corresponding total price.

Ties : The retailer in this case can buy the intermediate good A from a supplier only if he also buys another intermediate good B from the same supplier.

Exclusive Dealing : If the good that the supplier sells to the retailer is a branded final good, under an exclusive dealing contract the retailer is restricted not to sell to the consumers any other rival suppliers' brands.

Exclusive Teritorries : The retailer is restrained to serve consumers only in a specified geographic region. The supplier can limit the geographical location of his authorized dealers or forbid a retailer from serving consumers who are located in a territory asigned to another retailer.

2.2 Bargaining

In the previous analysis the downstream firms were treated as price takers that have no bargaining power against the upstream firms, and thus, the contract terms were set by the upstream firm alone. Although this case could be possible if the downstream sector is perfectly competitive and/or the upstream sector is monopolistic, it does not depict the present situation in the vertically related firms. In reality, retailers often bargain with the suppliers over the contract terms. In addition, the retailer sector sometimes is highly concentrated and some retailers have turned into large and powerful buyers who can negotiate better contract terms. The analysis of the situations in which the contract terms are determined through negotiations between each retailer and his supplier is founded on tools from the bargaining theory. In particular, the bargaining between the two parties is most frequently treated by the academic literature as a Nash bargaining problem[3].

A Nash bargaining problem describes the situation in which two rational parties negotiate to reach an agreement over the division of a "pie". In the case of negotiations over the contract terms between two parties of a vertical chain the "pie" is the joint profit of the vertical chain. The solution of such a problem is the determination of how much it should be worth to each of the two parties to have the opportunity to bargain. In other words the solution determines the amount of satisfaction that each of the parties should expect to get from the bargaining. Technically, the solution to such a problem involves the determination of each party's payoffs and the

[3]There are also other approaches that can be found in the literature, such as the egalitarian solution, the utilitarian solution or the strategic (dynamic) approach proposed by Ariel Rubinstein. While the axiomatic approach is focused on the properties of the potential solution of a bargaining problem, the dynamic approach is focused on the process of the negotiations, trying to reveal the solution through the bargaining procedure. A detailed review of these approaches can be found in Rusinowska (2003).

specification of a disagreement point. In each bargaining situation between two parties (labelled $i = 1, 2$) there is a set of possible agreements X, where $x \in X$ specifies the physical consequences to the two parties if x is the agreement that they reach. Each party's preferences over X along with its attitude towards risk are represented by a von Neumann-Morgenstern utility function u_i. The disagreement point, or, threat point, is a pair (d_1, d_2) of utility levels that represent the amount of satisfaction for the two parties in case they do not reach an agreement. Thus, the bargaining problem is represented by the pair (S, d) where $S = \{(u_1(x), u_2(x)) : x \in X\}$ and $d \in S$, $d = (d_1, d_2)$.

According to the static axiomatic approach, proposed by Nash (1950), in every bargaining problem there is a unique bargaining solution $f(S, d)$ that satisfies the following axioms:

1. Symmetry: If the two parties have exactly the same preferences, then the solution will be such that both parties get equal shares (i.e. 1/2 each).

2. Pareto efficiency: If s is a point in S such that there exists another point s' with $u_i(s') > u_i(s)$ then $f(S, d) \neq s$. In other words, two rational bargaining parties will never throw away some of the "pie".

3. Invariance to equivalent utility representations: A linear trasformation (S', d') of a bargaining problem (S, d) such that $S' = aS + b$ and $d' = ad + b$, where $a \geq 0$ will have as a solution a linear trasformation of the original problem's solution: $f'(S', d') = af(S, d) + b$.

4. Independence of irrelevant alternatives: If (S, d) and (S', d) are two bargaining problems such that $S \subset S'$, and $f(S', d) \in S$, then $f(S, d) = f(S', d)$. This means that the two bargaining parties are consistent: If any alternative agreement point, that would not arise (for some reason) initially, becomes infeasible, the two bargaining parties will still come to a feasible

agreement.

As Nash (1950) demonstrated, there is a unique solution that satisfies those axioms. This solution takes the form:

$$f(S,d) = \arg\max N = [(s_1 - d_1)(s_2 - d_2)] \tag{1}$$

The maximand N is called the *Nash product* and the solution $f(S,d)$ is called the *Nash bargaining solution.*[4]

It should be noted that the above analysis refers to a situation where the following assumptions hold:

1. The two bargaining parties are highly rational.
2. Each one can accurately compare his desires for various situations.
3. Each one has full knowledge of the tastes and preferences of the other.
4. The two bargaining parties are equal in bargaining skill.

This analysis is extended to the asymmetric case where the two parties are not equal in bargaining power. Denoting by $b \in (0,1)$ the bargaining power of the one of the bargaining parties relative to the bargaining power of the other, the solution to the bargaining problem in this case takes the form:

$$f(S,d) = \arg\max N = [(s_1 - d_1)^b (s_2 - d_2)^{(1-b)}] \tag{2}$$

Modern bargaining theory has shown that the Nash bargaining solution, apart from an axiomatic solution, is the unique equilibrium of a standard, non-cooperative bargaining game[5]. In the academic literature, the Nash axiomatic approach is used widely in Labor Economics, to describe the wage determination in cases of negotiations between employers and labor unions.

[4] For a more detailed anaylsis see Binnmore *et al.* (1986).

[5] Osborne and Rubinstein (1990).

In recent years, in line with the growth of the modern bargaining theory, the axiomatic approach is also used in many Industrial Organization applications. In sections 4 and 4.2 we use the axiomatic approach to determine the equilibrium of a model of bargaining between vertically related firms.

2.3 Buyer Power

2.3.1 Definition

Buyer power is a rather controversial term in the academic literature, as it has been employed in a variety of ways in different contexts. There are numerous different definitions of buyer power. Some of them relate buyer power to monopsony power, countervailing power or bargaining power. While in all those definitions buyer power is treated as the market power that is exercised by buyers, the specific meaning of market power is different.

One approach inverts the definition of market power (on the side of the sellers) to refer to buyer power as the market power on the side of the buyers. The market power (monopoly power) is the ability of a firm to set prices above its marginal cost (in general above competitive levels). If this definition is inverted, buyer power could be defined as the ability of a buyer to set prices below competitive levels. Such a definition can be found in Noll (2005):

> Buyer power refers to the circumstances in which the demand side of a market is sufficiently concentrated that buyers can exercise market power over sellers. A buyer has market power if the buyer can force sellers to reduce price below the level that would emerge in a competitive market. This buyer power arises from monopsony or oligopsony and is the mirror image of monopoly or oligopoly.

In this definition, buyer power is treated as synonymous to monopsony power. As sellers may raise the market price by withholding supply, buyers may be able to reduce the market price for a product by withholding demand. However, the depression of the quantity that the buyers demand is not the only way that buyer power can be exercised. Broader definitions of buyer power relate it to additional notions, such as bargaining power, and specify alternative sources of buyer power apart from the depression of the quantity demanded by the buyers.

A definition of this sort, is the one proposed by OECD[6] :

> A retailer is defined to have buyer power if, in relation to at least one supplier, it can credibly threaten to impose a long term opportunity cost (i.e. harm or withheld benefit) which, were the threat carried out, would be significantly disproportionate to any resulting long term opportunity cost to itself. By disproportionate, we intend a difference in relative rather than absolute opportunity cost, e.g. Retailer A has buyer power over Supplier B if a decision to delist B's product could cause A's profit to decline by 0.1 percent and B's to decline by 10 percent.

