Partial forward integration

Matthias Hunold\textsuperscript{*} and Frank Schlütter\textsuperscript{†}

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Abstract

We study the effects of partial ownership stakes that upstream firms can hold of their downstream customers. Our main finding is that partial forward ownership can have the same anti-competitive effects as passive backward ownership. This is in contrast to most of the established literature where forward ownership is mostly shown to be pro-competitive, and backward ownership as anti-competitive. We contribute to the current debate on the treatment of minority shareholdings in merger control.

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\textsuperscript{*}Heinrich-Heine-Universität (HHU) Düsseldorf, Düsseldorf Institute for Competition Economics (DICE), Universitätsstr. 1, 40225 Dusseldorf, Germany; E-mail: hunold@dice.hhu.de.

\textsuperscript{†}DICE as above; E-mail: schluetter@dice.hhu.de.
1 Introduction

Partial ownership among vertically related firms can be observed in various industries. Examples include cable operators and broadcasters, banks and payment providers as well as financial exchanges and clearing houses. The competitive effects are unfortunately not yet fully understood, although competition authorities are increasingly wondering how to deal with partial ownership. For instance, the European Commission (EC) is considering whether and, if yes, how to extend its merger control to the acquisition of minority shareholdings, which is so far not the case. The EC has jurisdiction to review a minority shareholding if it yields the acquiring firm decisive influence over the target firm. However, a firm may acquire a minority share of a target firm that yields substantial or material influence over the target firm even if it does not confer decisive control in the sense of the European Union merger regulation.

In this article, we demonstrate the effects of partial ownership stakes that upstream firms hold of their industrial customers. Our main finding is that such forward ownership can have anti-competitive effects, in particular lead to higher consumer prices. This is in contrast to existing literature where forward ownership is shown to be pro-competitive. With this we contribute to the current debate on the treatment of minority shareholdings in merger control.

An important insight of the literature on partial vertical ownership is that the direction of the acquisition matters for the competitive effects as two separate entities persist after the acquisition. Flath (1989) has shown that non-controlling forward ownership can reduce double marginalization. When a supplier partly internalizes the margin of a downstream firm, there is an incentive to charge a lower input price. A downstream firm typically passes a marginal cost reduction on to some degree – to the benefit of final consumers. The outcome is different when a customer owns shares of its supplier. The customer perceives the upstream profit share as a rebate on its input expenses, as part of these are retrieved back through the profit participation. As a consequence, with such non-controlling backward ownership the partially owned, but own-profit maximizing upstream firm has an incentive to increase the price until it is effectively again at the same level as before (Greenlee and Raskovich 2006). The downstream prices can even be higher with passive ownership when the customer partially owns a supplier that supplies a downstream competitor (Humold and Stahl 2016). In this case the customer benefits from sales of the competitor through the upstream margin and therefore raises its price. Non-controlling backward ownership can also deter entry of potential downstream competitors when the supplier charges uniform prices (Humold 2017).

This literature suggests that partial forward ownership is rather pro-competitive, whereas

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1See Brito et al. (2016); Greenlee and Raskovich (2006); Humold and Stahl (2016) for details.
2See the European Commission’s Staff Working Document “Towards improving EU merger control” of 2013.
4See paragraph 3 in Annex I of the European Commission’s Staff Working Document (fn. 2).
backward ownership is rather anti-competitive. However, these studies focus on the polar case of completely passive ownership, so that the partial owner has profit rights, but zero influence over the target’s strategy. This is instructive as a clean theoretical benchmark, yet it is arguably the more typical case that partial ownership includes both, partial profit and partial control rights. For instance, ordinary voting stock typically entitles the owner to profits and to vote at the shareholder meetings. There is a growing empirical literature which shows that even small minority shareholdings significantly influence target firms’ competitive strategies. See our detailed discussion in Section 4.1. The two older studies mentioned above also restrict their attention to linear wholesale price.

We demonstrate that important insights of the analyses with non-controlling vertical ownership neither extend to (i) more general (non-linear) contracts between upstream and downstream firms nor (ii) to the case where partial ownership allows the owner to influence the target to some degree.

As regards point (i), we show for two-part tariffs that a non-controlling ownership allows the supplier to come closer to maximizing the (residual) industry profit. In the case of upstream competition, the supplying firm strategically depreciates the value of the downstream firms’ outside options of other customers by decreasing the marginal input price below the level that would induce the downstream firms to charge the industry-profit-maximizing downstream price. With passive ownership, the upstream firm is entitled to a share of the downstream firm’s profit even if the firm sources from another supplier. This participation effectively decreases the relative importance for the supplier of depreciating the outside option. Hence, the optimal two-part tariff under passive forward integration is closer to the industry profit maximizing contract as compared to vertical separation.

