Upstream Pricing Pressure

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Abstract

Conventional wisdom says that horizontal mergers lead to upward pricing pressure, but is this necessarily true for horizontal mergers in upstream markets? As argued by several scholars and parties in recent merger cases, the answer is negative if vertical contracts are perfectly efficient. We consider a model of vertical relations in which firms must distort marginal prices; e.g., to provide insurance or induce information revelation. We find that an upstream merger creates unilateral incentives to raise prices, even though contracts are non-linear and secret. The merger is anticompetitive irrespective of the exact reason for the contractual distortion or the manner of retail competition. However, we find also that fierce retail competition can mitigate the magnitude of the price increase.

1 Introduction

In a standard oligopoly model, a horizontal merger that puts two substitute goods in the hands of one consolidated seller will, absent offsetting efficiency gains, lead to higher prices and lower consumer welfare. This simple logic is the heart of unilateral effects analysis of horizontal mergers; from the celebrated Upward Pricing Pressure test and related concepts (e.g., Farrell and Shapiro, 1990, 2010; Werden, 1996) to full-blown merger simulation.¹

The validity of this logic, however, is questionable when it comes to horizontal mergers in upstream markets, where Nash-in-prices is a poor description of firm behavior (Pakes, 2011). In fact, a powerful counterargument with broad support in the

¹Consideration of unilateral price effects is central in the 2010 US Horizontal Merger Guidelines (Section 6), as well as in the 2004 EU Guidelines (paragraphs 24-38).
literature says that such upstream mergers do not create incentives for higher consumer prices.\(^2\) This argument has three parts. First, upstream firms do not have direct control over consumer prices, although they can affect consumer prices through their per-unit wholesale prices. Second, when negotiating wholesale prices, upstream and downstream firms typically also specify fixed fees (i.e., non-linear contracts). Third, each upstream and downstream firm would like to sign an “efficient” contract—a wholesale price equal to marginal cost, and a fixed fee that divides profits—irrespective of the concentration level in the upstream market. In that case, an upstream merger should at worst be welfare neutral and not worthy of antitrust scrutiny.

This idea has important implications for merger litigation. Unilever’s acquisition of Sara Lee in 2010 is a case in point.\(^3\) In this case, the parties used the above argument to oppose the European Commission’s merger simulation study, which predicted that consumer prices would go up by around 5%, and led the Commission to require divestiture of Sara Lee’s Sanex deodorant brand to approve the merger. However, according to Ezrachi and Thanassoulis (2013, pp. 413-14) “an alternative analysis using the “efficient contracting” approach, might have resulted in clearance with limited, or no conditions. [...] The reliance on the linear assumption led to the conclusion that retail prices will increase and may have resulted in over-intervention.” Since Unilever/Sara Lee, quarrels about efficient contracts have become common in upstream merger cases.\(^4\)

We agree with the first and second parts of the efficient contracting argument: Vertical relations and non-linear contracts are ubiquitous.\(^5\) The third part, however, is problematic: Marginal cost pricing is rarely bilaterally optimal in practice because of various “agency issues”—risk sharing, screening, moral hazard. For example, wholesale prices above marginal cost coupled with reduced fixed fees can

- Insure risk averse retailers against low revenues (e.g., Rey and Tirole, 1986),
- Reduce retailers’ rents from private information (e.g., Martimort, 1996),
- Promote non-contractible investment by manufacturers (Romano, 1994).\(^6\)

\(^2\)As will become clear from our review of the literature in Section 1.1, there are two distinct versions of the argument; one based on secret contracts (our analysis is closest to this version), and one based on the absence of retail competition (our model includes this as a special case).

\(^3\)Unilever/Sara Lee Body Care, Case no COMP/M.5658 (2010). See also; e.g., the UK Competition Commission’s decision in Barr/Britvic (2013), and the Norwegian Competition Authority’s decision in Orkla/Cederroth (2015).

\(^4\)See; e.g., the UK Competition Commission’s decision in Barr/Britvic (2013), and the Norwegian Competition Authority’s decision in Orkla/Cederroth (2015).

\(^5\)Linear contracts are inefficient; e.g., because they create double marginalization (Spengler, 1950).

\(^6\)In addition, a burgeoning literature in behavioral contract theory, reviewed by Közegi (2014),
This paper brings such agency considerations into the study of upstream mergers. Our analysis has a simple and robust takeaway: As long as bilateral contracts are not completely frictionless, upstream horizontal mergers create unilateral incentives for higher wholesale and consumer prices. On the other hand, we show that the standard method’s second thesis—a high diversion ratio between brands implies a large price increase—does not readily transfer to vertically related markets.

Our modeling approach draws on recent advances in the theory of vertical relations. Following Rey and Vergé (2017), we consider a model of “interlocking relationships” in which two competing retailers stock differentiated brands from two manufacturers. Each manufacturer and retailer negotiate a two-part tariff, the details of which are unobservable to outside parties. This assumption captures the fact that real-world supply contract negotiations typically take place behind closed doors.

As is well known in the literature, secret contracting gives rise to an “opportunism problem” that exerts downward pressure on equilibrium wholesale prices. The point is that although high wholesale prices would curb retail competition and raise industry profits, each manufacturer-retailer pair has an incentive to secretly cut their own price to freeride on the margins of their rivals. The usual conclusion in the literature is that manufacturers, even an upstream monopolist, end up with prices at marginal cost. The welfare neutrality of upstream mergers is a direct consequence.

The key idea in our model is that contractual frictions mitigate the opportunism problem such that equilibrium wholesale prices exceed marginal cost even if contracts are non-linear and secret. This, in turn, opens the door for anticompetitive effects of upstream mergers.

Our approach is twofold. First, following recent work by Calzolari et al. (2018), we simply assume that fixed fees are not perfectly efficient at splitting profits between manufacturers and retailers. With this reduced-form representation, which easily accommodates general demand functions and retail competition in prices as well as quantities, we show that upstream mergers create unilateral incentives to raise prices as soon as (pre-merger) wholesale prices are distorted upwards, irrespective of the exact reason why they are. This model thus suggests that our main insight is robust and applicable in a wide range of cases.

Digging deeper into the subject, we next present a more structured model that studies how behavioral biases (loss aversion, present bias ...) create contractual frictions. Gabrielsen et al. (forthcoming) show also that positive wholesale margins for content may be required to internalize network effects in two-sided markets.

combines elements of risk sharing and screening. In this context, retailers are risk averse and obtain private information about whether demand is high or low after having signed their contracts. Optimal menus of two-part tariffs provide retailers with insurance and at the same time induce truth-telling. This requires a wholesale price above marginal cost in the low demand state, where an upstream merger again raises prices (while marginal cost pricing always prevails in the high demand state). The price increase is larger if brands are close substitutes, as in a standard Bertrand-Nash model. In our setting, however, the magnitude of the price increase depends not only on the diversion ratio between brands, but also on the intensity of retail competition. In particular, we find that fierce retail competition mitigates the merger’s anticompetitive effect for any upstream diversion ratio. The intuition is as follows. Wholesale prices in the low demand state are above cost to reduce the retailers’ information rents. These rents, however, fall also with the level of downstream competition, as intense competition dissipates retail flow profits. All else equal, the incentive to distort wholesale price upwards is therefore weaker both before and after the merger. As retail competition becomes even harder, wholesale prices in both cases converge to marginal cost, and the merger’s consumer welfare effect to zero.