According to this definition, buyer power is derived from a buyer's credible threat of harm or withholding of benefits. Contrary to the definition by Noll where buyer power was treated as synonymous to monopsony power, in OECD's definition buyer power is treated as bargaining power. What is different between the two notions is that while with monopsony power the buyer can obtain lower prices through the *act* of reducing the demanding quantity, with bargaining power lower prices are obtained through the *threat* of reducing the demanding quantity.

[6] OECD, Buyer Power of Large Scale Multiproduct Retailers, 6 (1998).

Clarke et al. (2002) offer a definition of buyer power which relates it to both bargaining power and monopsony power:

> Buyer power arises from the ability of retail firms to obtain from suppliers more favourable terms than those available to other buyers or those that would otherwise be expected under normal competitive conditions. Apart from the ability to extract discounts on transactions from suppliers, buyer power may manifest itself in the contractual obligations (as vertical restraints) which retailers may be able to place on suppliers.

In this definition , the existence of buyer power is specified not only by comparing the retailer's terms of trade with the competitive ones but also by comparing them with those of the other retailers. With the notion "terms of trade" we mean more than just the (wholesale) prices that a retailer pays to a supplier. As stated in section 2.1, the contracts signed between the suppliers and the retailers are often more complex and may include several restraints. The above definition also captures this fact.

Finally, Chen (2008)[7] offers a more thorough definition of buyer power:

> Buyer power is the ability of a buyer to reduce prices profitably below a supplier's normal selling price, or more generally the ability to obtain terms of supply more favourable than a supplier's normal terms. The normal selling price, in turn, is defined as the supplier's profit-maximizing price in the absence of buyer power. In the case where there is perfect competition among suppliers, the normal selling of a supplier is the competitive price, and the buyer power is monopsony power. On the other hand, in the

[7] Chen, Z. (2008). *Defining buyer power.*

case where competition among suppliers is imperfect, the normal selling price is above the competitive price, and the buyer power is countervailing power.

2.3.2 Sources of Buyer Power

Buyer power is often related to buyer's size. However, it is a common misperception that a buyer's size *per se* constitutes buyer power. In a setting where a seller and a buyer negotiate over the division of a pie, if the size of the buyer only increases the pie, the outcome of the negotiations is not affected by the buyer's size. In example, a supplier U that negotiates with two retailers R_1 and R_2 over the division of the respective profits v_1 and v_2 will obtain the same share if instead of R_1 and R_2 it negotiates with a single retailer R over the division of the profits $v = v_1 + v_2$, ceteris paribus. However, the ceteris paribus hypothesis does not always hold. In practice, the retailer's size affects the outcome of the negotiations by changing the outside options of both the upstream and the downstream firms.

Large retailers can more credibly threaten to search for alternative supply options or even attact entry of new suppliers by precommitting some of their purchases. In addition, a larger retailer size may be related to a larger retailer's range. In this case, if the retailer delists one of the products that it offers, it will keep selling other competing products. Thus, the impact on its profits from a failure in its negotiations with a supplier will be small, since the competing products will capture some of its lost sales. Buyer power is now derived from the fact that each supplier only accounts for a small fraction of the large retailer's total sales. This analysis can be applied to the large, one-stop retailers, who seem to have increased bargaining power against their suppliers.

It is also argued, that retailer's size may reduce the value of the supplier's alternative. Under some circumstances, a larger retailer can inflict a more-than-proportional loss on the supplier when they fail to reach an agreement. If a large retailer's contract is difficult to replace, when the supplier loses that contract and has to search for an alternative retailer to distribute a large volume, this may have a large impact on the price and the profits of the supplier. Moreover, large retailers in small local markets may act as *gatekeepers* when they face little or no competition since their suppliers have no alternative channels to distribute their products. In general, if a supplier can still access a market through an alternative channel, it can credibly refuse to sell to a retailer but if a large retailer has monopolized a large fraction of the market, the threat of the supplier is not credible.

2.3.3 Consequences of Buyer Power

The exercise of buyer power by powerful retailers in vertically related markets affects, apart from the terms of trade and the profits of the retailers and the suppliers, the final prices in the downstream market and thus the consumers' welfare. The competitive landscape at the retail level can also be altered when a powerfull retailer with buyer power is present. Furthermore, the existence of buyer power may result in retailer foreclosure or may affect the product variety and the incentives of the firms to invest and innovate. When we discuss the implications of buyer power it is important to consider both the vertical and the horizontal dimension. The bargaining power of a retailer relative to that of its supplier (vertical dimension) is of equal importance with the bargaining power of a retailer relative to that of its rival retailers (horizontal dimension).

A retailer's ability to negotiate discounts depends on its bargaining power

relative to both its suppliers and its rival retailers. In particular, the ability of one retailer to negotiate discounts from its suppliers can have positive or negative effects to the other retailers. It is possible that the presence of a powerful retailer with buyer power can have a positive effect on its rival retailers by helping them also to negotiate discounts. In this case, if the retailers are able to pass on these discounts to the consumers in the form of lower final prices, buyer power acts as socially beneficial *countervailing power*.

In contrast, it is also possible that a retailer with buyer power who negotiates discounts from its supplier may put the other retailers in a worse bargaining position. If a powerful retailer obtains a discount and this is passed on to its own customers in the form of lower consumer prices, a "virtuous circle" may occur: The lower consumer prices will lead to a further growth of the powerful retailer's sales who, having grown in size, may now negotiate greater discounts. This process, may result in lower retail prices for the rival retailers through an increased intensity of the competition at the retail level, especially when the retailers compete in prices. Another possibility is that if a powerful retailer negotiates more and more discounts, its supplier is, in order to remain in business, forced to make up for its lost profits by charging higher prices to the other retailers. In this case, the discount that is negotiated by a powerful retailer has a *waterbed effect* on the terms of trade of other less powerful retailers. Even if all retailers stay in the market and the quality and range of their final products remain unchanged, the consumers can still be harmed when the suppliers practice price discrimination. In addition, a waterbed effect may distort the competition in the retail market, as the already powerful retailer gets more advantageous terms and the costs of obtaining the intermediate good for its rivals increase.

However, it is not obvious how a waterbed effect works, that is, how this rebalancing of the terms of trade occurs. The intuitive view described above does not make precise why the supplier should now be able to charge higher prices to the other retailers and if this were possible previously why did not the supplier already tried it.

Recent economic literature[8] has provided some more consistent arguments in an attempt to theoretically explain the waterbed effect. One approach explains the waterbed effect through an adjustment of the upstream market structure that results from the existence of a powerful retailer at the downstream market that exercises buyer power. The increasing pressure on the margins of the suppliers triggers a consolidation in the upstream sector, as there will be a point at which their margins will be squeezed so much that it will not be profitable for all of them to continue operating. As fewer suppliers enter or as some drop out or merge with competitors, the upstream market becomes less competitive and thus the profits of the suppliers that are still present are restored. As a result the terms of trade of the less-powerful retailers will surely deteriorate. Regarding the powerful retailers, whose buyer power triggered the consolidation of the upstream sector, this approach expects that the discounts that they have extracted will overcome the deterioration of the terms of trade that results from the reduction of the competition upstream.

A second (more static) approach, explains the mechanism of the waterbed effect as a shift in market share away from less powerful retailers toward larger and more powerful retailers. The discounts that a powerful retailer obtains from its supplier will, to some extent, be passed on to consumers in the form of lower prices or better services. As a result, the larger retailer

[8] Majumdar (2005), Dobson & Inderst (2007), Inderst & Valletti (2008) and Dobson & Inderst (2008).

will now obtain a larger share of the final market while the market share of the smaller retailers will decline. This will be reflected in the terms of trade of both the powerful and the less powerful retailers. While the former can negotiate now additional size-related discounts, the latter will receive less advantageous terms as a result of the decreace in their market share. This of cource can trigger another round of adjustments in the downstream market, leading to even higher discounts for the powerful retailers and worse terms of trade for the small retailers.

