08/23

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WORKING PAPER

Business-to-Business Negotiations with Outside Options

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SNF Working Paper No. 08/23

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SNF Project No. 10052:
Media competition and media policy

The project is financed by the Research Council of Norway

CENTRE FOR APPLIED RESEARCH AT NHH
BERGEN, AUGUST 2023
ISSN 2704-0380 (Online)

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Abstract

This paper considers price negotiations between content providers and media distributors. The starting point is the observation that major content providers offer a range of products, some of which are hard to replace for distributors. For other products offered by the same content providers there may exist alternatives (outside options) for the distributors. We consider a bilateral bargaining framework where one content provider and one distributor negotiate over linear wholesale prices for two media products. The distributor has a threat to execute an outside option for one of the products. In contrast to the case with a single-good content provider, the distribution of bargaining power affects wholesale prices also when the outside option is binding. The higher the distributor's bargaining weight in the outside option, the lower the wholesale prices for both products. Remarkably, we find that, other things equal, the wholesale prices are identical for both products, even though an outside option only exists for one of them. Gains for the distributor from threatening to use its outside option decreases in its own bargaining weight.

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1 Introduction

Most firms offer multiple products. In media markets, companies such as The Walt Disney Company offers a wide variety of products, some of which are unique while others are more generic.[1] In the multichannel TV market, certain content providers offer channels with strong brand names that cable TV and broadband distributors lack alternatives for. An example of this is Disney's ESPN (sports) channel [2] and Paramount's flagship CBS [3], the most-watched US network with rights to major sports including the National Football League.[4] However, these same firms also offer content for which a distributor may have, or easily can develop, alternatives (commonly labelled outside options). This gives the distributor an additional bargaining chip when negotiating wholesale prices with content providers.

In this paper, we extend the existing literature on business-to-business (B2B) negotiations by explicitly taking into account the existence of outside options in a multi-product setting. We analyze how these outside options affect bargaining over wholesale prices. Among the research questions we focus on is whether an upstream firm, when confronted with a downstream firm threatening to exercise an outside option, should employ a tying strategy. This strategy entails the downstream firm being obligated to either purchase the complete range of products offered by the supplier or abstain from making any purchases at all. If the upstream firm chooses not to employ a tying strategy, which wholesale prices should it advocate for in a B2B negotiation? More to the point, how should it price products where the downstream firm has good outside options compared to products where outside options are poor (expensive to exercise)? And fundamentally, will there actually be any negotiations over wholesale prices if the downstream firm can credibly threaten to execute an outside option?

At least since the seminal paper of Katz (1987), it has been recognized that the

[1] https://thewaltdisneycompany.com/about/#our-businesses

[2] See https://www.latimes.com/entertainment-arts/business/story/2021-12-17/youtube-tv-loses-espn-abc-and-other-disney-channels-in-fee-dispute

[3] See https://www.cbs.com/live-tv/stream/tveverywhere/

[4] See https://www.latimes.com/entertainment/envelope/cotown/la-et-ct-cbs-time-warner-cable-20130718-story.html

presence of credible outside options may compel suppliers to agree on lower wholesale prices than they otherwise would. Typically, the execution of outside options involves significant fixed costs, such as investment in marketing and product development.[5] In the multichannel TV market Doudchenko and Yurukoglu (2016) find empirical support for Katz (1987) outside option mechanism.

In his formal model, Katz (1987) considers a framework where an upstream firm provides a single product through a take-it-or-leave-it contract. O'Brien (2014) extends this analysis by introducing a bargaining framework while retaining the assumption that the upstream firm offers a single product. He demonstrates that if the outside option for the single product is binding, the outcome will be the same as in Katz (1987): the wholesale price is determined directly from the value of the outside option and is independent of the distribution of the distribution of the bargaining weights between the upstream firm and the downstream firm(s). *De facto*, there will thus be no negotiations over the wholesale price. In equilibrium, it is inconsequential for the retailer whether or not it enters into a contractual agreement with the supplier. Applied to the media example above, this means that it does not matter for any given cable TV distributor whether it trades with The Walt Disney Company or rather invests in an outside option.

We show that this result hinges critically on the assumption that the upstream firm offers only a single product. To this end, we set up a framework where one upstream firm (content provider) and one downstream firm (distributor) negotiate bilaterally over linear wholesale prices for two products offered by the upstream firm. For the sake of simplicity, we assume that the downstream firm possesses the ability to leverage an outside option for only one of the products. This is not essential; what matters is that it is more attractive (e.g., due to lower expenses) to invest in an outside option for one of the goods compared to the other. The timing of the game is that the upstream and downstream firms bargain over wholesale prices in the first

[5] Whenever this is true, it follows from Katz' analysis that the existence of outside options may result in size-based wholesale price discrimination, such that larger retailers, other things being equal, pay lower wholesale prices than their smaller counterparts.This is an age-old issue that goes back to the Robinson Patman Act in the US. However, we will not discuss price disrimination in this paper

period, knowing that the downstream firm has the opportunity to exercise its outside option in the second period if it finds the wholesale terms of trade unacceptable.