We do not propose a new method for estimating price effects of upstream mergers. Our model makes use of parameters that are hard to observe and quantify in reality, such as risk preferences and demand volatility. Nevertheless, we hope that our paper can contribute to a more accurate assessment of upstream horizontal mergers. On one hand, we show that the neutrality argument voiced in Unilever/Sara Lee and several other recent cases hinges on contracts being perfectly frictionless. In practice, this suggests that the efficient contract defense should be met with skepticism even if merging parties can substantiate that their contracts are non-linear and negotiated in private. Positive per-merger wholesale margins should always alert antitrust authorities to the potential for anticompetitive effects. On the other hand, we illustrate that even if an upstream merger creates unilateral incentives of the usual type, the vertical aspect should not be disregarded. For example, our result about retail competition highlights the value of methods for estimating cross-price elasticities that can disentangle the role of brand and retail substitution in scanner or survey data.

The paper now goes as follows. We start by explaining our contribution to the literature. Section 2 then outlines the basic framework and discusses our contracting game. Section 3 presents our main insight with a reduced-form representation. Section 4 sets up a structured model that permits a deeper look into the mechanisms, and that scrutinizes the effect of retail competition. Section 5 concludes.
1.1 Related literature

Our main contribution is to the theoretical literature on upstream mergers. In a seminal paper, Horn and Wolinsky (1988) consider a model in which two independent upstream firms supply exclusive yet competing retailers. These authors find that an upstream merger is anticompetitive when firms engage in Nash-bargaining over linear wholesale contracts. Ziss (1995) obtains a similar result when the upstream firms offer observable two-part tariffs. None of these results, however, survive the more convincing assumption that contracts are both non-linear and unobservable. In that case, Fumagalli and Motta (2001) and Nilsen et al. (2016) find that upstream mergers are consumer welfare neutral, whereas Milliou and Petrakis (2007) find even that prices can fall if retailers compete in quantities. By adding some contractual frictions, we can accommodate the possibility of non-linear and unobservable contracts without throwing the baby out with the bathwater.

Another important paper that develops the efficient contracting argument is O’Brien and Shaffer (2005). They study a model in which several manufacturers negotiate non-linear tariffs with a single retailer (“common agency”). In this context, marginal cost wholesale pricing on all brands makes the retailer a residual claimant on industry profits, and thus leads to monopoly retail prices (O’Brien and Shaffer, 1997; Bernheim and Whinston, 1998). O’Brien and Shaffer (2005) show that this pricing pattern prevails both before and after an upstream merger. Our model has common agency as a special case (when retailers serve independent markets), in which an upstream merger raises prices as long as contracts are distorted.

We know one other paper that relates upstream mergers to retail risk aversion and demand uncertainty. Baye et al. (2018) focus on how consumer one-stop shopping behavior and retail buyer power affect upstream firms’ incentive to merge. In their setting, however, an upstream merger reduces wholesale prices due to the presence of one-stop-shoppers (see their Lemma 1 for details). This mechanism is entirely different from the unilateral incentives in our model. It is hard to compare our results to theirs also because their manufacturers produce independent goods, in which case a merger proposal would not normally raise antitrust concerns. Finally, Baye et al. (2018) do not consider retail competition nor second-best insurance through menu contracts.

We also contribute to the literature on interlocking relationships. This literature takes on the important task of extending insights about vertical relations from settings with upstream or downstream monopoly or exclusive retailers to the more realistic set-

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8 Sometimes this requires that a consolidated manufacturer can offer its products as a bundle, we return to this point in Section 2.1.
ting in which competing retailers stock several brands from rival manufacturers. With public non-linear contracts, however, this framework is unstable and cumbersome to work with (see Rey and Vergé, 2010; Ramezzana, 2016). Focusing on secret negotiations avoids these issues, but also means circling in on cost-based equilibria where the impact of upstream and downstream competition is somewhat subdued (e.g., Rey and Vergé, 2017; Nocke and Rey, 2018). Our approach can be seen as a middle ground: Secret negotiations ensure stability while contractual frictions provide a springboard for economic forces.

2 Framework

We consider a vertically related market with two upstream manufacturers, \( A \) and \( B \), and two downstream retailers, 1 and 2. Brands as well as retailers are differentiated, and both retailers can stock both brands (“interlocking relationships”). Final consumers can therefore choose from a set of four differentiated products, \{A_1, B_1, A_2, B_2\}. An equivalent interpretation of the set-up is that \( A \) and \( B \) supply inputs to 1 and 2, who produce differentiated final goods with one-to-one technologies.

Manufacturers produce their brands at constant and symmetric marginal costs \( c_A = c_B = c \geq 0 \). In case of an upstream merger, we assume that the consolidated manufacturer’s marginal cost is also \( c \); i.e., we do not consider efficiency gains from the merger. For simplicity, we normalize all retail costs to zero.

Throughout the paper, we assume that manufacturers and retailers negotiate two-part tariffs, and that retailers compete à la Bertrand in the final market. The specific assumptions on contracts and consumer demand in the reduced-form and structured models will be laid out at the start of Sections 3 and 4, respectively.

2.1 Contracting game and solution concept

Contract negotiations are secret. Specifically, we assume that each manufacturer-retailer pair chooses supply terms to maximize their (expected) bilateral profit, taking as given i) the retailer’s pricing strategy and contract with the rival manufacturer, and ii) the rival retailer’s pricing strategy and contracts with both manufacturers. In addition, the supply terms must satisfy any relevant constraints on the firms’ profits (i.e., incentive compatibility and/or participation constraints).

It is well known that modeling of secret contracting raises complex issues with respect to the framework’s solution concept.\(^9\) Our approach falls in under the notion

\(^9\)For example, with retail competition à la Bertrand, perfect Bayesian equilibria with “passive
of a “bargaining equilibrium,” which is the leading concept in the recent theoretical and empirical literature. On the theoretical side, this approach was pioneered by Crémer and Riordan (1987) and Horn and Wolinsky (1988), and has recently been put on firmer grounds by Collard-Wexler et al. (forthcoming). In the vertical relations literature, the concept has been developed by O’Brien and Shaffer (1992) in the context of upstream monopoly, and by Rey and Vergé (2017) for upstream oligopoly. In the empirical literature, the method has proved useful in structural models of vertically related industries. These models often assume linear contracts as a shorthand way of creating double marginalization effects. Topics recently tackled with this approach include price discrimination on medical equipment (Grennan, 2013), price effects of horizontal mergers among hospitals (Gowrisankaran et al., 2015), competition among health insurance companies (Ho and Lee, 2017), and bundling and vertical integration in multichannel television markets (Crawford and Yurukoglu, 2012; Crawford et al., 2018).