As regards point (ii), we show that partially controlling forward ownership can lead to exactly the anti-competitive effects that were derived for the case of non-controlling backward ownership. The intuition for this equivalence result is that the upstream owner uses its influence to induce the management of its customer to internalize its upstream profits. As argued by O’Brien and Salop (2000), this is similar to the customer obtaining a share of the upstream profits – as with passive backward ownership. Moreover, the pro-competitive incentive of partial forward ownership to reduce double marginalization may not materialize when the upstream firm has to compete for the downstream business. The upstream margin can be so low that the supplier has no incentive to cut the margin further, although it partly internalizes the customer’s profit.

The notion of partially controlling backward ownership has been looked at in Hunold et al. (2012), Brito et al. (2016) and Levy et al. (forthcoming). If backward ownership is (partially) controlling, it tends to decrease double marginalization, as a full vertical merger

\[\text{Fiocco (2016) studies non-controlling partial forward integration and shows that it allows the manufacturer to capture some of the information rents that accrue to a privately informed retailer and hence affects the contracts that the manufacturer offers the retailer and consequently the resulting competition in the downstream market. However, the results only apply to the particular case of asymmetric information. Moreover, Fiocco does not study whether similar effects arise with backward ownership in such a setting.}\]
typically would absent foreclosure effects \cite{Hunold2012} and \cite{Brito2016}.
Different from these insights, we show that partially controlling forward integration may
lead to anti-competitive effects that are distinct from the effects of a vertical merger.

In addition to the articles on partial vertical ownership mentioned above, other authors
have pointed out that an important feature of partial ownership is that it can yield
different degrees of profit and control rights to show that foreclosure tends to be more
likely when the degree of control that a vertically related firm has is larger than its profit
share (\cite{Baumol1994}, \cite{Spiegel2013}, and \cite{Levy2016}). The reason is that the partial owner can use the control rights to let the target undertake a
costly foreclosure measure, but has to bear a relatively small part of these costs through
the reduced profits. This argument is different from the argument presented in the present
article which more generally applies if partial forward ownership involves both a profit
participation and some degree of influence.

The remainder of the article is structured as follows. We introduce the benchmark model
in Section 2. In Section 3 we analyze the competitive effects of passive forward integration.
Section 4 turns to the case of influential partial ownership, where we discuss the meaning
and the operationalization of partial control in Section 4.1 and 4.2. We conclude in Section 5
with a discussion of partial vertical ownership in competition policy.

2 Framework

Consider a vertically related industry with two upstream and two downstream firms. The
production of one unit of downstream output requires one unit of a homogeneous input
produced by two suppliers \( j \in \{U, V\} \). Upstream firm \( V \) has marginal costs of \( c > 0 \). The
marginal costs of \( U \) are normalized to zero, which implies that the upstream firm \( U \) is
more efficient than the competitor \( V \). The upstream firms generally can price discriminate
between the downstream firms. For expositional simplicity, we treat \( V \) as a competitive
fringe which offers the input at a linear unit price equal to its marginal costs of \( c \). As
a tie-breaking assumption, we impose that if downstream firms are indifferent between
both suppliers, they purchase from the efficient supplier \( U \). In the benchmark model we
allow for the upstream firm \( U \) to offer linear contracts to the downstream firms. We also
extend the contract space to observable two-part tariffs in order to either verify that our
results are upheld or discuss differences between the contractual arrangements.

For small \( c \) the competitive fringe constitutes a relevant constraint on the price setting
of the efficient supplier \( U \). We generally focus on this case and refer to it as effective
upstream competition. If \( c \) is large, the competitive fringe \( V \) is not a relevant competitor.

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\cite{Hunold2012}
\cite{Brito2016}
\cite{Baumol1994}
\cite{Spiegel2013}
\cite{Levy2016}


\cite{Levy2016} argue that foreclosure can also occur in case of backward ownership with
partial control, similar to the case of full control. These articles do not consider partially controlling
forward integration.
and the upstream competition is ineffective. In this case the upstream firm $U$ can set monopoly prices. In cases where it is instructive, we also discuss the case of ineffective upstream competition.