3 Literature Review

3.1 Early literature: The Polar Case of Monopoly

Early literature concerning vertical contractual relations focuses on the polar case of monopoly, trying to explain the relationship between a manufacturer who contracts with a single retailer or with a group of retailers. The main explanation for the use of vertical restraints in contracts signed between the manufacturer and the retailers is the elimination of different externalities that arise under uniform wholesale pricing. Apart from explaining the reasons for the existence of vertical restraints, the literature also identifies the optimal contracts under various market conditions.

A theoretical basis for vertical restraints imposed by an upstream firm on downstream firms is set by Mathewson and Winter (1984). Their model consists of a manufacturer, who has some monopoly power, and a number of monopolistically competitive retailers. The retailers are spatially differentiated and provide consumers with pre-sales services such as information about the product through advertising it locally. Those characteristics of the market give rise to three types of externalities that render the wholesale price alone insufficient to coordinate the retailer's decisions with the manufacturers' interests. The vertical externality is known as the "double marginalization effect" that results in an increase of the retail price and reduces the advertising level. The horizontal externality among the retailers arises because an increase in the level of advertising from one retailer also increases the demand for the other retailers. The third one, the "horizontal pecuniary" externality, provides an incentive to the retailer not to raise his retail price, because the demand for the other retailers will also increase through the cross elasticity of demand. Vertical restraints are used as in-

struments to eliminate the effects of these externalities by bringing retailer's actions into line with the manufacturer's interests. Mathewson and Winter (1984) found that the manufacturer in this case will use a resale price floor coupled with a franchise fee to achieve profit maximization and neutralize the externalities.

Bolton and Bonanno (1988) on the other hand assumed that the retailers provide to the consumers either cum-sales or post-sales services or both. In that case there is no free riding effect because the consumers can benefit from the retailer's services only if they purchase the product from him, but inefficiency arises from the fact that the cum-sales or post-sales services alter the quality of the product. Although resale price maintenance and franchise fees are superior to the optimal linear contract from the point of view of the manufacturer, they are not equivalent to vertical integration. The optimal will be a more sophisticated contract that restricts the set of prices which can be chosen by the retailers (a price-dependent franchise fee) so that the manufacturer approximates the outcome of vertical integration by fixing the wholesale price. When the degree of product differentiation is small, resale price maintenance can be a good substitute for the optimal contract since such a contract might be very costly to enforce when the number of retailers is large.

Marvel and McCafferty (1984) provided a complementary explanation for the use of vertical restraints. They built a model of "quality certification" that explains the use of resale price maintenance for products that don't require tangible pre-sales services. In their model consumers also value the quality of the products but, in contrast to previous cases, the retailers cannot influence directly the product's quality. Retailers now serve as consumers' agents who select from a variety of items those that are most likely to sat-

isfy their customers' tastes. They certify the quality of the products they choose to offer by refusing to sell products whose quality levels fall below a "quality threshold". An externality arises now because the stocking of a product by a reputable retailer acts like a quality signal for the consumers who may purchase the product from another retailer. Under uniform pricing the manufacturer faces an adverse selection problem: Low-threshold retailers will drive high-threshold retailers out of the market and thus the product's image will be lowered. If the manufacturer wishes to "purchase" quality certification for his product, he must protect high-threshold retailers. Marvel and McCafferty found that even if the manufacturer can limit the retailers that stock his product through refusals to deal, he will also adopt a resale price floor.

Another explanation for the use of vertical restraints is the existence of uncertainty in the retail market. When there is uncertainty about the retailer's profits and the retailer is risk averse, the contract must provide both incentives and insurance to the retailer. Rey and Tirole (1986), comparing a policy that allows competition between the retailers with anticompetitive restraints such as resale price maintenance and exclusive territories, showed that in this case direct competition among the retailers may be more desirable than the vertical restraints. When there is no uncertainty, competition, resale price maintenance and exclusive territories together with a franchise fee lead to the same profits for the manufacturer and the retailer. However these policies are not equivalent in the presence of uncertainty about the final price of the product, the demand or the cost. Rey and Tirole also studied the efficiency of each policy in incentive provision, insurance provision and income transfer in the cases of demand and cost uncertainty. They found that under incomplete information the manufacturer may not want to im-

pose vertical restraints, since the policy that allows competition between the retailers is more efficient in providing insurance to the retailers when they are very risk averse. They also found that contrary to the case of full information resale price maintenance and exclusive territories are not substitutes when information is incomplete.

Winter (1993) demonstrates that the incentive for vertical restraints follows directly from three features of retail markets: The fact that retailers' services reduce consumers' time costs of obtaining the product, retailers' differentiation because of location and the time required for consumers to shop among stores, and consumers' heterogeneity in their opportunity costs of time. Retailers in Winter's model compete in prices and services so that each retailer selects its optimal mix of the two instruments to attract consumers both into the market and away from other retailers. Retailers in this case are biased against nonprice or service competition toward price competition because their target is consumers with low time costs who can switch between retailers. Simple contracts fail to coordinate the incentives of the retailers in the distribution of the product because the manufacturer's optimal mix of price and services is determined by the tastes of consumers on the margin of buying the product, while retailers' optimal mix is determined by the tastes of consumers on the margin of buying the product from them and not from other retailers. Since services are difficult to observe and enforce, manufacturers will impose territorial or price floor restraints.

3.2 Vertical Restraints and Upstream Competition

The effects of vertical restraints in the polar case of monopoly may differ from that in markets with more than one manufacturer. In this case apart from the externalities that arise in the competition between retailers, there are

also externalities across the manufacturers. Different types of contracts may have different effects on the competition between vertical chains. Therefore, manufacturers can use contracts in order to relax the competition between them. Literature is focused on settings with two competing vertical chains, but of course the results can be applied to the general case of more than two vertical chains.

One issue that concerned much of the literature on vertical contractual relations is the incentives of the suppliers to delegate the responsibility for selling their product to retailers. Bonanno and Vickers (1988) have shown that in a duopolistic market with two vertical chains and price competition in the retail level, vertical separation instead of vertical integration is preferred by both manufacturers. Along with a contract between manufacturer and retailer that includes franchise fees, vertical separation is the unique perfect equilibrium of a two stage game in which first manufacturers choose either vertical separation or integration and the wholesale prices that they will charge to the retailers, and then retailers and the manufacturers that chose integration compete in retail prices. Vertical separation is used as a method of commitment and combined with the appropriate contract it can be a profitable strategy for the manufacturer as it induces a more friendly behavior from the rival manufacturer. This result was generalized by Gal-Or (1990) for an n firm oligopoly. Under the assumptions that the retailers do not have private information, they have little or no bargaining power and they do not provide any other services (promotional etc) except from selling the products, she demonstrated that at the Bertrand equilibrium manufacturers prefer to be represented by retailers to sell their products. According to Gal-Or (1990), in a game in which first the manufacturers choose between integration and separation, then those that chose separation determine the

terms of trade with their retailers and finally the retailers and the manufacturers that chose to sell their product directly to the consumers compete in prices, the equilibrium will always be symmetric. For low contracting costs and with contracts that include non linear pricing (two part tariffs) all manufacturers will choose to sell their product to retailers. The reason is that the benefit of a single manufacturer to contract with a retailer is an increasing function of the number of manufacturers that will also choose to be represented by retailers.

