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# Downstream horizontal mergers and wholesale price discrimination

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## Abstract

This paper provides a theoretical model that highlights the fact that market power and/or efficiency gains associated with a downstream merger create asymmetries between merged and non-merged firms, which in turn may lead an upstream supplier to engage in price discrimination. We consider a supply chain with one supplier and three differentiated retailers that compete in a Cournot-Nash fashion. Trade is conducted via observable two-part tariffs. We assume that two retailers decide to merge. Pre-merger, all retailers obtain the same marginal wholesale price since they are identical. Post-merger, the larger merged entity – because it is more cost-efficient and it is endowed with a larger product portfolio – obtains a lower marginal wholesale price than its non-merged rival. Allocative efficiency increases and, different from existing merger theory in one-tier markets, the merger always increases consumer surplus and total welfare regardless of the magnitude of the efficiency gains.

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# 1. Introduction

Mergers and acquisitions (M&As, hereafter mergers) constitute a common business practice: mergers are announced in business press almost every day. A large number of mergers take place between firms that compete among them – horizontal mergers – and operate in supply chains. Some horizontal mergers occur downstream (the consumer-facing part of the supply chain), whereas others occur upstream (further away from the final consumer). Our focus in the present paper is on downstream horizontal mergers. Such mergers have occurred in many sectors, such as, grocery stores (e.g., *Martin McColl/Co-operative*, 2016), retail gasoline (e.g. *Rontec/Total*, 2011), pharmacies (e.g., *Celesio/Sainsbury's*, 2016), etc.

Nowadays, a large number of nations worldwide have laws or regulations which call for merger control (see, e.g., EC Horizontal Merger Guidelines (2004/03), US Horizontal Merger Guidelines (2010)). A central objective of antitrust authorities (AA), which are entrusted with the role of scrutinizing mergers, is to consider whether or not efficiency gains associated with horizontal mergers are likely to offset the enhanced market power of the merging firms.

The purpose of this paper is to provide a model that highlights the fact that market power and/or efficiency gains associated with a downstream merger create asymmetries between the merged entity and the non-merged firms (the former is larger than the latter because it sells more products and/or is more cost-efficient), which in turn may lead an upstream supplier to engage in wholesale price discrimination. Changes in the upstream supplier's pricing policy may have repercussions on the competitiveness of the downstream market.

We consider an upstream supplier that sells its product to three cost-symmetric retailers via observable two-part tariffs. Retailers are perceived by the consumers as differentiated and they compete in quantities. We assume that a horizontal merger between two retailers creates efficiency gains: the merged firm which post-merger sells two product varieties is more cost-efficient than the non-merged retailer which still sells one product. We allow the supplier to optimally discriminate among firms post-merger.[1]

We show that the downstream merger *always* increases both consumer surplus and total welfare regardless of the magnitude of the efficiency gains. This finding is in contrast to the well-known result that a merger in one-tier industries is beneficial only if it involves enough efficiency gains. In the pre-merger situation, all retailers obtain the same marginal wholesale price. Post-merger, the larger merged entity obtains a lower wholesale price than the smaller non-merged retailer, and thus allocative efficiency increases.[2] This effect, which is obviously absent in one-tier industries, is sufficiently strong so that consumer surplus and total welfare increase due to the merger even when efficiency gains are very small.

Closest to our analysis are Cho (2014) and Zhu et al. (2016) in that they also consider the welfare effects of a downstream merger that creates efficiency gains.[3] These studies assume a

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[1]As pointed out by Garcia and Janssen (2018), and also highlighted by Matsui (2018), the laws that pertain to price discrimination are *"rarely enforced when it comes to wholesale price discrimination as it may be difficult to prove that competition is harmed or (since wholesale prices are not generally observed) it may be difficult to establish that a manufacturer effectively applies wholesale price discrimination*." Indeed, there exist empirical studies that provide evidence regarding the practice of wholesale price discrimination in grocery retail markets (e.g. Villas-Boas, 2009; Yonezawa et al., 2020) and retail gasoline (Coloma, 2003), sectors in which, as noted above, horizontal mergers has occurred.