Let us first assume that the upstream firm does not use a tying strategy. We show that it is in no way inconsequential for the downstream firm whether it trades with the upstream firm. Quite the contrary. Both firms strictly benefit from entering a contractual agreement with each other, and wholesale prices will be determined through negotiations (given that both firms have positive bargaining weights). What the outside option does, is to increase the *perceived* bargaining power of the downstream firm. If the fixed cost of executing the outside option falls, the downstream firm will capture a large share of the gains from the bilateral trade because its perceived bargaining power increases. Interestingly, we find that upstream profit is maximized if the two wholesale prices are identical, other things being equal (in particular, symmetric demands). The upstream firm will thus at the outset not use its market power to charge a relatively high price for the product for which there is no outside option. However, we show that there might not exist an equilibrium with equal wholesale prices unless the wholesale contract specifies both price and quantity for each of the products. If the contract only specifies wholesale prices, the downstream firm might find it optimal to deviate from a bargaining outcome which otherwise would maximize joint profit. The reason is that the downstream firm's temptation to invest in the outside option and buy the other good for a relatively low prices might be too strong. Thus, it is clearly in the interest of the supplier to make sure that the contract specifies both prices and quantities. Otherwise, it might be unable to serve the downstream firm with both products unless it charges a higher price for the good without an outside option and a lower price for the other product compared to what would maximize upstream profit.

What if the upstream firm goes for a tying strategy? If it succeeds with that, profits for the upstream firm increase and that of the downstream decrease compared to a situation where the downstream firm can choose whether to buy nothing, only one of the products or both. This is true even though we restrict attention to cases where the downstream firm in equilibrium ends up buying both products from the upstream firm, tying or not. The explanation for this result is that with tying, the opportunity cost of using the outside option increases since it implies that it foregoes profit from the other good. However, tying might not be a viable strategy for the upstream firm. First it could violate competition law (this is further discussed in section Section 5.2). Second, if the downstream firm for some reason has invested in an outside option, then the best the upstream firm can do is to sell the other good to the downstream firm. That will unambiguously be profitable for the upstream firm; the B2B negotiation ensures that the profit margin will be positive. Unless the upstream firm can commit to tying, such a strategy will thus not be credible. Then we are back to the non-tying strategy described above.

The examples above relate to the media market; however, the research question regarding the impact of B2B bargaining with outside options is relevant to a broad range of markets and products. For instance the retail grocery market. On their website, Coca Cola writes "We're meeting you at any point in your day with the drinks you love... our beverage options across 200+ brands bring a little magic to your day – or night." [6] For some of these brands (e.g., Coca Cola, Diet Coke), retailers have few or no alternatives. However, for a large fraction of the 200+ brands, the retailers enter the negotiations with Coca Cola with a credible threat to execute an outside option. A similar example is Procter & Gamble with its slogan "iconic brands you can trust in your home".[7] Pampers (diapers) and Gillette (razors) are probably "iconic" in the meaning that they are strong brand products for retailers. Nonetheless, Procter & Gamble, like Coca Cola, also have a long range of products where buyers credibly can threaten to execute outside options when they negotiate wholesale prices.

2 Literature review

Much of the research literature applies the Nash bargaining solution concept (Nash (1950)) when analyzing negotiations between upstream and downstream firms. Horn and Wolinsky (1988) extend the Nash bargaining solution to a model where two

[6] https://www.coca-colacompany.com/brands

[7] seehttps://us.pg.com/brands/

downstream firms acquire inputs through bilateral monopoly relations with suppliers. Their model softens the take-it-or-leave-it assumption of traditional models of vertical relations (such as the one in Katz (1987)), but imposes the restrictive assumption that players do not have any outside options. This gives rise to what is labelled "Nash-in-Nash" bargaining. The non-cooperative underpinnings for this model are explored in Collard-Wexler et al. (2019). Empirical studies based on Nash bargaining include Draganska et al. (2012) in manufacturer-retail environments, Dubois and Sæthre (2020) for the pharmaceutical industry, Crawford and Yurukoglu (2012) for media content distribution, Ho and Lee (2017) for insurance networks, Grennan (2014); Grennan and Swanson (2020) for hospital-supplier relations, Gowrisankaran et al. (2015) in hospital mergers, and Crawford et al. (2018) for vertical mergers in cable programming. Nash bargaining and Nash-in-Nash bargaining, while yielding tractability, neither explain nor accommodate bargaining breakdown, and the latter framework requires restrictions on the formulation of disagreement payoffs. This second limitation has sparked interests in a number of extensions, currently underway, that seek to add an element of strategic exclusion following the "outside option principle" of Binmore et al. (1989) (see, for example Ghili (2022) and Ho and Lee (2019)).[8]

In our model, we follow this last strand of literature and apply the "Nash-in-Nash with Threat of Replacement" (NNTR) bargaining solution to determine the outcome of the B2B negotiation between a multi-product upstream firm and a downstream firm. See Ho and Lee (2019) and Chambolle and Molina (Forthcoming) for further discussions of this bargaining concept.

As Katz (1987) and O'Brien (2014), we focus on contracts with linear wholesale prices. Such contracts are commonly observed in practice, for instance between ebook publishers and retailers (Gilbert (2015)), in negotiations between cable TV distributors and channels (Crawford and Yurukoglu (2012); Crawford et al. (2018)), in hospital-insurer relationships (Ho and Lee (2017)), and between hospitals and manufacturers (Grennan (2013, 2014)). Other recent papers focusing on linear contracts include Gaudin (2018, 2019). Inderst and Schaffer (2018) note that two-part

[8] For a more complete overview, see Lee et al. (2021).

tariff in supplier-retailer relations avoid the double-marginalization problem (Spengler (1950)), but may nonetheless be inferior to linear contract if firms have outside options, if demand is uncertain (Gaudin (2018)) or if contracts as secret (O'Brien and Schaffer (1991)). Vertical contracts are generally assumed to be linear in the literature on input price discrimination; see, for example, the work of DeGraba (1990) and Inderst and Valletti (2009).