A lot of work has been done in studying the impact of contracting with retailers on intrabrand and interbrand competition. Rey and Stiglitz (1995) examined the role of vertical restraints in the competition between vertical chains in a symmetric duopoly. Assuming asymmetric information between retailers and manufacturers, they compared contracts that include exclusive territories without franchise fees with contracts that include exclusive territories with franchise fees. Vertical restraints are used as a mechanism for reducing competition between the vertical chains and increasing the manufacturers' profits. The use of exclusive territories can increase the manufacturers' profits even if they don't charge franchise fees. Even though under certain conditions profits are higher without franchise fees, Rey and Stiglitz (1995) found that the dominant strategy for the firms is the contract with exclusive territories and franchise fees.

Gal Or (1991) investigated whether the use of vertical restraints is optimal in a duopolistic market assuming that the downstream firms compete a la Bertrand and that the only reason to employ restraints is double marginalization. Comparing two-part tariffs, resale price maintenance and linear pricing contracts she obtained the result that two part tariffs is the unique equilibrium of the game only if the producers are significantly differentiated.

Otherwise, for a region of intermediate levels of fixed costs and differentiation both two-part tariffs and linear pricing are equilibria. For high values of fixed costs and slight differentiation between products, linear pricing is the only equilibrium strategy as the manufacturers can benefit from the double marginalization that arises.

Contrarily to previous literature, Milliou et al. (2008) allow for price-quantity bundle contracts and they demonstrate that such contracts play a significant role as they maximize the vertical chains' joint profits, allow the upstream firms to extract all of them and alter downstream competition from Bertrand to Cournot. Firms prefer to compete a la Cournot since this way the competition is weaker and the profits are higher. In a model with endogenous contract types as in Milliou et al. (2008), firms can commit to choosing quantities instead of prices as their strategic variable through the contracts that they use to trade with. Price –quantity bundle contracts compared with wholesale price, two part tariffs and resale price maintenance contracts prevail in equilibrium in a model with two vertical chains, product differentiation and Bertrand competition in the retail level.

3.3 Vertical Bargaining

Another important issue that literature on vertical contractual relations is concerned with is the attempt to theoretically support the "countervailing power hypothesis" originally proposed by Galbraith (1952). The countervailing power of a retailer can be defined as the bargaining power that he has with respect to the supplier with whom he trades. According to Galbraith, large and powerful retail organizations by exercising countervailing power are able to lower the wholesale prices they pay to their suppliers and eventually to set lower retail prices, which benefit the consumers. Therefore

in this case countervailing power is socially desirable. Galbraith's argument was mainly criticized because it fails to explain what the retailers' incentives could possibly be to pass their cost savings to the consumers. However, in the recent years a growing dominance of large retail stores along with an increasing trend for mergers and acquisitions in the retail sector that have been observed, enhanced the interest in the countervailing power hypothesis.

When the contract terms between the upstream and the downstream firms are determined through bargaining, the presence of high concentration downstream may result in increased incentives for mergers upstream, so that the upstream firms increase their bargaining position. Horn and Wolinsky (1988) consider a model in which the wholesale prices are determined in simultaneous bargaining between each downstream firm and its supplier. This way, each downstream firm regards itself as marginal, assuming that all other firms bargain effectively with their suppliers. With this model, they examine how input prices and profits are affected by the structures of the upstream and the downstream industries, the relations between the final products and the nature of bargaining between suppliers and downstream firms, using the Nash axiomatic approach to model the bargaining. They found that the incentives for merger in the upstream sector are stronger when the downstream products are substitutes. What is more, when the upstream sector is monopolized and the final products are substitutes, the profits of a downstream monopoly are less than the total downstream industry's profits in the case of downstream oligopoly.

The main insight of the theoretical analysis on the countervailing power hypothesis is that an increase in the concentration at the retail level does not always lead to lower prices for consumers. Under certain conditions retail prices may rise or fall. The mode of competition in the retail sector is

one of the factors that determine the effects of the exercise of countervailing power. Von Ungern - Sternberg (1996) studied the anticipated results of the countervailing power theory in two models that differ in the mode of competition in the retail level. In the first, retailers compete a la Cournot while in the second they act as price takers. In both cases a monopolist supplier bargains with each retailer about his wholesale price. Von Ungern - Sternberg found that in both cases a decrease in the number of retailers leads to lower wholesale prices. In the case of perfect competition between the retailers this decrease in the wholesale price will result in a reduction in the retail price that the consumers pay. In the Cournot model however, the reduction of the number of retailers, apart from the decrease in the wholesale price, results also in a decline in the intensity of competition and eventually a rise in the retailer margin. The decrease in wholesale prices is not sufficient to offset the increase in retailer margins as the number of the retailers decreases. As a result, contrary to the predictions of the countervailing power theory, the retail price that the consumers pay will increase. Dobson and Waterson (1997) also studied how an increase in the concentration in the retail sector affects consumer prices. Their model also considers bargaining between a single supplier and oligopolistic retailers over the wholesale price. Contrary to von Ungern - Sternberg's model, the competition in the retail level is now of Bertrand type and the retailers are differentiated in the retail services that they provide to the consumers. The countervailing power hypothesis is confirmed only when the retailer services are very strong substitutes. When the degree of differentiation between the retailers is high, an increase in the market concentration results in a decrease in the supplier's bargaining power because of the decrease in his available alternatives, and in higher potential profits for the retailers. Thus, the supplier is able to increase his profits

since he can obtain "a reduced share of a larger cake". As a result the retailers' margins will increase due to higher wholesale prices and so will the retail prices. When the degree of differentiation is low, the increased retail concentration also results in a decrease in the suppliers' bargaining power but not in an increase of the retailers' selling power. The final prices will fall as a result of the decrease in the wholesale prices.

The theoretical analysis of both von Ungern – Sternberg (1996) and Dobson and Waterson (1997) was criticized by Chen (2003) whose model seems to depict better some features of the retail industry. While in the previous models all firms in the retail sector are assumed to be symmetric, in Chen's approach the retail sector consists of a dominant firm that faces a competitive fringe, capturing this way the polarization of store size that is observed. In addition, the countervailing power is now modeled not as a decrease in the number of the retailers but as the ability of the dominant retailer to extract an increased share of the joint profits through the bargaining with the manufacturer. Finally, in an attempt to capture the possibility of profit sharing between the retailer and the supplier, Chen allows for two part tariffs instead of linear pricing. Under these assumptions, he demonstrated that an increase in the amount of countervailing power indeed leads to lower retail prices for the consumers. Because of the exercise of countervailing power from the dominant retailer the supplier's share of the joint profits will be decreased. Trying to compensate for the decrease in his profits, the supplier will lower the wholesale price for the fringe retailers. As a result, there will be a shift in the supply curve to the right which will lead to lower retail prices. The presence of fringe retailers is crucial in Chen's model in ensuring that the increase in countervailing power will result in lower prices for the consumers. Another important finding is the fact that while countervailing power is ben-

eficial for the consumers' welfare, its effect on the total surplus is ambiguous. Total surplus is more likely to be increased with the countervailing power when there is a large number of fringe firms.