In the downstream market, there are two symmetric firms, $A$ and $B$. We analyze both the cases of homogeneous Cournot and differentiated Bertrand competition in the downstream market. The downstream firms use the homogeneous input good in order to produce final products and sell them to the customers with the demand that satisfies one of the following properties depending on the mode of downstream competition.

**Assumption 1. Consumer demand**

(i) $\frac{\partial q_i}{\partial p_i} > \frac{\partial q_i}{\partial p_{-i}} > 0$ (Price competition)

(ii) $\frac{\partial q}{\partial q_i} > 0$, with $Q = \sum_i q_i$ (Quantity competition)

In order to illustrate the results, we provide closed-form solutions for the linear inverse demand specification

$$q_A(p_A, p_B) = \frac{1}{1 + \gamma} \left[ 1 - \frac{1}{1 - \gamma} p_A + \frac{\gamma}{1 - \gamma} p_B \right],$$  

when competition is in prices (Bertrand). The parameter $\gamma \in (0, 1)$ captures the degree of product differentiation between the two final products. For $\gamma \to 0$ the product markets are completely separated and for $\gamma \to 1$ the products become close to perfect substitutes. When the downstream firms compete in quantities (Cournot), we specify the linear demand function

$$p(q_A, q_B) = 1 - q_A - q_B.$$  

The timing of the game is as follows:

1. Upstream firm $U$ can acquire partial ownership $\delta_i \in (0, 1)$ of the downstream firms $i \in \{A, B\}$.

2. The upstream firms sell the input goods to the downstream firms. The firm $V$ offers the input good at marginal costs $c$ to both downstream firms. The firm $U$ offers linear (or two-part) contracts to the downstream firms in order to maximize profits.

3. Downstream firms $i \in \{A, B\}$ simultaneously decide from which supplier to source the input good, produce their products and sell quantities $q_A$ and $q_B$.

We solve this game of perfect information by backward induction.

After a benchmark case without partial ownership, we analyze the case that supplier $U$ may acquire passive (that is non-controlling) partial ownership of its customers and then turn to controlling partial ownership. Passive ownership entitles supplier $U$ to a share of

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9This demand function stems from a quadratic utility function of a representative consumer of the form $U(q_A, q_B, I) = q_A + q_B - \frac{1}{2}(q_A^2 + q_B^2 + 2\gamma q_A q_B) + I$ [Häckner 2000, Singh and Vives 1984].
the downstream profit, whereas partially controlling ownership additionally allows $U$ to influence the target firms’ decisions.

For the sake of simplicity, we assume that each firm initially is owned by a single representative owner who holds all the firm’s shares and has no other interests in the industry. This matters for the case with corporate control where the aggregation of the interests of the different shareholders in the target’s objective function is necessary. This assumption is equivalent to assuming that different shareholders with the same objective can efficiently pool their influence and act as a block of shareholders.

## 2.1 Benchmark without partial ownership

First, we briefly discuss the benchmark model without partial ownership for the case of linear contracts. The upstream firms $j \in \{U,V\}$ compete in prices in order to supply the downstream firms $i \in \{A,B\}$ with a homogeneous input good. The more efficient upstream firm $U$ always has the opportunity (and always finds it profitable) to supply both downstream firms as it can undercut the price of the competitive fringe $w_i^V = c$ and secure a positive margin. Therefore, we consider the candidate equilibrium in which the upstream firm $U$ supplies both downstream firms at $w_i^U = w_i$.

We allow the strategic variable of the downstream firms to be either quantities $q_i$ or prices $p_i$. Each downstream firm maximizes its operational profit

\[ \pi_i = (p_i - w_i) q_i, \quad (3) \]

if it sources from the upstream firm $U$ at the wholesale price of $w_i$. When we consider two-part tariffs or the effects of partial integration, we will denote by $\Pi_i$ the objective function of downstream firm $i$ that accounts for all fixed payments and structural links to the upstream firm $U$. In this benchmark case with linear tariffs and without partial integration we have $\Pi_i = \pi_i$. To ensure interior solutions throughout our analyses, we impose the following assumptions on the downstream firms’ objective functions depending on the mode of downstream competition:

### Assumption 2. Price competition

1. $\frac{\partial^2 \Pi_i(p_i, p_{-i})}{\partial p_i^2} < 0$ (concavity)
2. $\frac{\partial^2 \Pi_i(p_i, p_{-i})}{\partial p_i \partial p_{-i}} > 0$ (strategic complementarity)
3. $\frac{\partial^2 \Pi_i(p_i, p_{-i})}{\partial p_i \partial p_{-i}} / \frac{\partial^2 \Pi_i(p_i, p_{-i})}{\partial p_i^2} > \frac{\partial^2 \Pi_i(p_{-i}, p_i)}{\partial p_{-i}^2} / \frac{\partial^2 \Pi_i(p_{-i}, p_i)}{\partial p_{-i} \partial p_i}$ (stability)

### Assumption 3. Quantity competition

1. $\frac{\partial^2 \Pi_i(q_i, q_{-i})}{\partial q_i^2} < 0$ (concavity)
2. \( \frac{\partial^2 \Pi_i(q_i, q_{-i})}{\partial q_i \partial q_{-i}} < 0 \) (strategic substitutability)

3. \( \frac{\partial^2 \Pi_i(q_i, q_{-i})}{\partial q_i \partial q_{-i}} > \frac{\partial^2 \Pi_{-i}(q_{-i}, q_i)}{\partial q_{-i} \partial q_i} \) (stability)

Assumption 2 and 3 ensure for both modes of competition that for given input costs \((w_i, w_{-i})\) the downstream equilibrium is uniquely defined by the system of first-order conditions of the downstream firms. We denote the reduced downstream equilibrium profit of firm \(i\) that is net of fixed payments with \(\pi_i(w_i, w_{-i})\). For the downstream equilibrium profits, we assume that the profit of firm \(i\) decreases in its own costs \(w_i\) and increases if the competitor faces higher inputs costs \(w_{-i}\). Additionally, we assume that for symmetric input costs the downstream profits decrease if overall cost level increases. That is, \(\frac{\partial \pi_i(w, w)}{\partial w} < 0\).

In the second stage, the upstream firm \(U\) maximizes the profit function

\[
\pi^U = \sum_i w_i q_i,
\]

subject to the constraints that both downstream firms choose firm \(U\) as their supplier. If upstream competition is effective (\(c\) sufficiently small), the upstream firm \(U\) optimally sets the linear fee as high as possible at \(w_i = c\). If \(c\) is large enough, the upstream firm is not constrained by the competitive fringe and can charge the contract that is the interior solution to the unconstrained maximization problem. Denote the optimal solution to the unconstrained maximization problem with \(w^*_i\).

The linear demand specifications of the equations 1 and 2 yield the same interior solution to the upstream firm \(U\)'s maximization problem of \(w^*_i = \frac{1}{2}\) for linear contracts. Accordingly, for \(c < \frac{1}{2}\) competition is effective in this setting. The retail prices differ according to the mode of downstream competition. Given input prices \(w_i, i \in \{A, B\}\), the equilibrium retail price under Cournot competition is \(p^C_i = \frac{1}{3}(1 + w_i + w_{-i})\). In the differentiated Bertrand model the retail prices depend on the differentiation parameter \(\gamma\) and equal \(p^B_i = \frac{\gamma^2 - 2(1 + w_i) - \gamma w_{-i}}{\gamma^2 - 4}\).

3 Passive partial ownership

In this section we analyze the competitive effects of passive shareholdings that a supplier holds of its downstream customers. Flath (1989) shows for linear tariffs that passive forward integration tends to be pro-competitive. He considers vertically related Cournot oligopolies for which passive forward integration reduces double marginalization. This pro-competitive result of Flath (1989) also finds consideration in a European Commission’s staff working document on minority shareholdings of 2013.\(^{10}\)

In a first step, we show that one can derive the result of Flath (1989) also in our model. In particular, we demonstrate that passive forward integration can be pro-competitive by

\(^{10}\)See paragraph 62 in Annex 1 of the European Commission’s Staff Working Document “Towards improving EU merger control” of 2013.
reducing upstream margins under linear tariffs if upstream competition not too intense. However, if upstream competition is more intense, the pro-competitive effect of reduced double marginalization does not materialize and a passive forward ownership has no effect. Surprisingly, we show that with two-part tariffs passive forward ownership tends to increase the marginal input prices charged to the downstream firms and can thus be anti-competitive. This is arguably an important insight that should find consideration in the assessment of passive forward shareholdings when non-linear wholesale contracts are feasible.