Our analysis is also related to the delisting literature. Davies (1994) identifies patterns in the delisting behavior of retail buyers, but focuses on reasons related to consumer behavior and the retail market. We differ from this paper by focusing on the threat of delisting and its influence on the upstream B2B market. More recently, Florez-Acosta and Herrera-Araujo (2020) focuses on the strategic use of delisting in supermarkets' choice of product portfolio, rather than how this threat influences wholesale prices which is the focus of the current paper.

3 The model

Market structure: We consider a model with one downstream firm (d) and one upstream firm (u). The downstream firm can sell two goods, $i = m, n$, and we normalize marginal production costs for both to zero. Consumers perceive the goods as independent or as substitutes. The downstream firm can acquire good n either from the upstream firm or through an outside option. We follow the seminal paper by Katz (1987) and assume that the outside option can be exercised at a fixed cost $f \geq 0$. The cost of substituting product m with an outside good is significantly higher. To highlight the forces at work, we assume that the cost is prohibitively large. The upstream firm thus has monopoly power for product m

The inverse demand curve for product i is given by

$$p_i = 1 - q_i - sq_j, \tag{1}$$

where $i, j = m, n; i \neq j$. The products are independent in consumer demand if $s = 0$, and substitutes if $0 < s \leq 1$. The downstream firm pays a wholesale price w_i per unit of good i, and earns operating profit

$$\pi_d = (p_m - w_m)\, q_m + (p_n - w_n) q_n.$$

Profit maximization implies that

$$q_i = \frac{1 - s - w_i + s w_j}{2\,(1 - s^2)}, \tag{2}$$

and profit becomes

$$\pi_d = \frac{(1 - w_m)}{2} \frac{1 - s - w_m + s w_n}{2\,(1 - s^2)} + \frac{(1 - w_n)}{2} \frac{1 - s - w_n + s w_m}{2\,(1 - s^2)}. \tag{3}$$

Timing: We consider a three-stage game in which the upstream and downstream firms bargain over wholesale prices at the first stage. If this bargaining fails, the downstream firm has the opportunity to exercise its outside option for good n at the second stage. In one of the model variants, the firms will subsequently bargain over the the wholesale price of good m. In the other variant, there will be no trade between the firms if the downstream firm exercises its outside option (we label this model *the tying variant*).

At the third stage, the downstream firm sets retail price(s) and sells to consumers.

Equilibrium concept: We apply the "Nash-in-Nash with Threat of Replacement" (NNTR) bargaining solution (Ho and Lee, 2019; Chambolle and Molina, Forthcoming) to determine the outcome of the bargaining in stage 1. We denote by $\gamma \in [0, 1]$ the bargaining weight of the downstream firm.

We apply the NNTR bargaining solution, rather than the more commonly used "Nash-in-Nash" bargaining solution (Horn and Wolinsky, 1988). The reason is that the NNTR bargainng solution extends the "Nash-in-Nash" by allowing the downstream firm to threaten to exercise an outside option (c.f. the discussion in the Introduction).

4 Benchmark: No outside option

Let us start out by abstracting from the downstream firm's outside option (e.g., because it is too expensive to execute due to a high f). Suppose that the downstream firm buys both goods from the upstream firm. Then the upstream firm's profit level equals

$$\pi_u = w_m \frac{1 - s - w_m + s w_n}{2\left(1 - s^2\right)} + w_n \frac{1 - s - w_n + s w_m}{2\left(1 - s^2\right)} \tag{4}$$

Without the outside option, the NNTR solution is here equivalent to the "Nash-in-Nash" solution, implying that the wholesale prices maximize the (possibly asymmetric) Nash bargaining product. Setting both firms' disagreement profit to zero, the Nash bargaining product is given by

$$\phi = \pi_u^{1-\gamma} \pi_d^{\gamma},$$

where the first-order condition (FOC) with respect to w_i is

$$\frac{d\phi}{dw_i} = (1-\gamma) \frac{\pi_d^{\gamma}}{\pi_u^{\gamma}} \frac{d\pi_u}{dw_i} + \gamma \frac{\pi_u^{1-\gamma}}{\pi_d^{1-\gamma}} \frac{d\pi_d}{dw_i} = 0. \tag{5}$$

Since we have assumed symmetric demand for the two products, they will have identical wholesale prices ($w_m = w_n = w$). Solving equation (5), we find:

$$w^{no} = \frac{1-\gamma}{2}. \tag{6}$$

If all the bargaining power is in the hands of the upstream firm, such that $\gamma = 0$, the outcome resembles the complete double marginalization outcome of Spengler (1950); the upstream firm de facto offers an take-it-or-leave-it contract. In the other extreme, where all bargain power is in the hands of the downstream firm ($\gamma = 1$), there is no double marginalization, and the wholesale price equals the upstream marginal cost. When γ is between 0 and 1, the wholesale price is somewhere in-between these two extremes and its exact value depends on the distribution of the bargaining weights.