Finally, Iozzi and Valletti (2010) examine the countervailing power theory building a model in which an upstream supplier bargains separately and simultaneously with many differentiated competing retailers. Firms play a two-stage game: At the first stage each downstream firm bargains with the upstream supplier over the wholesale price of an input and at the second stage the downstream firms compete in the final good market. The authors study both the cases of Cournot and Bertrand competition. They suggest two modeling options for the behaviour of the rival downstream firms in case one firm does not reach an agreement with the upstream supplier: In the "Reaction" scenario, the breakdown of the negotiations between the upstream supplier and a downstream firms is observed by the rival firms who react at the second stage by making their optimal choices being aware of the absence of one firm. In the "No Reaction" scenario, the breakdown of the negotiations between one downstream firm and the upstream supplier is not observed by the rival downstream firms who now make their optimal choices at the second stage as if all of the firms were present. The modeling choice changes, sometimes dramatically, the way in which the downstream market parameters affect the input prices and the market equilibrium. In particular, even though in the case of Cournot competition they didn't find support for the countervailing power hypothesis, in the case of Bertrand competition the existence of countervailing power depends on the degree of substitutability between the final goods and on the ability of downstream firms to react when the bargaining between the upstream supplier and one downstream firm fails.

4 The Model

4.1 Description of the model

We consider a vertically related industry with one upstream and two downstream firms. The upstream supplier, denoted by U, produces an intermediate good at a cost that is normalized to zero, which is sold to two downstream competing firms denoted by $D_i,\ i = 1, 2$. Each downstream firm has an exclusive relationship with the upstream supplier, which means that the downstream firms have no alternative choice of obtaining the intermediate good. Downstream firms use this intermediate good as an input to produce differentiated goods that they sell to final consumers. The downstream firms operate using a 1:1 technology. This means that the transformation technology is such that one unit of the intermediate good (input) is transformed to one unit of final good (output). As a result, the demand for the intermediate good can be derived directly from the demand for the final good. We assume that the downstream firms incur a "retailing" cost $c_i,\ i = 1, 2$ that is different between D_1 and D_2. This difference in the retailing costs between the two firms renders the firm with the lower cost more efficient than the other firm in the production of the final good. In order to obtain the intermediate good, each downstream firm pays a linear input price $w_i, i = 1, 2$ to the upstream supplier. Later we will also consider non-linear pricing schemes, where apart from a wholesale price w_i the downstream firms also pay a franchise fee F_i to the upstream supplier in order to acquire the right to buy the intermediate good. The choice between the two pricing schemes is exogenous and is not part of the bargaining procedure. The contract terms on the other hand, are determined through simultaneous bargaining between the upstream supplier and each downstream retailer. The bargaining process is depicted as a Nash

bargaining problem, as the one described in section 2.2.

Each downstream firm D_i faces the following linear inverse demand function for its final product:

$$p_i = a - q_i - \gamma q_j \ , \ i, j = 1, 2 \ \ i \neq j, \ 0 \leq \gamma \leq 1 \tag{3}$$

where p_i and q_i are respectively the quantity and the price of firm D_i's final product. This inverse demand function is twice continuously differentiable and strictly decreasing when positive. It is derived from the quasi-linear quadratic utility function of the representative consumer:

$$U = aq_i - \frac{1}{2}\left(q_i^2 + 2\gamma q_i q_j\right) + I \ , \ for \ i = 1, 2 \ , \ i \neq j \tag{4}$$

where I denotes the consumption of all other goods. The parameter γ denotes the degree of product substitutability. The higher is γ, the closer substitutes the differentiated products of the downstream firms are. When $\gamma = 0$ the final goods that the downstream firms produce are independent, while when $\gamma = 1$ the final goods are homogeneous.

Firms play a two-stage game with observable actions. At the first stage the upstream supplier negotiates separately with each downstream firm D_i over the contract terms (w_i in the linear pricing case and (w_i, F_i) in the nonlinear pricing case). At the second stage the downstream firms observe the outcomes of the first stage and compete in quantities (Cournot competition). The fist-stage negotiations are conducted simultaneously so that, during bargaining, each bargaining pair treat the other pair's input prices as given. We assume that both the upstream supplier and the downstream firms have some power over setting the terms of the vertical contracts. In particular, we assume that the bargaining power of the upstream supplier is

β and of each downstream firm $1-\beta$, with $0 \leq \beta \leq 1$.

Following Iozzi and Valletti (2010), we introduce two possible scenarios concerning the disagreement payoffs of the upstream supplier. When the negotiations between the upstream supplier and one of the downstream firms break down the former can still sell the intermediate good to the other downstream firm. The determination of the disagreement payoffs of the upstream supplier depends on the definition of the behavior of the other downstream firm in the case of disagreement. In the "No Reaction" scenario, the breakdown of the negotiations between the upstream supplier and one of the downstream firms is not observed by the rival downstream firm. Therefore, the rival downstream firm does not readjust its anticipated optimal choice of the second stage but keeps acting as if the other firm was present. In the "Reaction" scenario, the rival downstream firm observes the breakdown of the negotiations between the upstream and the other downstream firm, and reacts by making its optimal choice taking into account that it is now a monopolist in the dowstream market. The modeling choice of the outside option can change the way that the parameters of the problem (the retailing cost c_i , the bargaining power β or the substitutability degree γ) affect the equilibrium outcomes in both the cases of linear and non-linear pricing.

4.2 Equilibrium

At the first stage of the game each bargaining unit makes its optimal choice having full knowledge of the other unit's actions at the second stage. In other words, each firm knows exactly what the other firm will choose in the second stage when it makes its optimal choice at the first stage. In other words there is common knowledge in the game. Every player knows not only the optimal choices of the other player in every subgame but also knows that

the other player has the same knowledge and that the other player knows about it, and so on. To solve for the equilibrium of the two-stage game we follow the process of backward induction. First, we determine the optimal strategy of the player who makes the last move of the game. Then, the optimal action of the next-to-last moving player is determined taking the last player's action as given. The process continues in this way backwards in time until all players' actions have been determined. This way, we derive the subgame perfect Nash equilibria of the two-stage game.

At the last stage of the game the two retailers compete in quantities. In such a duopoly, where the firms compete a la Cournot, each firm sets its final quantity to maximize $\Pi_{D_i} = (p_i - c_i - w_i)\, q_i$, where p_i is given by (3), taking the rival firm's optimal choice as given. Therefore, each downstream firm's maximization problem is:

$$\max_{q_i} \Pi_{D_i} = (a - q_i - \gamma q_j - w_i - c_i)\, q_i \tag{5}$$

Maximizing (5) we obtain the system of reaction functions for the downstream firms:

$$q_i(q_j) = \frac{1}{2}\,(a - c_i - w_i - \gamma q_j) \tag{6}$$

Each firm's reaction function depicts the firm's optimal choice depending on the choice of the rival firm. It is obvious that a decrease in the wholesale price charged to D_i shifts its reaction function upwards and makes it more aggressive in the final goods market. The Cournot - Nash equlibrium occurs when each firm's choice maximizes its profits given the choice of the rival firm. Solving the system of reaction functions we obtain the Cournot equilibrium quantities:

$$q_i^c = \frac{a\,(2 - \gamma) - 2\,(c_i + w_i) + \gamma\,(c_j + w_j)}{4 - \gamma^2} \tag{7}$$

Now we can determine each firm's payoffs in the first stage of the game. At the first stage the upstream supplier forms a separate unit with each of the downstream firms and bargain simultaneously over the contract terms. If the upstream supplier and the downstream firm reach an agreement, the payoffs of the upstream supplier will be $\Pi^u = w_i q_i^c + w_j q_j^c$, while each downstream firm's payoffs will be $\Pi_{D_i} = (q_i^c)^2$, which results if we substitute in (5) the Cournot equilibrium quantities.