3.1 Linear tariffs

Let the upstream firm $U$ hold a passive partial ownership share $\delta_A = \delta_B = \delta$ in each downstream firm. A passive ownership share entitles the upstream firm $U$ to participate in the downstream firms’ profits. As the ownership is passive, the upstream firm $U$ does not obtain control rights over the target firms. This means that each downstream firm $i \in \{A, B\}$ maximizes its operational profit $\pi_i = (p_i - w_i) q_i$ with respect to the strategic variable (either price or quantities), as in case of vertical separation. Therefore, for given input prices, we obtain the same unique downstream equilibrium as in the benchmark case in Section 2.1.

For the upstream equilibrium, we focus on symmetric equilibria in which the upstream firm holds symmetric ownership shares $\delta$ in each downstream firm and charges a uniform wholesale price $w_A = w_B = w$ to the downstream firms. The upstream firm $U$ maximizes its profit function

$$\max_w \Pi^U = \pi^U(w, w) + \delta (\pi_A(w, w) + \pi_B(w, w)),$$

subject to the constraint $w \leq c$ which ensures that both downstream firms source from $U$. The first-order condition yields

$$\frac{\partial \Pi^U}{\partial w} = \frac{\partial \pi^U}{\partial w} + \delta \left( \frac{\partial \pi_A}{\partial w} + \frac{\partial \pi_B}{\partial w} \right) = 0.$$  (6)

As the downstream profits decrease in the uniform input costs $w$, the marginal profit of the upstream firm $U$ decreases for $\delta > 0$. Denote with $w^*$ the optimal wholesale price that solves Equation [6].

We distinguish two cases, depending on the intensity of upstream competition. First, if the constraint $w^* \leq c$ is not binding, it is feasible for the upstream firm $U$ to charge the optimal $w^*$. In this case, a passive ownership of the upstream firm $U$ in the downstream firms leads to a lower wholesale price $w^*$ as compared to vertical separation. In reaction to lower input costs, the downstream firms also optimally adjust the retail prices downwards.

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11For asymmetric shareholdings the upstream firm has an incentive to foreclose one downstream firm from the input market. We focus on the effect on the general input price level and abstract from the distributional effects by imposing symmetric shareholdings.
and the overall industry margin decreases. This pro-competitive effect has been already pointed out by Flath (1989). Second, for sufficiently intense upstream competition the constraint \( w^* \leq c \) might be binding. This implies that the upstream firm \( U \) cannot set the wholesale price \( w^* \) that is implicitly defined by Equation [3] without losing its customers to the competitive fringe. In this case the upstream firm \( U \) sets the wholesale price \( w \) to the highest possible level of \( c \). For small changes in \( \delta \), it remains optimal for the upstream firm \( U \) to charge this price and there are no competitive effects of a passive forward integration. Proposition 1 that is reminiscent of the result of Flath (1989) summarizes the result.

**Proposition 1.** Let the efficient supplier \( U \) hold a symmetric passive ownership \( \delta \) in each downstream firm and charge linear wholesale prices. If upstream competition is weak (\( c \) sufficiently large), passive ownership leads to lower wholesale prices and retail prices as compared to full separation. If upstream competition is sufficiently intense, passive ownership is competitively neutral.

For our linear demand specifications from Equations [1] and [2] the optimal linear wholesale price are \( w^B = \frac{2+2}\delta(-1+\gamma)-\gamma}{4+2\delta(-1+\gamma)-2\gamma} \) and \( w^C = \frac{3-2\delta}{6-2\delta} \). In both cases it holds that \( (w^B, w^C) < \frac{1}{2} \) and that the optimal wholesale price is decreasing in \( \delta \). Hence, upstream competition is effective whenever \( c < (w^B, w^C) \).

### 3.2 Two-part tariffs

The result of Proposition 1 relies on the assumption of linear wholesale prices. Arguably, this is a restrictive assumption for the contractual arrangements between firms in various situations. In this section we analyze the competitive effects if firms are allowed to contract on observable two-part tariffs. We show that the intuition of pro-competitive forward integration does not extend to this form of more general contracts between firms.