The key property of any bargaining equilibrium is that all bilateral pairs of firms maximize their joint profits taking all other contracts as fixed, and then split these profits according to a given sharing rule (e.g., relative bargaining power in the asymmetric Nash-sense). For tractability reasons, we will simply allow manufacturers to make take-it-or-leave-it offers, and not consider comparative statics on the sharing parameter.\(^{10}\) Note, however, that i) retailers still earn positive equilibrium profits because of their position as gatekeepers to the final market, and ii) because of contractual frictions, manufacturers and retailers are unable to disentangle the maximization of joint profits from the question of profit distribution.

In case of an upstream merger, we will allow the merged manufacturer to bundle its products and negotiate a single contract for the bundle (with a single fixed fee). The reason is as follows. If bundling were prohibited, the fact that the merged firm has two brands would in itself create an incentive to distort wholesale prices. Intuitively, a multi-product manufacturer that cannot bundle sets wholesale prices above cost to reduce the rent her retailer can extract by threatening to drop one brand (Shaffer, 1991).\(^{11}\) Obviously, this incentive is absent in the pre-merger situation. By permitting bundling, therefore, we ensure an apples-to-apples comparison of contractual frictions

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\(^{10}\)Recent vertical restraint models with such a solution concept include Montez (2015) and Gabrielsen and Johansen (2017); see also Ho (2009) and Bonnet and Dubois (2010) for empirical applications.

\(^{11}\)This distortion is the source of O’Brien and Shaffer’s (2005) Proposition 3, which says that upstream mergers can, in fact, raise wholesale and retail prices when bundling is infeasible.
in the pre- and post-merger equilibria.

3 Reduced-form representation

In this section, we use a reduced-form representation of contractual frictions to illustrate our main idea in a simple manner. A common feature of any friction in a bilateral contract (risk sharing, screening, upstream moral hazard ...) is the inefficiency of relying solely on fixed fees for profit distribution. For example, a risk averse retailer will require compensation (i.e., a risk premium) for paying an upfront fixed fee when final revenues are uncertain. As a shorthand way of capturing any such imperfection, we follow Calzolari et al. (2018) by directly assuming that fixed fees are “costly.” For any fee $F_{ij}$ paid to manufacturer $i$, retailer $j$ loses $(1 + \mu) F_{ij}$, where $\mu \geq 0$. The parameter $\mu$ measures the magnitude of the imperfection but has little intuitive meaning otherwise. In the words of Calzolari et al. (2018, p. 13), this approach permits focus “on the consequences rather than the causes of imperfect rent extraction.”

Let $D_{ij}(p)$ be the direct demand for brand $i \in \{A, B\}$ at retailer $j \in \{1, 2\}$, in which $p = (p_{A1}, p_{B1}, p_{A2}, p_{B2})$ is the vector of retail prices. Throughout the paper, we mark equilibrium values with upper bars, and $x_{-ij}$ means vector $x$ without element $ij$. We make the following assumptions on demand.

- The function $D_{ij}$ is twice continuously differentiable and has a negative own price effect, $\partial D_{ij}/\partial p_{ij} < 0$, and positive but weaker cross-price effects, $\partial D_{ij}/\partial p_{hj} > 0$ for $h \neq i \in \{A, B\}$, and $\partial D_{ij}/\partial p_{ik} > 0$ for $k \neq j \in \{1, 2\}$.

- There exists a unique retail pricing equilibrium defined by the retailers’ first order conditions for any vector of wholesale prices. In this equilibrium, $p_{ij}^R(w_{ij}, w_{-ij})$ is retailer $j$’s best-response to wholesale price $w_{ij}$ when all other products have wholesale price $\bar{w}$. Finally, $\partial p_{ij}^R/\partial w_{ij} > 0$ for all $w_{ij}$.

Consider first the pre-merger situation, and the contract negotiation between manufacturer $i$ and retailer $j$. Besides $p_{ij}^R(w_{ij}, \bar{w}_{-ij})$ (hereafter $p_{ij}^R$ for short), the firms take the equilibrium contracts and prices on all other products as given. The manufacturer’s objective function in this negotiation is therefore

\[
(w_{ij} - c) D_{ij}(p_{ij}^R, \bar{p}_{-ij}) + F_{ij} + (\bar{w}_{ik} - c) D_{ik}(p_{ij}^R, \bar{p}_{-ij}) + \bar{F}.
\]

12See Rey and Vergé (2017, p. 8) for the formal underpinnings of this assumption.

13There is a slight abuse of notation here, in that we write $D_{ik}(p_{ij}^R, \bar{p}_{-ij})$ instead of $D_{ik}(\bar{p}_{ik}, \bar{p}_{hk}, p_{ij}^R, \bar{p}_{hj})$. We will do this throughout the paper to simplify the exposition.
Furthermore, for retailer \( j \) to be willing to sign a contract with manufacturer \( i \), it has to be the case that
\[
(p^R_{ij} - w_{ij}) D_{ij} (p^R_{ij}, \overline{p}_{-ij}) + (p_{hj} - \overline{w}_{hj}) D_{hj} (p^R_{ij}, \overline{p}_{-ij}) - (1 + \mu) (F_{ij} + \overline{F}_{hj}) \geq \pi^O_j (\overline{w}_{-ij}) - (1 + \mu) \overline{F}_{hj},
\]
where \( \pi^O_j (\overline{w}_{-ij}) \) is the retailer’s flow profit from selling only brand \( h \neq i \) (i.e., her outside option). Because we allow the manufacturer to extract her full incremental contribution to the retailer’s profit, this participation constraint will hold with equality. The fixed fee paid by retailer \( j \) to manufacturer \( i \) is therefore

\[
F_{ij} = \frac{1}{1 + \mu} \left( (p^R_{ij} - w_{ij}) D_{ij} (p^R_{ij}, \overline{p}_{-ij}) + (p_{hj} - \overline{w}_{hj}) D_{hj} (p^R_{ij}, \overline{p}_{-ij}) - \pi^O_j (\overline{w}_{-ij}) \right)
\]