[2]The fact that the supplier will favor the larger firm under publicly observable two-part tariff contracts has been shown by Inderst & Shaffer (2009). Inderst & Shaffer (2009) consider two *ex-ante* cost-asymmetric downstream firms. In the present article, downstream firms initially have identical costs and cost asymmetries is the result of a merger that entails efficiency gains. The intuition behind our finding that the larger merged firm pays a lower marginal wholesale price is similar to theirs. See also the discussion in Section 3.

[3]See Zhu et al. (2016) for a review of the literature on horizontal mergers in vertically related markets. For the case of upstream mergers and efficiency gains see Inderst & Wey (2003) and Milliou & Pavlou (2013).

model of competing chains – with one upstream firm and one downstream firm in each chain –, and thus abstract from the issue of wholesale price discrimination. Moreover, they show that a horizontal merger is welfare-increasing only when the cost reduction exceeds a certain threshold; this result, unlike ours, is in line with merger theory in one-tier markets.

## 2. The baseline model with separate downstream firms

We consider a vertical supply chain with an upstream supplier, $U$, that produces and sells a differentiated good to consumers through three independent retailers, $R_i$, $i = 1, 2, 3$. Retailers' constant marginal production costs are identical and equal to $c > 0$. For simplicity, and with no loss of generality, we assume zero upstream marginal production costs.

Each downstream firm faces the following inverse demand function (Shubik & Levitan, 1980),

$$p_i = a - \frac{3}{1+\gamma} q_i - \frac{\gamma}{1+\gamma} \sum_{j=1}^{3} q_j, \tag{1}$$

where the parameter $\gamma \in [0, \infty)$ indexes the degree of substitutability. If $\gamma = 0$ products have independent demands whereas as $\gamma \to \infty$ products become perfect substitutes. A key feature of this demand function is that the overall size of the market varies neither with the number of varieties (firms) nor the degree of product substitutability (see, e.g., Motta, 2004). Therefore, this demand formulation is particularly attractive for our purposes as it allows to disentangle the direct effects of a downstream merger on welfare from those related to changes in market size (see also Iozzi & Valletti, 2014).

The timing of the two-stage game is as follows. First, $U$ makes publicly observable take-it or leave-it two-part-tariff offers, consisting of a linear wholesale price, $w_i$, and a fixed fee $F_i$. Second, retailers engage in quantity (Cournot) competition.

Each $R_i$ chooses its quantity $q_i$, taking the wholesale price $w_i$ and quantities of its rivals as given, to maximize its gross profits:

$$\max_{q_i} \pi_{R_i} = \left( a - \frac{3}{1+\gamma} q_i - \frac{\gamma}{1+\gamma} \sum_{j=1}^{3} q_j \right) q_i - (w_i + c) q_i, \quad i = 1, 2, 3.$$

Solving the system of F.O.Cs, we obtain retail quantities as functions of wholesale prices:

$$q_i^S = \frac{(1+\gamma)\left[(a-c)(6+\gamma) - 3(2+\gamma)w_i + \gamma \sum_{j \neq i} w_j\right]}{2(6+\gamma)(3+2\gamma)}, \quad i = 1, 2, 3 \tag{2}$$

Substituting (2) into (1), we obtain retail prices as functions of wholesale prices:

$$p_i^S = \frac{a(3+\gamma)(6+\gamma) + 3c(1+\gamma)(6+\gamma) + \big(18 + \gamma(15+\gamma)\big) w_i + \gamma(3+\gamma) \sum_{j \neq i} w_j}{2(6+\gamma)(3+2\gamma)},$$
$$i = 1, 2, 3 \tag{3}$$

Next, we determine the equilibrium contract terms. The upstream supplier can optimally extract profits from each downstream firm by setting $F_i{}^S = \pi_i{}^S = (p_i{}^S - c - w_i)q_i{}^S$. Thus, the upstream supplier chooses $w_i$ to maximize industry profits:

$$\max_{w_i} \Pi^S = \sum_{i=1}^{3} (p_\iota{}^S - c)q_\iota{}^S, \qquad i = 1, 2, 3. \tag{4}$$

From the first order conditions of (4), we obtain the equilibrium wholesale prices:

$$w_1^{S*} = w_2^{S*} = w_3^{S*} = \frac{(a-c)\gamma}{3(1+\gamma)} \equiv w^{S*}. \tag{5}$$