Firms' profits are now:

$$\pi_d^{no} = \frac{(1+\gamma)^2}{8(1+s)} \tag{7}$$

$$\pi_u^{no} = \frac{1-\gamma^2}{4(1+s)} \tag{8}$$

5 The downstream firm has an outside option

5.1 The outside option is viable, but the upstream firm makes a tying commitment

Assume that the outside option is viable, in the sense that f is so small that the downstream firm can credibly threaten to execute it. If the downstream firm follows through with this threat and products m and n are imperfect substitutes, both firms will clearly have incentives to reach an agreement wherein the downstream firm also sells product m. This will generate a positive incremental profit for both firms. However, suppose that prior to the bargaining process, the upstream firm can commit not to sell good m to the downstream firm unless it also purchases product n. This commitment will make it less attractive for the downstream firm to execute its outside option. With a slight abuse of language, we shall say that the upstream firm in this case makes a tying commitment.[9]

Let us first find the downstream firm's threat point when it negotiates with the upstream firm; this can be found by assuming that it executes its outside option. Due to the upstream firm's tying strategy, the downstream firm then cannot sell good m. We can therefore insert $q_m = 0$ into (1) and solve $q_n = \arg\max \pi_d$. This yields

$$\hat{q}_n = \frac{1}{2} \text{ and } \hat{p}_n = \frac{1}{2}. \tag{9}$$

If the downstream firm fails to reach an agreement with the upstream firm, it can

[9]We relax this assumption in our main analysis.

thus invest in the outside option and make an operative profit equal to

$$\hat{\pi}_d = \frac{1}{4}. \tag{10}$$

Following the NNTR solution, the wholesale prices from the negotiation between the downstream and the upstream firms are determined from:

$$\max_{w_m, w_n} \pi_u^{1-\gamma} \pi_d^{\gamma} \text{ subject to } \pi_d \geq \hat{\pi}_d - f. \tag{11}$$

If the constraint in (11) does not bind (f is too high), we obtain the same solution as in (6). If it binds (f is sufficiently small), we get $w_m = w_n = w$, where [10]

$$w = 1 - \sqrt{2\left(\frac{1}{4} - f\right)(1+s)}. \tag{12}$$

Since wholesale prices are independent of γ, the same is true for profits.

Proposition 1. *Tying. Assume that the upstream firm has committed to a tying strategy. Wholesale prices and the firms' profit levels do not depend on bargaining weights if the outside option binds.*

This result extends the finding in Katz (1987) and O'Brien (2014) to a setting where the upstream firm offers more than one product but has made a tying commitment. Similar to the case where the outside option binds in Katz (1987) and O'Brien (2014), wholesale prices follow directly from the value of the outside option and do not depend on the distribution of the bargaining weights between the upstream and downstream firms.

5.2 The outside option is viable, no tying commitment

The tying strategy described above might often seem unreasonable. If for some reason the downstream firm has executed the outside option for good n (e.g., for

[10] See the Appendix for the proof.

some exogenous reason or as the result of an out-of-equilibrium behavior), it will be mutually profitable for the parties that the downstream firm buys and sells good m. And it is far from obvious how the upstream firm can commit to not doing so. Furthermore, blocking the downstream firm's access to the strong brand product might be judged anti-competitive. In the rest of the paper, we shall therefore consider the case where the upstream firm cannot make any tying commitment (even though tying would raise upstream profit in our framework). We consider this to be the most interesting scenario. Note that anti-competitive effects of tying is discussed in the EU guidelines on vertical restraints in section 8.2.8 on tying.[11]

If the downstream firm's cost of executing the outside option is sufficiently small, it might be the case that the upstream firm maximizes profits by only selling good m. Although technically possible, this is not interesting for our analysis where the multi-product aspect of the upstream firm is the core. To abstract from this possibility, we assume that $f = max(0, f_{min})$, where

$$f_{min} = \frac{1}{16(1+s)}\left[1 + 3s + (1-s)(1+2\gamma) - 2\sqrt{2(2-(1-s)(1-\gamma^2))}\right].$$

If the downstream firm were to use its outside option, we can set $w_n = 0$ in equation (2) and (3). From this we find that output and operating profit for the downstream firm are

$$\tilde{q}_m = \frac{1-s-w_m}{2(1-s^2)}; \tilde{q}_n = \frac{1-s+sw_m}{2(1-s^2)}; \tilde{\pi}_d = \frac{2\left(1-w_m\right)\left(1-s\right)+w_m^2}{4(1-s^2)}$$

From these equations it is clear that the downstream firm will sell both goods unless w_m is too high.

The Nash bargaining product is now:

$$\tilde{\phi} = \tilde{\pi}_u{}^{1-\gamma}\left(\tilde{\pi}_d - \hat{\pi}_d\right)^{\gamma},$$

where $\hat{\pi}_d = 1/4$ from equation (10) and $\tilde{\pi}_u = w_1\tilde{q}_1$. The FOC wrt. w_m equals

[11]See https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022XC0630(01)&from=EN

$$\frac{d\phi}{dw_m} = (1-\gamma)\frac{(\tilde{\pi}_d - \hat{\pi}_d)^{\gamma}}{(\tilde{\pi}_u)^{\gamma}}\frac{d\tilde{\pi}_u}{dw_1} + \gamma\frac{(\tilde{\pi}_u)^{1-\gamma}}{(\tilde{\pi}_d - \hat{\pi}_d)^{1-\gamma}}\frac{d(\tilde{\pi}_d - \hat{\pi}_d)}{dw_m} = 0$$

Solving this we find

$$\tilde{w}_m = \frac{1-\gamma}{2}(1-s).$$

The closer substitutes the goods, the lower the wholesale price the upstream firm can charge for good m ($d\tilde{w}_m/ds < 0$). For perfect substitutes ($s = 1$), there is no additional profit for the downstream firm from providing good m in addition to good n. Hence, the supplier is forced to agree on a wholesale price equal to its marginal costs. For independent goods ($s = 0$), the wholesale price of product m resembles the one in the unconstrained equilibrium (given by (6)).