Let us now substitute \( F_{ij} \) into the manufacturer’s objective, and take the first order condition with respect to \( w_{ij} \) (dropping function arguments for brevity):

\[
0 = D_{ij} + (w_{ij} - c) \frac{\partial D_{ij}}{\partial p_{ij}} \frac{\partial p^R_{ij}}{\partial w_{ij}} + \left( \frac{1}{1 + \mu} \right) \left( -D_{ij} + \frac{\partial p^R_{ij}}{\partial w_{ij}} \left( D_{ij} + (p^R_{ij} - w_{ij}) \frac{\partial D_{ij}}{\partial p_{ij}} + (p_{hj} - \overline{w}_{hj}) \frac{\partial D_{hj}}{\partial p_{ij}} \right) \right) = 0 \text{ in equilibrium}
\]

where the last parentheses equal zero because of the retailer’s first order condition for \( p_{ij} \) (i.e., the envelope theorem). Let \( \overline{p}_{ij} = p_{ij}^R (\overline{w}_{ij}, \overline{w}_{-ij}) \), and \( \overline{D}_{ij} = D_{ij} (\overline{p}) \). We can then rearrange the above condition, evaluated in \( \overline{w}_{ij} \), as follows

\[
\frac{\partial \overline{p}_{ij}}{\partial w_{ij}} \left( (\overline{w}_{ij} - c) \frac{\partial D_{ij}}{\partial p_{ij}} + (\overline{w}_{ik} - c) \frac{\partial D_{ik}}{\partial p_{ij}} \right) + \frac{\mu}{1 + \mu} \overline{D}_{ij} = 0. \tag{1}
\]

An equilibrium in wholesale prices is characterized by condition (1) being satisfied in all four bilateral negotiations simultaneously. This equation system has a unique solution, which shows that the wholesale margin on brand \( i \in \{A, B\} \) at retailer \( j \neq k \in \{1, 2\} \) is implicitly defined as

\[
\overline{w}_{ij} - c = \frac{\mu}{1 + \mu} \left( \frac{\partial D_{ik}}{\partial p_{ij}} \frac{\partial D_{ij}}{\partial w_{ij}} - \frac{\partial D_{ik}}{\partial p_{ij}} \frac{\partial D_{ik}}{\partial w_{ik}} \overline{D}_{ij} \right) > 0, \tag{2}
\]

as long as \( \mu > 0 \), and where the positivity of the last term on the right hand side
follows directly from our demand assumptions. Equation (2) shows that marginal cost pricing is not bilaterally optimal when fixed fees are costly, even though contracts are negotiated in private. We will return to this mechanism in Section 4, where the added structure on the model produces a stronger intuition.

Consider now the post-merger situation. We can write the consolidated manufacturer’s objective when negotiating retailer \( j \)’s terms on the \( AB \)-bundle as

\[
\begin{align*}
\sum_{i,h \in A,B} (w_{ij} - c) D_{ij} (p_{ij}^R, p_{hj}^R, \bar{p}_{-j}) + \sum_{i,h \in A,B} (w_{ik} - c) D_{ik} (p_{ij}^R, p_{hj}^R, \bar{p}_{-j}) + F_j,
\end{align*}
\]

where \( \bar{p}_{-j} \) contains retailer \( k \)’s equilibrium prices. Retailer \( j \) has no outside option in these negotiations, so the participation constraint is simply

\[
\sum_{i,h \in A,B} (p_{ij}^R - w_{ij}) D_{ij} (p_{ij}^R, p_{hj}^R, \bar{p}_{-j}) - (1 + \mu) F_j \geq 0.
\]

The fixed fee for the bundle is therefore

\[
F_j = \frac{1}{1 + \mu} \sum_{i,h \in A,B} (p_{ij}^R - w_{ij}) D_{ij} (p_{ij}^R, p_{hj}^R, \bar{p}_{-j}).
\]

It is now straightforward to substitute \( F_j \) into the consolidated manufacturer’s objective and exploit the retailer’s first order conditions as above. We can write the merged firm’s first order condition for \( w_{ij} \), evaluated in \( \bar{w} \), as

\[
\begin{align*}
\frac{\partial p_{ij}}{\partial w_{ij}} \sum_{i \in A,B} \sum_{j \in 1,2} \frac{\partial p_{ij}}{\partial p_{ij}} + \frac{\mu}{1 + \mu} \bar{D}_{ij} = 0.
\end{align*}
\]

Let us now consider the merger’s effect on pricing incentives. Farrell and Shapiro’s (2010) basic logic is as follows: Subtract the pre-merger first order conditions from the post-merger first order conditions, and evaluate the difference at pre-merger prices. If you get a positive number, the merger creates unilateral incentives to raise prices. By the left hand sides of (1) and (3) we have

\[
\begin{align*}
\frac{\partial p_{ij}}{\partial w_{ij}} \sum_{i \in A,B} \sum_{j \in 1,2} \left( \frac{\partial D_{ij}}{\partial p_{ij}} \right) + \frac{\mu}{1 + \mu} \bar{D}_{ij} - \\
\left( \frac{\partial p_{ij}}{\partial w_{ij}} \left( \frac{\partial D_{ij}}{\partial p_{ij}} \right) + \frac{\mu}{1 + \mu} \bar{D}_{ij} \right),
\end{align*}
\]

Pre-merger FOC for \( w_{ij} \)

Post-merger FOC for \( w_{ij} \)
which reduces to
\[
\frac{\partial p_{ij}}{\partial w_{ij}} \sum_{j \in \{1,2\}} (w_{hj} - c) \frac{\partial D_{hj}}{\partial p_{ij}}.
\)

This equation says that a consolidated manufacturer, in contrast to a single manufacturer, prices with an eye on diversion to the other product both within and between stores; i.e., products \(jh\) and \(jk\) when setting \(w_{ij}\). Because we know from (2) that the pre-merger equilibrium margin in positive, it follows that (4) is also positive.

**Proposition 1.** A horizontal merger between manufacturers who bargain over secret two-part tariffs gives higher wholesale and retail prices as long as \(\mu > 0\).

The result is entirely driven by the fact that fixed fees are not perfectly efficient, which calls for positive wholesale margins on all products. With positive margins, price cuts that divert sales are costly. The merged firm therefore negotiates prices that account for cannibalization between retailers and brands. Pre-merger, in contrast, each manufacturer-retailer pair ignores the rival manufacturer’s margins: \(A\) and 1, for example, internalize the effect of \(w_{A1}\) on \(D_{A2}\), but not on \(D_{B1}\) and \(D_{B2}\). The merger therefore raises prices, and, all else equal, reduces consumer welfare.

**Remark: Cournot competition.** Proposition 1 easily extends to the case in which retailers compete in quantities. Following the same steps as above (given standard assumptions on inverse demand), it is easy to show that the pre-merger equilibrium wholesale margin for \(i \in \{A,B\}\) at retailer \(j \in \{1,2\}\) now is
\[
\overline{w}_{ij} - c = \frac{\mu}{1 + \mu - \frac{\partial q_{ij}}{\partial w_{ij}}} > 0,
\]
where \(\overline{q}_{ij}\) is retailer \(j\)’s equilibrium quantity of brand \(i\); a decreasing function of \(w_{ij}\). Furthermore, an equivalent expression to (4) is
\[
(\overline{w}_{hj} - c) \frac{\partial q_{hj}}{\partial w_{ij}},
\]
which is positive as long as \(\mu > 0\) (from (5)), and given that \(\partial q_{hj}/\partial w_{ij} > 0\).