4.3 Linear Pricing

In the case of linear pricing each downstream firm pays only a linear wholesale price w_i to the upstream supplier in order to purchase the intermediate good. At the first stage the upstream supplier and each downstream firm form a separate bargaining unit and set w_i to maximize the following Nash product:

$$\max_{w_i} N_i^L = [\Pi^u(w_i, w_j) - \Pi_i^o(w_i, w_j)]^\beta [\Pi_{D_i}(w_i, w_j)]^{1-\beta} \tag{8}$$

where $\Pi^u(w_i, w_j)$ and $\Pi_{D_i}(w_i, w_j)$ are the anticipated payoffs in the case of agreement for the upstream supplier and each downstream firm , $\Pi_i^o(w_i, w_j)$ are the upstream supplier's anticipated payoffs in the case of disagreement between U and D_i and $\beta \in [0,1]$ denotes the bargaining power of the upstream firm relative to that of the downstream firm. If the negotiations between U and D_i break down , D_i has no alternative source of buying the intermediate good, so its disagreement payoffs are always zero. On the other hand, U will still be selling to D_j, so its disagreement payoffs are $\Pi_i^o = w_j \bar{q}_j$, denoting by $\bar{q}_j$ the quantity that U will now sell to D_j. In case of agreement between U and D_i, the upstream supplier's payoffs will be $\Pi^u = w_i q_i + w_j q_j$. The first

order condition for the maximization of (8) can be expressed as:

$$\frac{\beta}{(1-\beta)}\frac{\Pi_{D_i}(w_i,w_j)}{\Pi^u(w_i,w_j)-\Pi_i^o(w_i,w_j)}=-\frac{\partial\Pi_{D_i}(w_i,w_j)/\partial w_i}{\partial\Pi^u(w_i,w_j)/\partial w_i-\partial\Pi_i^o(w_i,w_j)/\partial w_i} \tag{9}$$

4.3.1 No Reaction

In case of disagreement between the upstream supplier and the downstream firm i, D_i has no alternative source of buying the intermediate good and thus it cannot sell anything in the downstream market. On the other hand, the upstream firm can still sell the intermediate good to the other downstream firm D_j. In the No Reaction case, downstream firm j will not observe the breakdown of the negotiations between the upstream supplier and the rival downstream firm, and will keep selling $q_j = q_j^c$, which is given by (7). In other words, D_j will keep acting as a duopolist, even though it has achieved a monopoly position in the downstream market. The outside option of the upstream supplier in this case will be $\Pi_i^o = w_j q_j^c$, and takes the form:

$$\Pi_i^o = \frac{w_j[a(2-\gamma)+\gamma(c_i+w_i)-2(c_j+w_j)]}{4-\gamma^2} \tag{10}$$

In case of agreement between the upstream supplier and the downstream firms the agreement payoffs will be:

$$\Pi^u = \frac{\gamma[c_j w_i + w_j(c_i+2w_i)]-2[w_i(c_i+w_i)+w_j(c_j+w_j)]+a(2-\gamma)(w_i+w_j)}{4-\gamma^2} \tag{11}$$

for the upstream supplier, and

$$\Pi_{D_i} = \frac{\left(a\left(2-\gamma\right)-2\left(c_i+w_i\right)+\gamma\left(c_j+w_j\right)\right)^2}{\left(4-\gamma^2\right)^2} \tag{12}$$

for each downstream firm.

To solve for the equilibrium wholesale prices, we substitute the values of Π_i^o, Π^u and Π_{D_i} in (9). The system of reaction functions that results is:

$$w_i\left(w_j\right) = \frac{\beta}{2}\left(a\left(2-\gamma\right) + \gamma\left(c_j + w_j\right) - 2c_i\right) \tag{13}$$

Solving the system (13) for w_i we obtain the equilibrium wholesale price :

$$w_i^{nr} = \frac{\beta\left[a\left(2-\gamma\right)\left(4+\beta\gamma\right) + 2\gamma c_j\left(2-\beta\right) - c_i\left(8-\beta\gamma^2\right)\right]}{\left(4+\beta\gamma\right)\left(4-\beta\gamma\right)} \tag{14}$$

Proposition 1 *When the trading form between of the upstream supplier and the downstream firms consists of a linear wholesale price and there is No Reaction to the breakdown of the negotiations, the wholesale price of the intermediate good is given by (14) and is decreasing in c_i and increasing in c_j for all a, β, γ.*

The quantities that the downstream firms will finally choose take the form:

$$q_i^{nr} = \frac{2(2-\beta)[a(2-\gamma)(4+\beta\gamma) + 2\gamma(2-\beta)c_j - (8-\beta\gamma^2)c_i]}{(4-\gamma^2)(16-\beta^2\gamma^2)} \tag{15}$$

and the corresponding prices for the consumers are:

$$p_i^{nr} = \frac{a(2-\gamma)(4+\beta\gamma)(4+\beta(2-\gamma^2)) - 2(2-\beta)(c_i(8-\gamma^2(4-\beta)) + c_j\gamma(4+2\beta-\beta\gamma^2))}{(4-\gamma^2)(16-\beta^2\gamma^2)} \tag{16}$$

4.3.2 Reaction

In the Reaction case, the breakdown of the negotiations between the upstream supplier and the downstream firm i is observed by the rival down-

stream firm j, who realizes that it has achieved a monopoly position in the downstream market. Thus its optimal quantity will now be the monopoly quantitiy $q_j^m = \frac{a-w_j-c_j}{2}$. The payoffs of the upstream and the downstream firms in the case of agreement will be the same as in the No Reaction case, given by equations (11) and (12). The outside option of the downstream firms will still be zero since in the case of disagreement between the upstream supplier and any of the downstream firm, the downstream firms have no alternative source of buying the intermediate good. The difference in this case concerns the upstream supplier's outside option. If U disagrees with D_i, it will sell only to D_j, but now D_j's demand for the intermediate good is q_j^m. Therefore, the upstream supplier's outside option is now $\Pi^o = w_j q_j^m$, and takes the form:

$$\Pi_i^o = \frac{w_j(a - c_j - w_j)}{2} \tag{17}$$

Substituting in (9) the values of Π^u, Π_{D_i} and Π_i^o , given by (11), (12) and (17) respectively we obtain the system of reaction functions:

$$w_i(w_j) = \frac{1}{4}\left(a\beta\left(2-\gamma\right) - 2\beta c_i + \beta\gamma c_j + 2\gamma w_j\right) \tag{18}$$

The equilibrium wholesale price that results from the solution of the system (18) is:

$$w_i^r = \frac{\beta\left(a - c_i\right)}{2} \tag{19}$$

The equilibrium wholesale price in the Reaction case depends only on c_i. This obviously results from the fact that q_j^m depends on c_j and w_j but not on c_i or w_i. Also, the degree of product differentiation γ plays no role in the determination of the wholesale price in this case.

Proposition 2 *When the trading form between of the upstream supplier and*

the downstream firms consists of a linear wholesale price and there is Reaction to the breakdown of the negotiations, the wholesale price of the intermediate good is given by (19) and is decreasing in c_i but is independent of c_j and γ for all a, β.