Inserting for $\tilde{w}_m$ we can write

$$\tilde{\pi}_u = \frac{1-s}{8(1+s)}\left(1-\gamma^2\right) \tag{13}$$

$$\tilde{\pi}_d = \frac{5+3s+\gamma(2+\gamma)(1-s)}{16(1+s)} \tag{14}$$

With this threat of replacement, the NNTR solution solves the the following bargaining problem:

$$\max_{w_m, w_n} \pi_u^{1-\gamma}\pi_d^{\gamma} \text{ subject to } \pi_d \geq \tilde{\pi}_d - f.$$

The downstream firm prefers to buy both goods from the upstream firm if $\pi_d^* \geq \tilde{\pi}_d - f$. Using (3) and (14) we find that this holds if

$$w_n \leq w_n^* \equiv 1 - s(1-w_m) - \frac{k}{2}, \tag{15}$$

where

$$k \equiv \sqrt{(1+\gamma)^2(1-s)^2 - 4(4f - 2w_m + w_m^2)(1-s^2)}.$$

For the equilibrium we are interested in - where the outside option binds - equation

(15) holds with equality. From (15) we find:

$$\left.\frac{\partial w_n^*}{\partial \gamma}\right|_{w_m} = -\frac{(1+\gamma)(1-s^2)}{2k}$$

Proposition 2. *No tying. Holding fixed the wholesale price of the product for which the upstream firm is the sole supplier, the wholesale price of the good for which there exists an outside option is decreasing in the downstream firm's bargaining weight;* $\left.\frac{\partial w_n^*}{\partial \gamma}\right|_{w_m} < 0$.

The result in Proposition 2 is in sharp contrast to the outcome in single-good models. As shown by O'Brien (2014), when bargaining over a single good, the value of γ does not affect the wholesale price if the outside option binds. Instead, the wholesale price follows directly from the value of the outside option. [12] Practitioners with experience from negotiations are unlikely to support a prediction that no real bargaining takes place if there is a binding outside option. As shown in Proposition 2, as soon the upstream firm offer more than one good, we have the more intuitively appealing result that the wholesale price for the good with a binding outside option decreases in the bargaining power of the downstream firm.

In Proposition 2 we held w_m fixed. Endogenizing both wholesale prices, we show in the appendix that the upstream firm will optimally charge the same price for the products, $w_n = w_m = w^*$. Specifically, defining $M = 5 + 3s + \gamma(2+\gamma)(1-s) - 16f(1+s)$ we have

$$w^* = 1 - \frac{1}{4}\sqrt{2M}, \tag{16}$$

[12] In O'Brien (2014)) there is a single-good supplier bargaining with two competing downstream firms. Without binding outside options, negotiations will take place. Wholesale price discrimination takes place in favour of the downstream firm that is more patient in the negotiations than the rivals (or has better inside options). If the outside option is binding, then the wholesale price follows from directly from the value of the outside option, and there are thus no negotiations in O'Brien's model. Here O'Brien's model coincides with (Katz, 1987), and restrictions on the possibility of price discrimination reduce the wholesale price for all downstream firms and consumers naturally benefit from this. Without a binding outside option, negotiations take place, and in most cases a reduction in the ability to price discriminate will reduce the negotiation incentives (and the supplier's incentive to give a discount), so that wholesale prices go up.

where

$$\frac{dw^*}{d\gamma} = -\frac{(1-s)(1+\gamma)}{2\sqrt{2M}} < 0.$$

Interestingly, we thus see that even though the downstream firms has an outside option only for good n, the upstream firm will optimally charge the same price for good m and good n. The reason for this is that since the goods enter symmetrically in consumer utility, profit is maximized if they are sold for the same prices, other things equal. However, for equation (16) to hold in equilibrium, it might be necessary that the upstream and downstream firm agree on both wholesale prices and quantities, not only prices (see further discussion below):

Proposition 3. *No tying. Assume that the wholesale contract specifies both wholesale prices and quantities. Equilibrium wholesale prices for the two products will then be identical, and decreasing in the bargaining weight of the downstream firm.*

An interesting implication of this result for empirical analysis is that we might not be able to detect which goods a downstream firm has outside options for through inspecting invoices from the supplier: wholesale prices for individual inputs may not contain any information about this even with linear wholesale contracts.

The result that the wholesale prices are identical is of course a special case that hinges on the assumption that demand and cost conditions for the two products are the same. The general insight is that channel profit will be suboptimal if negotiations between the firms lead to inefficient relative prices (which would be the case for instance if the upstream firm used its monopoly power over product m to set w_m high relative to w_n).

From equation (16) we have:

$$\frac{dw^*}{df} = \frac{2\sqrt{2}}{\sqrt{M}}(1+s) > 0$$

Not surprisingly, we thus see that the upstream firm can charge higher wholesale prices the higher the cost for the downstream firm of executing the outside option.