Vis-a-vis the Bertrand model, the main difference in the Cournot case is that firms do not internalize intra-brand competition, neither before nor after the merger. For example, now manufacturer \(A\) and retailer 1 do not internalize the effect of \(w_{A1}\) on \(D_{A2}\) in the pre-merger equilibrium. The underlying intuition is that the manufacturer’s objective function is fully separable in \(w_{A1}\) and \(w_{A2}\) in the Cournot case (on this,
see Rey and Vergé, 2004). Still, the merger is raises prices because the merged firm internalizes inter-brand competition (i.e., the effect of $w_{A1}$ on $D_{B1}$).

4 A model of risk sharing and screening

In this section, we abandon the reduced-form representation (i.e., $\mu = 0$ hereafter) in favor of a model that creates contractual frictions from primitive assumptions on preferences and information. Specifically, we consider an environment in which the retailers are risk averse and initially uncertain about consumer demand for the manufacturers’ brands. After negotiating their contracts, however, the retailers obtain private information about the state. This is known as a “hidden information” model in the principal-agent literature (see Laffont and Martimort, 2002, Section 2.12). In this setting, the tension between insurance provision and information revelation creates contractual frictions, that in turn have implications for upstream merger analysis.

To make formulas for prices, fixed fees, etc. easy to gaze and interpret, we will hereafter work with linear demand functions. Specifically, let

$$D_{ij}(\theta, p) = \theta - \frac{p_{ij} - \alpha p_{hj} - \beta p_{hk} + \alpha \beta p_{hk}}{1 - \alpha - \beta + \alpha \beta},$$

be the direct demand for brand $i \neq h \in \{A, B\}$ at retailer $j \neq k \in \{1, 2\}$. The parameter $\alpha \in (0, 1)$ measures the closeness of substitution or the diversion ratio between brands. The parameter $\beta \in (0, 1)$ measures consumers’ willingness to substitute between retailers. Higher values of $\alpha$ and $\beta$ mean closer substitution, and fiercer competition. Note that this demand system is in the spirit of Shubik and Levitan (1980); for example in having the useful property that total demand is invariant to the diversion ratio if all brands have the same price.\(^{14}\)

The state of demand is given by the random variable $\theta$. For simplicity, we assume that $\theta$ can take two values, $\theta = H$ or $\theta = L$ (high or low demand, respectively), with equal probability. The difference $\lambda \equiv H - L \geq 0$ measures the amount of demand variability, where $\lambda = 0$ means no uncertainty. To ensure that production is always positive in both states, we also require that $L$ is not too small relative to $H$ and $c$, specifically $L \geq \frac{1}{3 - \beta} (H - (2 - \beta) c)$. The parameter $\theta$ is unknown to all firms at the outset of the game, but is observed by the retailers before downstream competition takes place.

The focus on risk averse retailers is warranted; e.g., because retailers can inherent\(^{14}\) For any given price $p$, we have $D_{ij} = \theta - \frac{p - \alpha p + \beta p + \alpha \beta p}{1 - \alpha - \beta + \alpha \beta} = \theta - \frac{1}{1 - \alpha - \beta + \alpha \beta} (1 - \alpha - \beta + \alpha \beta) p = \theta - p$.\(^{12}\)
their manager’s risk aversion.\footnote{See; e.g., Banal-Estañol and Ottaviani (2006) for a good discussion of the evidence for risk averse firm behavior.} Recently, Nocke and Thanassoulis (2014) show also that risk aversion can arise endogenously if retailers want to invest in the future but face credit constraints in the present. For simplicity, we will consider the extreme (or “infinite”) type of risk aversion, in which the retailers only care about the worst-case scenario $\theta = L$ in negotiations with each manufacturer. This is the same assumption as in; e.g., Rey and Tirole (1986). We maintain that manufacturers are risk neutral, which allows us to abstract from any direct risk management incentives for horizontal mergers (on this, see Banal-Estañol and Ottaviani, 2006).

We will also allow manufacturers and retailers to negotiate menus of two-part tariffs. With two demand states, a menu with two options offers better insurance than a uniform two-part tariff. We should therefore expect each manufacturer-retailer pair to negotiate a menu in equilibrium. Formally, let $(w^H_{ij}, F^H_{ij})$ and $(w^L_{ij}, F^L_{ij})$ be the wholesale prices and fixed fees on product $ij$ intended for state $H$ and $L$, respectively. We assume that manufacturer $i$ and retailer $j$ agree on the menu at the first stage before $\theta$ is known, and that retailer $j$ chooses one of the options after observing the demand state.\footnote{If manufacturers also learned $\theta$ ex post, the firms could, in principle, negotiate contracts with fixed fees contingent on the state of demand. However, we rarely observe such contracts in reality, probably because it is prohibitively costly to verify demand conditions and enforce the contracts. We therefore explicitly rule out state-contingent contracts by assuming that only the retailers learn $\theta$.} Finally, we assume that the retailer’s choice from the menu is unobservable to the manufacturer, and to outside firms.

In the following, we will restrict attention to symmetric bargaining equilibria (i.e., $w_{ij} = w$ for $i \in \{A,B\}$ and $j \in \{1,2\}$) in which all brands obtain distribution. Given the demand function in (7), it is easy to show that there exists a unique equilibrium with these properties. Focusing on this equilibrium from the outset greatly simplifies the exposition.

### 4.1 Preliminaries: retail prices and outside options

In this section, we derive two important building blocks for the merger analysis. For given wholesale prices, we need i) the retail price equilibrium and retail flow profits with interlocking relationships, and ii) a retailer’s flow profit when selling only one brand (i.e., her outside option). These expressions have the same form in both demand states, so we simply suspend superscripts $H$ and $L$ until Section 4.2.
4.1.1 Retail prices and flow profits with interlocking relationships

In this situation, retailer $j$’s variable profit for wholesale prices $(w_{ij}, w_{hj})$ is

$$\pi_j (\theta, p) = (p_{ij} - w_{ij}) D_{ij} (\theta, p_{ij}, \overline{p}_{-ij}) + (p_{hj} - w_{hj}) D_{hj} (\theta, p_{hj}, \overline{p}_{-hj}).$$

The best-response function for $p_{ij}$, given the demand in (7), is

$$p_{ij}^R (\theta, w_{ij}) \equiv \arg \max_{p_{ij}} \pi_j (\theta, p) = \frac{(1 - \beta) \theta + w_{ij} + \beta \overline{p}_{hj}}{2}. \quad (8)$$