The supplier has no incentive to practice wholesale price discrimination since downstream firms are identical. Industry profits, consumer surplus and total welfare are given by:

$$\Pi^{S*} = \frac{(a-c)^2}{4}, \; CS^{S*} = \frac{(a-c)^2}{8}, \; TW^{S*} = CS^{S*} + \Pi^{S*} = \frac{3(a-c)^2}{8}. \tag{6}$$

# 3. A downstream merger between two retailers

We now consider the case where two of the retailers, say $R_1$ and $R_2$, merge horizontally. In the downstream industry, there is now the merged retailer $R_{12}$ that sells two product varieties, and retailer $R_3$ which is the outsider to the downstream merger and sells one product variety. Following Motta (2004), we assume that the downstream merger generates cost savings that allow the merging parties to operate at marginal cost $ec$, with $e < 1$. The lower the parameter $e$, the higher the efficiency gains of the merging retailers. The supplier specifies a two-part tariff for each retailer, i.e., $(w_{12}, F_{12})$ for the merged retailer and $(w_3, F_3)$ for the outsider.

The merged retailer and outsider, taking wholesale prices as given, choose simultaneously and independently their quantities in order to maximize the following profit functions:

$$\max_{q_1,q_2} \pi_{R_{12}} = \sum_{i=1}^{2} \left[ \left( a - \frac{3}{1+\gamma} q_i - \frac{\gamma}{1+\gamma}(q_1 + q_2 + q_3) \right) q_i - (w_{12} + ec)q_i \right],$$

$$\max_{q_3} \pi_{R_3} = \left( a - \frac{3}{1+\gamma} q_3 - \frac{\gamma}{1+\gamma}(q_1 + q_2 + q_3) \right) q_3 - (w_3 + c)q_3.$$

Solving the system of F.O.Cs of the above maximization problems, and using the inverse demand functions in (1), we obtain retail prices and retail quantities as functions of wholesale prices:

$$q_1^M = q_2^M = \frac{(1+\gamma)[a(6+\gamma) - 2(3+\gamma)(ec + w_{12}) + \gamma(c + w_3)]}{6(6 + 6\gamma + \gamma^2)} \equiv q_{12}^M,$$

$$q_3^M = \frac{(1+\gamma)[a(3+\gamma) + \gamma(ec + w_{12}) - (3 + 2\gamma)(c + w_3)]}{3(6 + 6\gamma + \gamma^2)}, \tag{7}$$

$$p_{12}^{M}=\frac{a(6+\gamma)(3+2\gamma)+(18+18\gamma+2\gamma^2)(ec+w_{12})+\gamma(3+2\gamma)(c+w_3)}{6(6+6\gamma+\gamma^2)},$$

$$p_{3}^{M}=\frac{a(3+\gamma)^2+\gamma(3+\gamma)(ec+w_{12})+(9+9\gamma+\gamma^2)(c+w_3)}{3(6+6\gamma+\gamma^2)}$$

The supplier optimally extracts profits from the merged retailer and the outsider by setting $F_{12}^{M}=2(p_{12}^{M}-ec-w_{12})q_{12}^{M}$ and $F_{3}^{M}=(p_{3}^{M}-c-w_3)q_{3}^{M}$ respectively.

Therefore, $U$ chooses $w_{12}$ and $w_3$, to maximize industry profits:

$$\max_{w_{12},w_3}\Pi^{M}=2(p_{12}^{M}-ec)q_{12}^{M}+(p_{3}^{M}-c)q_{3}^{M}.$$

From the F.O.Cs of (8), we obtain the equilibrium wholesale prices:

$$w_{12}^{M*}=\frac{[3(a-c)-2\gamma c(1-e)]\gamma}{18(1+\gamma)},\qquad w_{3}^{M*}=\frac{[3a+c\gamma-ec(3+\gamma)]\gamma}{9(1+\gamma)}. \tag{8}$$

**Proposition 1.** *Under a downstream merger that entails efficiency gains, the supplier will favor the larger merged retailer, i.e, the merged retailer will pay a lower marginal wholesale price than the outsider. Moreover, the pre-merger equilibrium marginal wholesale price lies between the discriminatory marginal wholesale prices post-merger.*