We can now calculate the profit levels of the firms by inserting for (16) into (3) and (4). This yields

$$\pi_d^* = \frac{M}{16\,(1+s)} \text{ and } \pi_u^* = \frac{2\sqrt{2M}-M}{8\,(1+s)}. \tag{17}$$

Recall that the downstream firm's profit level is equal to π_d^{no} if we abstract from the outside option, c.f. equation (7). It follows that the downstream firm can credibly threaten with the outside option if

$$\pi_d^* - \pi_d^{no} = \frac{(1+\gamma)\,(3-\gamma) + (3+\gamma)\,(1-\gamma)\,s}{16\,(1+s)} - f \tag{18}$$

is greater than zero.

From (18) we immediately see that the value of the outside option, $\pi_d^* - \pi_d^{no}$, is decreasing in the cost of executing it ($\frac{d\left(\pi_d^*-\pi_d^{no}\right)}{df} < 0$). We further have

$$\frac{d\,(\pi_d^* - \pi_d^{no})}{d\gamma} = \frac{1-s-(1+s)\,\gamma}{8\,(1+s)}. \tag{19}$$

From equation (19) we see that the value of the outside option for the downstream firm is strictly decreasing in its bargaining weight if s=0. More surprisingly, the value of the outside option might be a hump-shaped function of γ if the substitutability between the products if s is positive. Indeed, for sufficiently low values of s, the option value is strictly increasing in γ even for γ arbitrary close to 1. More precisely, we have

Proposition 4. *No tying. Let $\gamma' = (1-s)/(1+s)$ The value of the outside option for the downstream firm is increasing in its bargaining weight for $\gamma < \gamma'$ and decreasing in its bargaining weight for $\gamma > \gamma'$.*

In Figure 1 we have set $s = 1/4$ and $f = 1/20$ to illustrate Proposition 4. The value of the outside option is then increasing in γ until $\gamma' = 0.6$, and subsequently it is decreasing in γ.

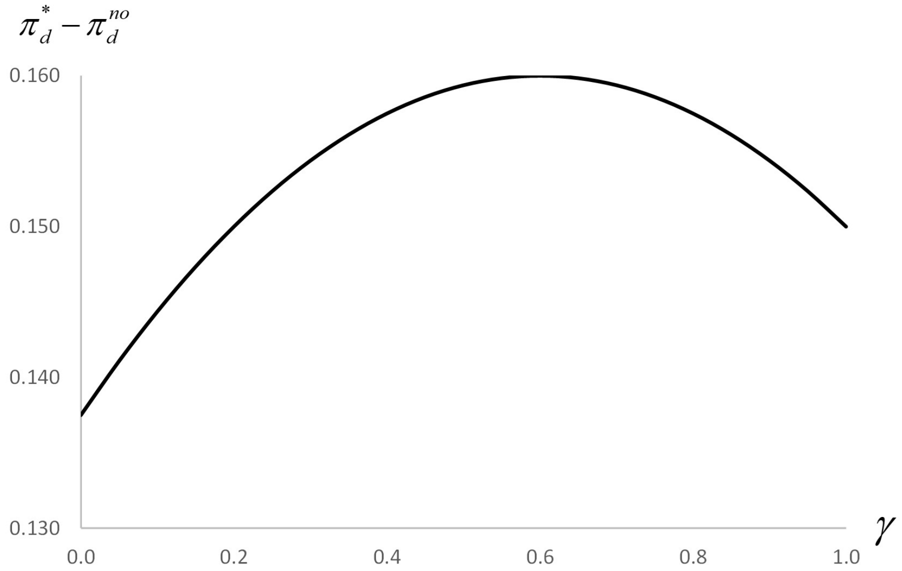

Figure 1: *Value of the outside option for the downstream firm.*

Let us look a bit further at the implications of the substitutability parameter. From equation (16) and (18) we find that

$$\frac{dw^*}{ds} = -\frac{2\sqrt{2}\left(\pi_d^* - \pi_d^{no}\right)}{\sqrt{M}} < 0 \text{ and } \frac{d\left(\pi_d^* - \pi_d^{no}\right)}{ds} = -\frac{\gamma}{4\left(1+s\right)^2} < 0.$$

This means that greater substitutability between the two products reduces both the wholesale price and the value of the outside option. Interestingly, the value of the outside option for the downstream firm is thus particularly high if the products that the upstream firm offers are poor substitutes. Note also that the higher is the downstream firm's bargaining power, the more does the value of the outside option fall as s increases.

Figure 2, where $s = 1/2$ and $f = 1/20$, provides a numerical example to summarize what determines the wholesale prices. The downward-sloping black curve shows equilibrium wholesale prices if there were no outside option or if it is not binding. It is decreasing in γ because the downstream firm is able to negotiate lower wholesale prices the greater its bargaining weight. With the given parameter values, the outside option is not binding if $\gamma > 0.8$; then the downstream firm has such strong bargaining power that it does not need to use the outside option as a threat. For lower values of γ, the existence of an outside option has the same effect as increasing the bargaining weight (γ) for the downstream firm. Regardless of the existence of any outside option, wholesale prices are decreasing in the downstream firm's bargaining weight, but they are lowest if the outside option is binding. However, in an appendix which is available from the authors on request, it is shown that we will have an equilibrium with identical wholesale prices for the two products only if the contract specifies both wholesale pries and quantities. Otherwise, the upstream firm must set a relatively low price on the product for which the downstream firm has an outside option if the downstream firms has a "low" bargaining weight.