In a symmetric bargaining equilibrium, every brand will be sold at a symmetric wholesale price $w_{ij} = \overline{w}$. It will also be the case that $p_{ij}^R (\theta, \overline{w}) = \overline{p}_{ij}$. We solve this equation system given (8), and get the symmetric retail price

$$\overline{p} = \frac{(1 - \beta) \theta + \overline{w}}{2 - \beta}. \quad (9)$$

We note in passing that equation (9) gives us the pass-through rate of the equilibrium wholesale price to the equilibrium retail price:

$$\frac{\partial \overline{p}}{\partial \overline{w}} = \frac{1}{2 - \beta} \equiv \tau \in \left(\frac{1}{2}, 1\right). \quad (10)$$

Furthermore, given that the equilibrium wholesale price is $\overline{w}$, and that the retailer expects the other brands to be bought at $\overline{w}$ and sold at $\overline{p}$, we can set $\overline{p}_{hj} = \overline{p}$ in (8) to get

$$\overline{p}_{ij} (\theta, w_{ij}, \overline{w}) = \frac{(1 - \beta) 2\theta + (2 - \beta) w_{ij} + \beta \overline{w}}{2 (2 - \beta)}. \quad (11)$$

Let $\overline{p}$ be the vector of prices as in (11). The retailer’s flow profit from selling both products is then $\pi_j (\theta, \overline{p})$, or

$$\pi_j (\theta, w_{ij}, \overline{w}) = \frac{(1 - \alpha) (1 - \beta) 4\theta (2\theta - 2w_{ij} - 2\theta \beta + \beta \overline{w})}{4 (1 - \alpha) (1 - \beta) (2 - \beta)^2} \times \frac{(2 - \beta)^2 w_{ij}^2 + 2 (2 - \beta) (2\alpha \beta - 2\alpha - \beta) w_{ij} \overline{w}}{4 (1 - \alpha) (1 - \beta) (2 - \beta)^2} \times \frac{(1 - \alpha) (1 - \beta) (3\beta - 2) 4\theta \overline{w} - (8\beta - 4\alpha \beta + 4\alpha \beta^2 - 5\beta^2 - 4) \overline{w}^2}{4 (1 - \alpha) (1 - \beta) (2 - \beta)^2}.$$
4.1.2 Retailers’ outside options

Note first that, as we have assumed that the retailers’ contract acceptance decisions are unobservable, retailer $k$ would not observe retailer $j$’s delisting decision, and therefore $j$ should expect $k$ to keep charging $\bar{p}$ for both her products. Second, we define $\rho_{ij}$ as retailer $j$’s “virtual” price on product $i$; i.e., the price that corresponds to zero demand for this product:

$$D_{ij} (\theta, \rho_{ij}, p_{hj}, \bar{p}, \bar{p}) = 0,$$

or

$$\rho_{ij} (\theta, \bar{w}, p_{hj}) = \frac{(1 - \alpha) ((1 - \beta) 2\theta + \beta \bar{w}) + \alpha (2 - \beta) p_{hj}}{2 - \beta}. \quad (12)$$

Taken together, these observations mean that if retailer $j$ drops product $i$, the optimal price on brand $h$ is

$$\arg \max_{p_{jh}} (p_{jh} - w_{jh}) D_{ij} (\theta, \rho_{ij} (\theta, \bar{w}, p_{hj}), p_{hj}, \bar{p}, \bar{p}),$$

which it turns out equals $\tilde{p}_{jh} (\theta, w_{ij}, \bar{w})$ as defined by Equation (11). It is not surprising that the delisting decision does not affect the optimal price $\tilde{p}_{jh}$, since $\tilde{p}_{jh}$ is independent of $w_{ij}$, and the retailer still expects the rival’s brands to retail at $\bar{p}$. Finally, by inserting $\tilde{p}_{jh}$ as well as (9) and (12) into the retailer’s objective, we get that her variable profit in case she drops product $i$ is

$$\pi^O_j (\theta, w_{hj}, \bar{w}) = \frac{(1 + \alpha) ((2 - \beta) w_{hj} - (1 - \beta) 2\theta - \beta \bar{w})^2}{4 (1 - \beta) (2 - \beta)^2}. \quad (13)$$

The intuition behind expression (13) is simply that the retailer can extract rents from each manufacturer (in the pre-merger situation only) by threatening to sell the rival’s brand exclusively. The more differentiated are brands (higher $\alpha$), the more potent is this threat, as is easily seen in the numerator of Equation (13).

4.2 Pre-merger equilibrium

Consider now the negotiations between manufacturer $i$ and retailer $j$. The firms need to agree on a contract that ensures that retailer $j$ first accepts to stock brand $i$, and then truthfully reports the demand state. This latter requirement translates into several incentive compatibility constraints. At the equilibrium, the relevant constraint is the
one that ensures that retailer \( j \) picks \((w_{ij}^H, F_{ij}^H)\) if \( \theta = H \); i.e., \(^{17}\)

\[
\pi_j (H, w_{ij}^H, \overline{w}^H) - F_{ij}^H - \overline{F}_{hj}^H \geq \pi_j (H, w_{ij}^L, \overline{w}^H) - F_{ij}^L - \overline{F}_{hj}^H. \tag{IC_H}
\]

This constraint will hold with equality in equilibrium, which implies

\[
F_{ij}^H = \pi_j (H, w_{ij}^H, \overline{w}^H) - \pi_j (H, w_{ij}^L, \overline{w}^H) + F_{ij}^L.
\]

Furthermore, at the outset, retailer \( j \) will only accept to stock brand \( i \) (conditional on later picking the right contract from the menu) as long as \(^{18}\)

\[
\pi_j (L, w_{ij}^L, \overline{w}^L) - F_{ij}^L - \overline{F}_{hj}^L \geq \pi_j (L, \overline{w}^L, \overline{w}^L) - \overline{F}_{hj}^L. \tag{IR}
\]

---

By standard arguments (e.g., Laffont and Martimort, 2002, Section 2.12), the corresponding constraint for picking \((w_{ij}^L, F_{ij}^L)\) if \( \theta = L \) does not bind.

Furthermore, there are two additional constraints, one in each demand state, because retailer \( j \) can pick the wrong contract also from manufacturer \( h \)'s menu. However, with our linear demand specification, it is straightforward to show that such “double-sided” deviations are never more profitable than deviating vis-a-vis only manufacturer \( i \). To see this formally, note that in a symmetric equilibrium, and for the state of high demand, the incentive constraint for a double-sided deviation can be written as

\[
\frac{\pi_j (H, \overline{w}^H)}{2} \geq F_{ij}^H - F_{ij}^L. \tag{IC_H}
\]

\( IC_H \) above can be written as

\[
\frac{\pi_j (H, \overline{w}^H)}{2} \geq F_{ij}^H - F_{ij}^L. \tag{IC_H}
\]

If \( S < D \), then if the first condition holds, so will the last one. Given the demand in (7), we find

\[
D - S = \alpha \frac{(\overline{w}^H - \overline{w}^L)^2}{4 (1 - \alpha) (1 - \beta)} \geq 0,
\]

which implies that \( IC_H \) is the only binding high demand constraint.