The Cournot equilibrium quantities will now take the form:

$$q_i^r = \frac{(2-\beta)(a(2-\gamma) - 2c_i + \gamma c_j)}{2(4-\gamma^2)} \tag{20}$$

and the final prices will be:

$$p_i^r = \frac{a(2-\gamma)(2+\beta(1+\gamma)) + (2-\beta)((2-\gamma^2)c_i + \gamma c_j)}{2(4-\gamma^2)} \tag{21}$$

4.4 Non - Linear Pricing

We now assume that the contracts between the upstream supplier and each retailer take the form of two-part tariffs. Each retailer D_i apart from the wholesale price w_i pays now an additional fixed fee F_i to the supplier in order to purchase the intermediate good. At the first stage of the game the upstream supplier U and each downstream retailer D_i form a separate bargaining unit and negotiate over the terms of the two-part tariffs contract (w_i, F_i) ,taking the outcome of the simultaneously-run negotiations of the other bargaining unit (U, D_j) as given. In case of agreement between U and D_i, the upstream supplier's payoffs are $\Pi^u(w_{i,}w_j) + F_i + F_j$, where Π^u are the upstream firm's gross profits: $\Pi^u = w_i q_i + w_j q_j$. The downstream retailer's agreement payoffs are $\Pi_{D_i}(w_i, w_j) - F_i$, where $\Pi_{D_i}(w_i, w_j)$ are the downstream firm's gross profits. If the negotiations between U and D_i break down , D_i has no alternative source of buying the intermediate good, so its disagreement payoffs are zero. On the other hand, U will still be selling to

D_j, so its disagreement payoffs are $\Pi_i^o + F_j$, where $\Pi_i^o = w_j \bar{q}_j$, denoting by $\bar{q}_j$ the quantity that U will now sell to D_j. Given the above, at the first stage of the game the bargaining unit (U, D_i) will set (w_i, F_i) to maximize the following Nash product:

$$\max_{w_i, F_i} N_i = \left[\Pi^u(w_i, w_j) + F_i + F_j - \Pi_i^o(w_i, w_j) - F_j\right]^{\beta} \left[\Pi_{D_i}(w_i, w_j) - F_i\right]^{(1-\beta)} \tag{22}$$

which obviously reduces to:

$$\max_{w_i, F_i} N_i = \left[\Pi^u(w_i, w_j) + F_i - \Pi_i^o(w_i, w_j)\right]^{\beta} \left[\Pi_{D_i}(w_i, w_j) - F_i\right]^{(1-\beta)} \tag{23}$$

The existence of the fixed fee F_i in the contract allows the joint surplus of each bargaining unit to be maximized given the other unit's optimal bargaining outcome. The two-part tariff contract is bilaterally efficient due to the existence of an upstream transfer through the fixed fee. Maximizing (23) with respect to F_i we obtain:

$$F_i = \beta \Pi_{D_i}(w_i, w_j) - (1-\beta)\left[\Pi^u(w_i, w_j) - \Pi_i^o(w_i, w_j)\right] \tag{24}$$

and substituting in (23) we obtain:

$$\max_{w_i} \left[\beta^{\beta}(1-\beta)^{(1-\beta)} \left[\Pi_{D_i}(w_i, w_j) + \Pi^u(w_i, w_j) - \Pi_i^o(w_i, w_j)\right]\right] \tag{25}$$

Therefore, w_i is chosen to maximize the bargaining unit's joint surplus:

$$\max_{w_i} \left[\Pi_{D_i}(w_i, w_j) + \Pi^u(w_i, w_j) - \Pi_i^o(w_i, w_j)\right] \tag{26}$$

The first order condition for the maximization of (26) is:

$$\frac{\partial \Pi_{D_i}(w_i,w_j)}{\partial w_i} + \frac{\partial \Pi^u(w_i,w_j)}{\partial w_i} - \frac{\partial \Pi_i^o(w_i,w_j)}{\partial w_i} = 0 \tag{27}$$

At the second stage of the game, downstream firms compete in quantities. The agreement payoffs of the upstream and the downstream firms will be respectively $\Pi^u(w_i,w_j) = w_i q_i^c + w_j q_j^c$ and $\Pi_{D_i}(w_i,w_j) = (q_i^c)^2$, where q_i^c is :

$$q_i^c = \frac{a(2-\gamma) - 2(c_i+w_i) + \gamma(c_j+w_j)}{4-\gamma^2} \ , \ for\ i,j = 1,2 \ \ i \neq j \tag{28}$$

as in the previous sections.

As we did before, we assume two possible scenarios (Reaction, No Reaction) concerning the upstream firm's outside option.

4.4.1 No Reaction

In the case of disagreement between the upstream supplier and one of the downstream firms, the rival downstream firm does not readjust its expected Cournot quantity of the second stage. The outside option of the upstream supplier in this case will be $\Pi_i^o = w_j q_j^c$, given by (10). To solve for the equilibrium wholesale price of the intermediate good now we substitute in (27) the values of Π^u , $\Pi_{D_i}$and Π_i^o given by (11) , (12) and (10) respectively. The resulting system of reaction functions is :

$$w_i(w_j) = \frac{\gamma^2(\alpha(2-\gamma) - 2c_i + \gamma(c_j+w_j))}{4(\gamma^2-2)} \tag{29}$$

Solving the system (29) for w_i we obtain the equilibrium wholesale price:

$$w_i^{nr} = \frac{\gamma^2(c_i(4-\gamma^2) - 2\gamma c_j - a(4-2\gamma-\gamma^2))}{16-12\gamma^2+\gamma^4} \tag{30}$$

To solve for the franchise fee F_i we must calculate the equilibrium payoffs $\Pi_{D_i}\left(w_i^{nr}, w_j^{nr}\right), \Pi^u\left(w_i^{nr}, w_j^{nr}\right)$ and $\Pi_i^o\left(w_i^{nr}, w_j^{nr}\right)$ and substitute in (24). The resulting equilibrium F_i is :

$$F_i^{nr} = \frac{2\left(2\beta + \gamma^2\left(1-\beta\right)\right)\left(a(4-\gamma(2+\gamma)) + \gamma(2c_j + \gamma c_i) - 4c_i\right)^2}{\left(16 - 12\gamma^2 + \gamma^4\right)^2} \tag{31}$$

Proposition 3 *When the contracts between the upstream supplier and the downstream firms take the form of two-part tariffs and there is No Reaction to the breakdown of the negotiations the contract terms are given by (30) and (31). The wholesale price w_i^{nr} is increasing in c_i and decreasing in c_j for all a, γ.*

The Cournot equilibrium quantities will now take the form:

$$q_i^{nr} = \frac{2a - c_i - c_j}{4 - \gamma(2-\gamma)} + \frac{c_j - c_i}{4 - \gamma(2+\gamma)} \tag{32}$$

and the final prices will be:

$$p_i^{nr} = \frac{a(2-\gamma^2)(4-\gamma(2+\gamma)) + 8c_i - 2\gamma(3\gamma c_i - (2-\gamma^2)c_j)}{16 - 12\gamma^2 + \gamma^4} \tag{33}$$

4.4.2 Reaction

In the case of agreement between the upstream supplier and the downstream firms, the payoffs of both the upstream and the downstream firms will be the same as in the previous cases. In the event of a breakdown of the negotiations between the upstream supplier and one of the downstream firms, the rival firm now takes into account the absense of the other firm and readjusts its expected Cournot equilibrium quantity of the second stage. If U and D_i cannot reach an agreement, D_j will be a monopolist in the

downstream sector, and thus its optimal quantity will be $q_j^m = \frac{a-w_j-c_j}{2}$. The upstream firm's outside option will be $\Pi_i^o = w_j q_j^m$ as in 4.1.2 section and is given by (17). The system of reaction functions that is now obtained by substituting in (27) the values of Π^u , $\Pi_{D_i}$and Π_i^o given by (11) , (12) and (17) respectively, is

$$w_i = \frac{\gamma[\gamma^2(a - c_j - 2w_j) + 4w_j - 2(a - c_i)]}{4(2 - \gamma^2)} \tag{34}$$