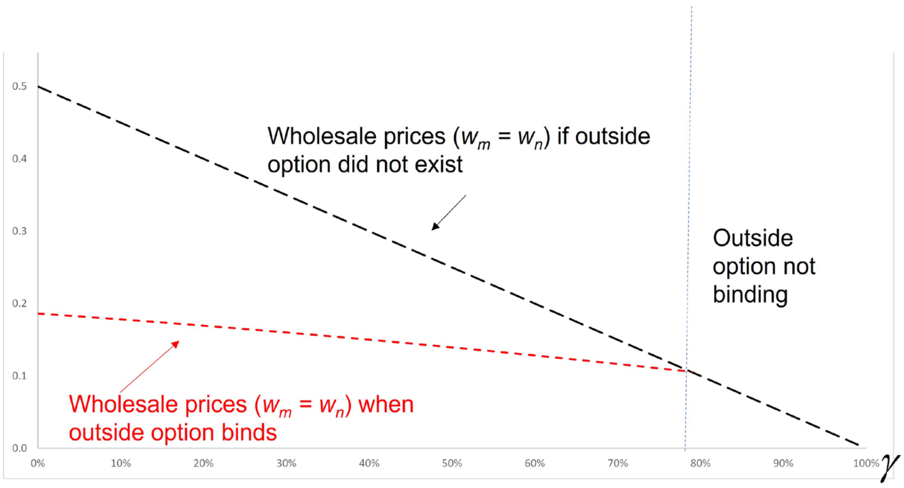

Figure 2: *Wholesale prices as a function of γ, with and without an outside option.*

6 Concluding remarks

In this paper we take into account that content providers in the media market offer multiple products. Media distributors might credibly threaten to replace some if these products with outside options. We explore the effect of such multi-product firms on B2B bargaining for wholesale prices and show that the distribution of bargaining power affects wholesale prices also when the outside option is binding. The higher the distributor's bargaining weight when bargaining over the outside option, the lower are wholesale prices for both products. For the products (channels) offered by Disney or CBS where distributors have outside options as well as for products without outside options, wholesale prices will be decreasing in the distributors' bargaining weight. This means that if distributors have an outside option for a news channel or a children's channel, this may reduce the wholesale price for other channels that the content provider is in a unique position to offer consumers.

Although our formal model focuses on a case with one content provider and one distributor, we conjecture that the results extends to a more competitive environment. In fact, Dukes et al. (2006) provides a theoretical framework for analysing competing content providers and distributors that could be adapted to our setting.

References

Binmore, K., A. Shaked, and J. Sutton (1989), "An Outside Option Experiment," *Quarterly Journal of Economics*, 104(4):753-770.

Chambolle, C. and H. Molina (Forthcoming), "A Buyer Power Theory of Exclusive Dealing and Exclusionary Bundling," *American Economic Journal: Microeconomics.*

Collard-Wexler, A., G. Gowrisankaran and R. Lee (2019), "Nash-in-Nash Bargaining: A Microfoundation for Applied Work," *Journal of Political Economy*, 127(1): 163-195.

Crawford, G. S. and A. Yurukoglu (2012), "The Welfare Effects of Bundling in Multichannel Television Markets," *American Economic Review*, 102(2): 643-685.

Crawford, G. S., R.S. Lee, , M.D. Whinston, and A. Yurukoglu (2018), "The Welfare Effects of Bundling in Multichannel Television Markets," *Econometrica*, 86(3), 891-954.

Davies, G. (1994), "The Delisting of Products by Retail Buyers," *Journal of Marketing*, 10(6): 473-493.

DeGraba, P. (1990), "Input Market Price Discrimination and the Choice of Technology," *American Economic Review*, 80(5): 1246-1253.

Doudchenko, N. and A. Yurukoglu (2016), "Size Effects and Bargaining Power in the Multichannel Television Industry," *Working paper.*

Draganska, M., D. Klapper, and S.B. Villas-Boas, (2010), "A Larger Slice or a Larger Pie? An Empirical Investigation of Bargaining Power in the Distribution Channel," *Marketing Science*, 29(1): 57-74.

Dubois, P. and M. Sæthre, (2020), "On the Effect of Parallel Trade on Manufacturers' and Retailers' Profits in the Pharmaceutical Sector," *Econometrica*, 88(6): 2503-2545.

Dukes A., E. Gal-Or and K. Srinivasan (2006), "Channel Bargaining with Retailer Asymmetry," *The Journal of Marketing Research*, 43(1), 84-97.

Evens, T., and K. Donders (2018), "Platform Power and Policy in Transforming Television Markets," *London: Palgrave Macmillan.*

Florez-Acosta, J. and D. Herrera-Araujo (2020), "Multiproduct Retailing and Consumer Shopping Behavior: The Role of Shopping Costs," *International Journal of Industrial Organization*, 68, 102560.

Gaudin, G. (2018), "Vertical Bargaining and Retail Competition: What Drives Countervailing Power," *Economic Journal*, 29(3), 128: 1-32.

Gaudin, G. (2019), " Vertical Relations, Opportunism, and Welfarn," *RAND Journal of Economics*, 50(2): 342-358.

GILBERT, R.J. (2015), "E-Books: A Tale of Digital Disruption," *Journal of Economic Perspectives*, 29(3), 165-184.

GHILI, S. (2022), "Network Formation and Bargaining in Vertical Markets: The Case of Narrow Networks in Health Insurance," *Marketing Science*, 41(3), 501-527.