---

An implicit assumption in \( IR \) is that retailer \( j \), in case of no agreement with manufacturer \( i \), will pick the right contract from her menu with manufacturer \( h \). It can be easily checked ex-post that this is true in equilibrium given the linear demand specification. Formally, given Equation (17) below, we have

\[
\pi_O (L, \overline{w}_N^L, \overline{w}_N^L) - F_N^L \geq \pi_O (L, \overline{w}_N^H, \overline{w}_N^L) - F_N^H \iff
\]

\[
\left( \frac{4 (1 + \alpha) (1 - \beta) (H - c) + 2 H (\beta^2 - \alpha^2) + \alpha^2 (2 - \beta) L + \beta (\alpha^2 H - 2 \beta c)}{2 \alpha^2 \beta - 2 \beta^2} \right) \geq 0
\]

As the LHS falls in \( c \), we check for \( c = L \) (the highest cost that justifies production if \( \theta = L \)). This gives

\[
(4 (1 - \beta) (1 + \alpha) + 2 \beta^2 + \alpha^2 \beta - 2 \alpha^2) \lambda \geq 0,
\]

which holds in the entire parameter space.
In particular, this participation constraint must hold if \( \theta = L \) because of retailer \( j \)'s risk aversion. This constraint will also bind in equilibrium, such that
\[
F^L_{ij} = \pi_j \left( L, w^L_{ij}, \bar{w}^L \right) - \pi^O_j \left( L, \bar{w}^L, \bar{w}^L \right).
\]
(14)

Together with the incentive constraint, this implies
\[
F^H_{ij} = \pi_j \left( H, w^H_{ij}, \bar{w}^H \right) + \pi_j \left( L, w^L_{ij}, \bar{w}^L \right) - \pi^O_j \left( L, \bar{w}^L, \bar{w}^L \right) - \pi_j \left( H, w^L_{ij}, \bar{w}^H \right),
\]
(15)

where the last term is retailer \( j \)'s potential flow profit gain from picking \((w^L_{ij}, F^L_{ij})\) if \( \theta = H \) (akin to an “information rent”).

Let \( D_{ij}(\theta, \tilde{p}_{ij}(\theta, w_{ij}, \bar{w}), \bar{p}_{-ij}) = D_{ij}(\theta, w_{ij}, \bar{w}) \) be the derived demand for product \( ij \), and let \( D_{ik}(\theta, w_{ij}, \bar{w}) \) be defined analogously. We can then write manufacturer \( i \)'s expected profit in the relationship with retailer \( j \) as
\[
\Pi_i(\theta, w^H_{ij}, w^L_{ij}, F^H_{ij}, F^L_{ij}) = \frac{1}{2} \sum_{S=H,L} \left( (w^S_{ij} - c) D_{ij}(S, w^S_{ij}, \bar{w}^S_{ij}) + F^S_{ij} + (\bar{w}^S - c) D_{ik}(S, w^S_{ij}, \bar{w}^S_{ij}) + F^S_{ik} \right)
\]

By maximizing this function with respect to \((w^H_{ij}, w^L_{ij})\) subject to (14) and (15), and solving the resulting first-order conditions given the symmetry requirements \( w^H_{ij} = \bar{w}^H = w^H_N \) and \( w^L_{ij} = \bar{w}^L = w^L_N \) (“N” for “no merger”), we get the following result.

**Proposition 2.** Wholesale prices in the pre-merger equilibrium are
\[
w^H_N = c
\]
(16)
\[
w^L_N = c + \frac{2(1-\alpha)(1-\beta)\lambda}{2(1+\alpha)(1-\beta) + \beta^2} > c
\]
(17)

The manufacturer and retailer can provide insurance to the retailer by negotiating a relatively small fixed fee in the low demand state. Still, if this fee was too small, the retailer could not resist underreporting demand in the high state. In other words, satisfying \( IC_H \) requires that there is some risk on the retailer’s profit from an ex ante perspective. Second-best insurance against this risk can be given by raising the wholesale price above marginal cost in the low demand state, as this reduces the retailer’s exposure in an unfavorable situation. Of course, distorting the contract this way would not be worthwhile if the manufacturer could also observe the demand level, or if the two states were equal \((\lambda = 0)\). Note also that if demand turns out to be low, the
retailer could never gain by overreporting the state. Consequently, there is no need to distort the contract for the high demand state, where bilateral efficiency entails a wholesale price equal to marginal cost (i.e., “no distortion at the top”).

The underlying intuition holds, of course, also if incentive compatibility is not an issue. Suppose, as in Section 3, that each manufacturer and retailer negotiate a single two-part tariff. Setting \( w^H = w^L = w \) above and optimizing subject to \( IR \) only, it is easy to show that the symmetric equilibrium price is

\[
w_N = c + (1 - \alpha) \lambda / (2 - \beta).^{19}
\]

Again, raising the wholesale price above cost partly shifts the risk of low demand onto the manufacturer, which encourages the retailer to expand her participation. Both with menus and uniform contracts, our results reflect a general principle in the moral hazard literature; namely that a risk neutral principal cannot hire a risk averse agent on a residual claimant contract (Shavell, 1979).^{20}

Proposition 2 can also be interpreted in light of the literature on opportunism in vertical contracting (e.g., O’Brien and Shaffer, 1992; McAfee and Schwartz, 1994; Rey and Vergé, 2017). This literature makes the important point that if supply terms are private information (or negotiated sequentially), the contracting parties’ incentive to make “opportunistic” price cuts dissipates market power and profits. In our model, the opportunism problem is less extreme not because firms refrain from making price cuts, but because it is bilaterally optimal to insure retailers against the demand uncertainty. This result suggests that factors that create contractual frictions (e.g., risk aversion and uncertainty), which are seen as a nuisance in classic contract theory, might benefit the firms by restoring market power.

### 4.3 Price effects of an upstream merger

Suppose that manufacturers \( A \) and \( B \) merge. Because bundling is feasible, the merged firm and retailer \( j \) will negotiate a menu with options \( (w^H_{A_j}, w^H_{B_j}, F^H_j) \) and \( (w^L_{A_j}, w^L_{B_j}, F^L_j) \) for states \( H \) and \( L \), respectively. The incentive constraint for the high demand state is now

\[
\pi_j(H, w^H_{A_j}, w^H_{B_j}, \bar{w}^H_{-j}) - F^H_j \geq \pi_j(H, w^L_{A_j}, w^L_{B_j}, \bar{w}^H_{-j}) - F^L_j. \quad (IC_H)
\]

^{19}With uniform contracts, we can show that \( w_N > c \) holds for general demand functions, a continuum of demand states, and any concave von-Neumann Morgenstern utility function defined over retail profits (proof available on request). With menus, the result \( w^L_N > c = w^R_N \) is much harder to generalize, see Arve and Martimort (2016, pp. 3241-42) for a discussion of the underlying issues.