**Proof.** We require that both downstream firms are served by the supplier. Substituting the equilibrium wholesale prices in (8) into the expressions for retail outputs in (7), we verify that both firms are served whenever $3(a-c)-2c(1-e)\gamma>0$. It is obvious that when the latter condition holds then $w_{12}^{M*}>0$. Define $\Delta w^{M*}=w_{3}^{M*}-w_{12}^{M*}$. Then, using (8), we have,

$$\Delta w^{M*}=\frac{\gamma[3(a+c)+4c\gamma-2ec(3+2\gamma)]}{18(1+\gamma)}.$$

It can be easily checked that $\Delta w^{M*}(e=0)=\gamma[3(a+c)+4c\gamma]/18(1+\gamma)>0$, $\lim_{e\to 1}\Delta w^{M*}=(a-c)\gamma/6(1+\gamma)>0$, and $\partial\Delta w^{M*}/\partial e=-(3+2\gamma)/9(1+\gamma)<0$. Thus, the sign of $\Delta w^{M*}$ is always positive. Moreover, using (5) and (8), we obtain,

$w_{3}^{M*}-w^{S*}=\frac{c\gamma(3+\gamma)(1-e)}{(9(1+\gamma))}>0$ and $w_{12}^{M*}-w^{S*}=-\frac{\gamma[3(a-c)+2c\gamma(1-e)]}{18(1+\gamma)}<0$. Thus, it holds $w_{3}^{M*}>w^{S*}>w_{12}^{M*}>0$. ■

As in Inderst and Shaffer (2009), the supplier finds it optimal to price discriminate in favor of the *larger* firm. In that paper, a firm's market share is directly related to its lower marginal cost, thus the supplier favors the more efficient firm. In the present paper, the supplier favors the merged firm even if the downstream merger creates no cost-efficiency gains whatsoever, since the firm selling *two differentiated* products has a larger total market share compared to its single-product rival.[4] When the merger brings also about cost-efficiency gains, the merged firm's market share will become even larger (the outsider's market share even smaller). Thus, the larger share for the merged firm comes from (a) selling two differentiated products (*multi-product effect*), (b) being cost-efficient due to merger-related synergies (*efficiency effect*).

[4]One may ask whether post-merger the two-product firm's market share is indeed larger than that of its rival. It is well known that under Cournot competition with homogeneous goods, the merged firm and the outsider share the market equally, but this is obviously not the case when goods are differentiated. Thus, even if the sum of the merged products' market share shrinks compared to the pre-merger case, when products are differentiated, this shrinkage is never so large as to result in equal market shares with the outsider.

Let us assume for a moment that the efficiency gains are negligible, and concentrate on the multi-product effect. Using (5) and (8), we have that $\lim_{e\to 1} w_{12}^{M*} = (a-c)\gamma/6(1+\gamma) < w^{S*}$ and $\lim_{e\to 1} w_3^{M*} = w^{S*}$, which implies that if the downstream merger creates no cost-efficiency, then the supplier lowers the merged firm's wholesale price while keeping the outsider's wholesale price at its pre-merger level.[5] Bringing back efficiency gains, a "waterbed effect" as in Inderst and Shaffer (2009) appears: as the merged firm becomes more cost-efficient, $U$ increases the wholesale price of the outsider (above its pre-merger level).

Industry profits, consumer surplus and total welfare are given by:

$$\Pi^{M*} = \frac{9a^2 - 6ac(1+2e) + c^2(3+6e^2+2(e-1)^2\gamma)}{36},$$

$$CS^{M*} = \frac{9a^2 - 6ac(1+2e) + c^2(3+6e^2+2(e-1)^2\gamma)}{72}, \tag{9}$$

$$TW^{M*} = CS^{M*} + \Pi^{M*} = \frac{9a^2 - 6ac(1+2e) + c^2(3+6e^2+2(e-1)^2\gamma)}{24}.$$

**Proposition 2.** *A downstream merger that entails efficiency gains always increases both consumer surplus and total welfare.*

**Proof**. From (6) and (9) we have, $CS^{M*} - CS^{S*} = [3c(1-e)(2a-c) + c^2\gamma(e-1)^2]/36 > 0$, and $TW^{M*} - TW^{S*} = [3c(1-e)(2a-c) + c^2\gamma(e-1)^2]/12 > 0$. ■

The result in Proposition 2 is in contrast to the well-known result that a horizontal merger in one-tier industries is beneficial only if it involves enough efficiency gains. Pre-merger, all retailers obtain the same marginal wholesale price. Post-merger, we know from Proposition 1 that the larger merged retailer obtains a lower marginal wholesale price than the outsider, and thus allocative efficiency increases. This effect, which is obviously absent in one-tier market, is sufficiently strong so that consumer surplus and total welfare increase due to the merger even when efficiency gains are very small.