GOWRISANKARAN, G., NEVO, A., AND TOWN, R. (2015), "Mergers when Prices are Negotiated: Evidence from the Hospital Industry," *American Economic Review*, 105(1):172-203.

GRENNAN, M. (2013), "Price Discrimination and Bargaining: Empirical Evidence from Medical Devices," *American Economic Review*, 103 (1), 145-177.

GRENNAN (2014), "Bargaining Ability and Competitive Advantage: Empirical Evidence from Medical Devices," *Management Science*, 60(12), 3011-3025.

GRENNAN, M. AND A.T. SWANSON (2020), "Transparency and Negotiated Prices: The Value of Information in Hospital-Supplier Bargaining," *Journal of Political Economy*, 128 (4), 1234-1268.

HO K. AND R.S. LEE (2017), "Insurer Competition in Health Care Markets," *Econometrica*, 85(2): 379-417.

HO K. AND R.S. LEE (2019), "Equilibrium Provider Networks: Bargaining and Eclusion in Health Care Markets," *American Economic Review*, 109(2): 473-522.

HORN, H. AND A. WOLINSKY (1988), "Bilateral Monopolies and Incentives for Merger," *RAND Journal of Economics*, 19: 408-419.

INDERST, R. AND T. VALLETTI (2009), "Price Discrimination in Input Markets," *RAND Journal of Economics*, 40(1): 1-19.

INDERST, R. AND G. SHAFFER (2018), "Managing Channel Profits When Retailers Have Profitable Outside Options," *Management Science*, 65(2): 642-659.

Katz, M.L. (1987), "The Welfare Effects of Third-Degree Price Discrimination in Intermediate Good Markets," *American Economic Review*, 77(1): 154-167.

Lee, R. S., M.D. Whinston, and A. Yurukoglu (2021), "Structural Empirical Analysis of Contracting in Vertical Markets," *In Handbook of Industrial Organization*, 4(1): 673-742. Elsevier.

Meza, S., and Sudhir, K. (2010), "Do Private Labels Increase Retailer Bargaining Power?," *Quantitative Marketing and Economics*, 8(3), 333-363.

Nash, J. (1950), "The Bargaining Problem," *Econometrica*, 18(2): 155-162.

O'Brien, D. and G- Schaffer (1992), "Vertical Control with Bilateral Contracts" *RAND Journal of Economics*, 23(3): 299-308.

O'Brien, D. (2014), "The Welfare Effects of Third-Degree Price Discrimination in Intermediate Good Markets: The case of Bargaining," *RAND Journal of Economics*, 45: 92-115.

Rey, P. and T. Vergé (2017), "Secret Contracting in Multilateral Relations," *TSE Working paper*, 16-695.

Spengler, J. (1950), "Vertical Integration and Antitrust Policy," *Journal of Political Economy*, 58(4): 347-352.

A Proofs

This appendix provides a general proof of the NNTR bargaining solution in our framework.

Assume that the downstream firm has an outside option for good n that yields a payoff equal to $K \geq 0$.

Following the NNTR solution, the wholesale prices from the negotiation between the downstream and the upstream firms are determined as follows:

$$\max_{w_m,w_n} \pi_u^{1-\gamma}\pi_d^{\gamma} \text{ subject to } \pi_d \geq K.$$

The Lagrangian asocaited with this maximization problem is $\mathcal{L} = \pi_u^{1-\gamma}\pi_d^{\gamma} - \lambda\left[\pi_d - K\right]$. This yields the following first-order condition with respect to w_i:

$$(1-\gamma)\frac{\pi_d^{\gamma}}{\pi_u^{\gamma}}\frac{d\tilde{\pi}_u}{dw_i} + \gamma\frac{\pi_u^{1-\gamma}}{\pi_d^{1-\gamma}}\frac{d\pi_d}{dw_i} - \lambda\frac{d\pi_d}{dw_1} = 0$$

We also require $\lambda\left[\pi_d - K\right] = 0$.

If $\lambda = 0$, the optimal solution is the same as the one presented in Section 4. However, our interst lies in what happens when $\lambda \neq 0$. In this case, using (3) and rearranging $\pi_d = K$ yield

$$w_n = 1 - s\left(1-w_m\right) - \sqrt{\left(1-s^2\right)\left(4K - \left(1-w_m\right)^2\right)}. \tag{A.1}$$

Note that the first-order conditions are symmetric so that a solution is $w_m = w_m = w$. Using this in (A.1) yields

$$w = 1 - \sqrt{2K\left(1+s\right)}. \tag{A.2}$$

It suffices to replacing K in (A.2) by $\hat{\pi}_d - f$ to get (12), and replace K by $\tilde{\pi}_d - f$.

This paper considers price negotiations between content providers and media distributors. The starting point is the observation that major content providers offer a range of products, some of which are hard to replace for distributors. For other products offered by the same content providers there may exist alternatives (outside options) for the distributors. We consider a bilateral bargaining framework where one content provider and one distributor negotiate over linear wholesale prices for two media products. The distributor has a threat to execute an outside option for one of the products. In contrast to the case with a single-good content provider, the distribution of bargaining power affects wholesale prices also when the outside option is binding. The higher the distributor's bargaining weight in the outside option, the lower the wholesale prices for both products. Remarkably, we find that, other things equal, the wholesale prices are identical for both products, even though an outside option only exists for one of them. Gains for the distributor from threatening to use its outside option decreases in its own bargaining weight.

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