^{20}In the literature on risk averse firms, price formulas similar to (17) appear as early as Baron (1970). In this literature, the term after \( c \) is often called the per-unit risk premium.
After the merger, retailer \( j \) has no alternative trading partner, so the participation constraint is simply
\[
\pi_j \left( L, w^L_{A_j}, w^L_{B_j}, w^L_{-j} \right) - F^L_j \geq 0. 
\]

Assuming again that \( IC_H \) and \( IR \) are the binding constraints at the equilibrium, we get
\[
F^L_j = \pi_j \left( L, w^L_{A_j}, w^L_{B_j}, w^L_{-j} \right),
\]
and therefore
\[
F^H_j = \pi_j \left( H, w^H_{A_j}, w^H_{B_j}, w^H_{-j} \right) + \pi_j \left( L, w^L_{A_j}, w^L_{B_j}, w^L_{-j} \right) - \pi_j \left( H, w^L_{A_j}, w^L_{B_j}, w^H_{-j} \right). \tag{19}
\]

The merged firm’s objective function in the negotiations with retailer \( j \) is
\[
\Pi_{AB} \left( \theta, w^H_{A_j}, w^H_{B_j}, w^L_{A_j}, w^L_{B_j}, F^H_j, F^L_j \right) = \frac{1}{2} \sum_{i \in A, B} \sum_{S=H,L} \left( (w^S_{ij} - c) D_{ij} (S, w^S_{A_j}, w^S_{B_j}, w^S_{-j}) + F^S_{ij} + (\bar{w}^S - c) D_{ik} (S, w^S_{A_j}, w^S_{B_j}, w^S_{-j}) + F^S_{k} \right)
\]
where \( F^S_{k} \) is retailer \( k \)'s equilibrium fixed fee. To find the post-merger wholesale prices, we substitute the fixed fees in (18) and (19) and solve the first-order conditions under the symmetry assumptions \( w^H_{ij} = \bar{w}^H = w^H_M \) and \( w^L_{A_j} = \bar{w}^L = w^L_M \) (“\( M \)” for “merger”). We get
\[
w^H_M = c, \tag{20}
\]
\[
w^L_M = c + \frac{2 (1 - \beta) \lambda}{2 (1 - \beta) + \beta^2} > c. \tag{21}
\]
Just as the separated manufacturers, the upstream monopolist can sustain prices above cost in the low demand state. The intuition behind Equations (20) and (21) is the same as in the pre-merger equilibrium. Note also that it is easy to verify that the merger is profitable; i.e., that
\[
\Pi_{AB} (\theta, w_M) - (\Pi_A (\theta, w_N) + \Pi_B (\theta, w_N)) > 0
\]
in the entire parameter space. Besides the prospect of higher prices, the merger strengthens manufacturers’ bargaining position vis-a-vis the retailers, and allows the upstream sector to capture a larger share of industry profits.

We are now ready to compare prices before and after the merger. Let \( \Delta_w = w_M - w_N \) be the difference in wholesale prices, and let \( \Delta_p = \tau \Delta_w \) be the corresponding retail price effect. From (16) and (20), it follows that the merger has zero price impact in the
high demand state, $\Delta^H_w \equiv c - c = 0$, and therefore $\Delta^H_p = 0$. This finding is in line with the previous literature on upstream mergers and secret contracts. In the low demand state, however, we get from (17) and (21) that

$$\Delta^L_w = x (1 - \beta) \lambda,$$

where

$$x \equiv \frac{2 \alpha (2 - \beta)^2}{(2 - 2 \beta + \beta^2)} \frac{(2 + 2 \alpha - 2 \beta - 2 \alpha \beta + \beta^2)}{2 + 2 \alpha - 2 \beta - 2 \alpha \beta + \beta^2} > 0,$$

such that $\Delta^L_w > 0$, and thus $\Delta^L_p > 0$. In expectation, therefore, the merger raises wholesale and retail prices by $\frac{1}{2} \Delta^L_w > 0$ and $\frac{1}{2} \Delta^L_p > 0$. Note finally that

$$\frac{\partial \Delta^L_w}{\partial \beta} = -\frac{2 \alpha \beta \lambda (2 - \beta) (4 \alpha (1 - \beta)^2 + (2 - 2 \beta + \beta^2) (6 - 6 \beta + \beta^2))}{(2 - 2 \beta + \beta^2)^2 (2 - 2 \beta + 2 \alpha - 2 \alpha \beta + \beta^2)^2} < 0. \quad (23)$$

**Proposition 3.** When contractual frictions stem from risk sharing and screening, a merger between manufacturers raises (expected) wholesale and retail prices. Moreover, the price increases are larger the closer substitutes are brands, but smaller the closer substitutes are retailers.

On one hand, the hidden information model confirms our earlier intuition that the upstream merger creates unilateral incentives to raise prices. On the other hand, it delivers a novel and potentially important result about the impact of retail competition. In particular, Equation (23) above shows that retail competition mitigates the merger’s price effects when manufacturers. The intuition is this. The merger raises prices only in the low demand state, where Equations (17) and (21) show that wholesale prices exceed marginal cost. The reason to distort wholesale prices this way is to reduce the retailers’ information rents (i.e., the last right hand side terms in (15) and (19)). When retailers become close substitutes, however, these information rents are small, because the competitive pressure dissipates all retail flow profits. In turn, the incentive to distort wholesale prices is also reduced, and the difference between prices in the pre-merger and post-merger equilibria becomes smaller. In the limit when $\beta \to 1$, we see from (17) and (21) that both $w^L_N$ and $w^L_M$ go to $c$, and the upward pricing pressure disappears.

This tells us something about using retail scanner data in upstream merger analysis. In *Unilever/Sara Lee*, for example, the EU Commission used scanner data to estimate cross-price elasticities for the merger simulation model. In such oligopoly models, a
larger elasticity will, all else equal, predict a merger to be more harmful for consumers. For upstream mergers, however, this assumption is valid only insofar as brand and retail substitution – both of which are picked up in scanner data – can be expected to affect prices in the same direction. In our model, this is not necessarily the case: The parameters $\alpha$ and $\beta$ have effects with opposite signs. Thus, the reduction in consumer welfare following the merger can be non-monotonic in the industry’s degree of total substitution. To us, this reveals a new source of potential inaccuracy from applying the standard oligopoly logic on upstream mergers. In particular, our model highlights the practical value of demand estimation methods that can disentangle the roles of brand and retail substitution.

5 Concluding remarks

We are currently working on several extensions of the above framework; e.g., to consider also the effect of retail bargaining power.
References