Our analysis has been based on the assumption that contract terms are determined through take-it-or-leave-it offers by the upstream supplier. This implies that in an eventual negotiation $U$ possesses all the bargaining power. Whereas for simplicity reasons we have suppressed the bargaining process, our welfare findings remain the same under Nash bargaining as under a take-it-or-leave-it offer. As is well-known, the Nash bargaining solution under two-part tariff contracts can be found in two steps. First, since contracts are public, negotiations between $U$ and downstream firms do *not* take place separately, and hence marginal wholesale prices are chosen to maximize overall industry profits (Alipranti et al., 2004, ftn 9). This implies that the optimal marginal wholesale prices obtained in (5) and (8) are still valid. Second, the firms negotiate over the fixed fees so as to divide the maximized total industry profits; these profits

[5]The intuition for this is as follows. Both pre- and post-merger, the upstream supplier wants to maximize overall industry profits and thus it sets wholesale prices so as to offset downstream competition (i.e., to internalize the Cournot externality that each downstream firm exert upon each other). The fiercer is downstream competition, the more urgent is for the supplier to set higher wholesale prices. Compared to the pre-merger case, the smaller number of firms post-merger guarantees softer competition. Since the softening of competition derives from the less aggressive behavior of the merged products, the supplier lowers their wholesale price while keeping that of the outside product – the reaction function of which remains unchanged after the merger – unchanged.

are distributed to $U$ and downstream firms according to their bargaining powers (as expressed by the exogenous Nash-parameter bargaining weights). Whereas bargaining implies different equilibrium fixed fees as compared to take-it-or-leave-it offers, fixed fees are simply a device used to transfer surplus and have no impact on marginal costs or quantities produced. Hence, our welfare results remain under Nash bargaining the same as under take-it-or-leave-it offers.

The above remark sheds also light to the incentive of the downstream firms to merge. Note that the industry as a whole is better off post-merger, i.e., $\Pi^{M*} > \Pi^{S*}$.[6] With take-it-or-leave-it offers, it may be argued that since at the end the supplier gets all the benefit from the merger, the downstream firms are indifferent about whether to merge. Yet, with Nash bargaining, the downstream firms obtain some portion of merger's benefit (the higher their bargaining power the higher is that portion), creating a clear incentive to merge.

# 4. Conclusions

The present paper provides a theoretical model that highlights the fact that market power and/or synergy benefits associated with a downstream horizontal merger create asymmetries between merged and non-merged retailers, thereby leading an upstream supplier to optimally practice wholesale price discrimination. Specifically, we consider one supplier serving three retailers that are perceived by consumers as differentiated and compete in quantities. We assume that two retailers decide to merge: post-merger, there are the merging retailers and the non-merging retailer (outsider). We show that, under observable two-part tariffs, the merger always increases consumer surplus and total welfare regardless of the magnitude of efficiency gains. Thus, different from the existing merger theory on one-tier market, a horizontal merger in the downstream sector of a vertical market can be beneficial for consumer and society even when efficiency gains are very small.

Our work can be extended in several ways. For instance, it would be interesting to check the validity of our findings with respect to alternative (*i*) modes of retail competition (e.g., Stackelberg, Bertrand), (*ii*) contract types (e.g., simple linear wholesale tariffs, quantity/price bundles), (*iii*) information structures regarding the (un)observability of contracts (e.g., interim observable and/or interim unobservable contracts).[7] In addition, one could study alternative market structures with more upstream as well as downstream firms. These issues feature high in our research agenda.

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[6]Using (6) and (9), we have that $\Pi^{M*} - \Pi^{S*} = [3c(1-e)(2a-c) + c^2\gamma(e-1)^2]/18 > 0$.

[7]See Rey and Vergé (2004).

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