The equilibrium wholesale price of the intermediate good that results from the solution of (34) is :

$$w_i^r = \frac{\gamma^2 (a - c_i)}{2 (\gamma^2 - 2)} \tag{35}$$

and the resulting frachise fee F_i is :

$$F_i^r = \frac{(2c_i - \gamma c_j - a (2 - \gamma))^2(\gamma^2 (\beta - 1) - 2\beta)}{8 (2 - \gamma^2)^2} \tag{36}$$

Proposition 4 *When the contracts between the upstream supplier and the downstream firms take the form of two-part tariffs and there is Reaction to the breakdown of the negotiations, the contract terms are given by (35) and (36).*

The Cournot equilibrium quantities will now take the form:

$$q_i^r = \frac{a(2 - \gamma) - 2c_i + \gamma c_j}{2(2 - \gamma^2)} \tag{37}$$

and the final prices will be:

$$p_i^r = \frac{a(2 - \gamma (1 + \gamma)) + (2 - \gamma^2)c_i + \gamma c_j}{2(2 - \gamma^2)} \tag{38}$$

4.5 Results

The second model that we used, where we assumed that the contracts between the upstream supplier and the downstream firms take the form of two-part tariffs, seems to depict more accurately the reality in such markets. For instance, one should expect that the more efficient downstream firm would negotiate more favourable contract terms than the other firm. Indeed, it can be easily shown that in the case of non-linear pricing the downstream firm with the lowest marginal cost is the one that gets the lowest wholesale price. Using equations (30) for the "No Reaction" and (35) for the "Reaction" scenario we obtain :

$$w_i^{nr} - w_j^{nr} = \left(\frac{\gamma^2(4 - 2\gamma - \gamma^2)}{16 - 12\gamma^2 - \gamma^4} \right) (c_i - c_j) \tag{39}$$

and

$$w_i^r - w_j^r = \frac{\gamma^2}{2(2 - \gamma^2)} (c_i - c_j) \tag{40}$$

respectively. The relation between $(w_i - w_j)$ and $(c_i - c_j)$ is positive in both the cases of Reaction and No Reaction.

Proposition 5 *When the downstream firms differ in their own efficiency and the contracts between the downstream firms and the upstream supplier take the form of two-part tariffs, the more efficient firm pays a lower wholesale price in both the cases of Reaction and No Reaction to the breakdown of the negotiations.*

Moreover, in the case of non-linear pricing, a further growth of a downstream firm will result in a decrease in its negotiated wholesale price. As one firm in the downstream sector becomes increasingly efficient, a further reduction in its marginal retailing cost c_i will result in more favourable con-

tract terms for this firm in both the cases of "No Reaction" and "Reaction". It is easily shown from equations (30) and (35) that:

$$\frac{\partial w_i^{nr}}{\partial c_i} = \frac{\gamma^2(4-\gamma^2)}{16-12\gamma^2+\gamma^4} \tag{41}$$

and

$$\frac{\partial w_i^{r}}{\partial c_i} = \frac{\gamma^2}{2(2-\gamma^2)} \tag{42}$$

which are both always positive since $0 \leq \gamma \leq 1$. While in the case of "Reaction" each firm's wholesale price is independent of the other firm's marginal retailing cost, in the case of "No Reaction" a decrease in c_i will result not only in a decrease in the firm's equilibrium wholesale price w_i^{nr}, but also in an increase in the rival donwstream firm's equilibrium wholesale price w_j^{nr}. From equation (30) we obtain:

$$\frac{\partial w_j^{nr}}{\partial c_i} = -\frac{2\gamma^3}{16-12\gamma^2+\gamma^4} \tag{43}$$

which is negative for every $\gamma \in [0,1]$.

Proposition 6 *When the contracts between the upstream supplier and the downstream firms take the form of two-part tariffs, and there is No Reaction to a breakdown of the negotiations, a decrease in one downstream firm's retailing cost will result in a decrease in its own equilibrium wholesale price and in an increase in the rival downstream firm's equilibrium wholesale price.*

In other words, an increase in a downstream firm's efficiency, apart from a discount in its own terms of trade has a waterbed effect on its rival firm's terms of trade. A decrease in a downstream firm's retailing cost acts just like an increase in the firm's buyer power. A growing firm that is becoming

more and more efficient can negotiate better contract terms than a firm that is less efficient in the production of the final good.

Furthermore, it can be shown that a decrease in a downstream firm's retailing cost will have as a result the consumer prices to fall. As we have shown earlier, the equilibrium final prices in the nonlinear pricing case are given by

$$p_i^{nr} = \frac{a(2-\gamma^2)(4-\gamma(2+\gamma)) + 8c_i - 2\gamma(3\gamma c_i - (2-\gamma^2)c_j)}{16 - 12\gamma^2 + \gamma^4} \tag{44}$$

in the "No Reaction" case and

$$p_i^{r} = \frac{a(2-\gamma\,(1+\gamma)) + (2-\gamma^2)c_i + \gamma c_j}{2(2-\gamma^2)} \tag{45}$$

in the "Reaction" case. It is easily shown that in the case of "No Reaction" the effect of a dicrease in the retailing cost of downstream firm i on the equilibrium final prices is given by:

$$\frac{\partial p_i^{nr}}{\partial c_i} = \frac{8 - 6\gamma^2}{16 - 12\gamma^2 + \gamma^4} \tag{46}$$

and

$$\frac{\partial p_j^{nr}}{\partial c_i} = \frac{2\gamma(2-\gamma^2)}{16 - 12\gamma^2 + \gamma^4} \tag{47}$$

while in the "Reaction" case this effect is given by:

$$\frac{\partial p_i^{r}}{\partial c_i} = \frac{1}{2} \tag{48}$$

and

$$\frac{\partial p_j^{r}}{\partial c_i} = \frac{\gamma}{2(2-\gamma^2)} \tag{49}$$

Therefore, in both cases, when a downstream firm becomes more efficient in the production of the final good, both final prices go down.

Proposition 7 *When the contracts between the upstream supplier and the downstream firms take the form of two-part tariffs, an increase in the efficiency of a retailer has a positive effect on all the final prices.*

5 Conclusions

In vertically related markets, where the contract terms between the suppliers and the retailers are determined through bargaining, it is often assumed that large and powerful retailers can negotiate better contract terms than their smaller and less powerful competitors. In this research we examine a case where the powerful retailer is more efficient in the production of the final good. In other words, the powerful retailer has lower (marginal) retailing cost than its rival competitor.

As Iozzi and Valletti (2010) have shown, the modelling choice of the disagreement payoffs of the upstream supplier, can change, sometimes dramatically, the equilibrium values of the contract terms as well as those of the final prices and quantities of the downstream market. When the contracts between the upstream supplier and the downstream retailers take the form of two-part tariffs, the most efficient retailer is the one that can negotiate better contract terms. Furthermore, the more efficient a retailer becomes in the production of the final good, the more favourable contract terms it can negotiate. In the case that there is reaction in the breakdown of the negotiations between the upstream supplier and one of the retailers, each firm's equilibrium wholesale price is independent of the other firm's retailing cost. On the other hand, in the case of no reaction, each firm's equilibrium negotiated wholesale price is inversely related to the other firm's retailing cost. In other words, when one firm becomes more efficient in the production of the final good, not only it can negotiate better contract terms for itself, but also the contract terms of the rival firm deteriorate.

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