As a benchmark, consider that the competitive fringe supply is very inefficient (\( c \to \infty \)) such that supplier \( U \) acts as an upstream monopolist. Absent partial ownership, with observable two-part tariffs the supplier optimally sets the marginal wholesale prices at a level such that the resulting downstream prices maximize the integrated industry profit and extracts the downstream profits (up to the constant outside options) through the fixed fees. Instead, if additionally a sufficiently efficient fringe supply is present (\( c \) not too large), the downstream firms can obtain positive profits if they choose the competitive fringe as their supplier instead of \( U \). In that case, the competitive fringe offers a relevant alternative supply to the downstream firms and the efficient upstream firm \( U \) cannot extract the whole industry profit. As a consequence, supplier \( U \) has to leave at least the value of the outside option to the downstream firms which they receive if they source the input good from the competitive fringe at marginal costs of \( c \). Fauli-Oller and Sandonis (2002) and Caprice (2006) point out that the upstream firm \( U \) can profitably decrease the value of the outside option for each downstream firm by charging low marginal prices.
to the downstream competitors. The upstream firm $U$ thus faces a trade-off between charging high marginal prices and by this maximizing the industry profit and charging low marginal prices and minimizing the downstream firms’ outside options. This results in an optimal linear fee that is below the industry-maximizing level. With passive forward ownership, the upstream firm $U$ acquires a participation in the downstream firms’ profits that is independent of their supplier choice. Effectively, this makes it less important for $U$ to depreciate the outside option profits (as it now internalizes them) and induces $U$ to charge higher marginal prices.

Let the upstream firm $U$ hold a passive partial ownership share $\delta_A = \delta_B = \delta$ in each downstream firm and let it charge observable two-part tariffs $C_i = (w_i, F_i)$ to the downstream firms. The competitive fringe supplies the input good at marginal costs $c$. Denote the reduced downstream profits net of fixed payments by $\pi_i(w_i,w_{-i})$. The downstream firm $i$ obtains the profit of $\pi_i(c,w_{-i})$ if it unilaterally deviates and sources from the competitive fringe at linear input costs of $c$. Given that the upstream firm $U$ supplies both downstream firms, the maximization problem is

$$
\max_{w_A, w_B, F_A, F_B} \Pi^U = \pi^I(w_A, w_B) + \delta (\pi_A(w_A, w_B) - F_A + \pi_B(w_B, w_A) - F_B) + F_A + F_B \\
\text{s.t.} \quad \pi_A(w_A, w_B) - F_A \geq \pi_A(c, w_B) \\
\pi_B(w_B, w_A) - F_B \geq \pi_B(c, w_A).
$$

The upstream firm $U$ maximizes its profit subject to the constraints that both downstream firms weakly prefer to source from $U$ rather than choosing the competitive fringe supply. In equilibrium, the upstream firm $U$ sets both downstream firms indifferent between $U$ and the competitive fringe. Hence, the reduced maximization problem can be written as

$$
\max_{w_A, w_B} \Pi^U = \pi^I(w_A, w_B) - (1 - \delta) (\pi_A(c, w_B) + \pi_B(c, w_A)).
$$

The system of first-order condition of this maximization problem is defined by

$$
\frac{\partial \Pi^U}{\partial w_i} = \frac{\partial \pi^I(w_i, w_{-i})}{\partial w_i} - (1 - \delta) \frac{\partial \pi_{-i}(c, w_i)}{\partial w_i} = 0.
$$

Denote with $w_i^{TP}$ the optimal linear fee that is implicitly defined by Equation $9$. Note that the upstream cannot extract the whole industry profit as in the benchmark case if $\frac{\partial \pi_{-i}(c, w_i)}{\partial w_i} \neq 0$. This condition holds if both the upstream and the downstream competition are sufficiently intense. Upstream competition allows the downstream firms to obtain a postie profit that is equal to their outside option and downstream competition induces the upstream firm to strategically decrease the value of these outside options. Therefore, as mentioned above, the upstream firm $U$ faces a trade-off between a high industry profit $\pi^I$ and low outside option for the downstream firms if there is upstream and downstream competition. The profit of a downstream firm increases ceteris paribus if the downstream competitor faces higher input costs. In turn, the upstream firm $U$ can decrease the
value of the outside option of firm $i$ by making the downstream firm $-i$ to a stronger competitor (by decreasing the linear fee). This drives the linear fees $w_i$ below the industry-maximizing level. Equation 9 shows that a passive ownership share $\delta$ reduces the incentive of depreciating the outside option of the downstream firms. Intuitively, the partial forward integration leads to a partial internalization the downstream firms’ profits which makes it less attractive to decrease these profits with a low linear wholesale price. As a result, partial forward integration enables the upstream firm $U$ to charge higher linear fees $w_{iTP}$ and to come closer to the industry-maximizing level as compared to vertical separation. The optimal fixed fees are determined by

$$F_{iTP} = \pi_i \left( w_{iTP}, w_{-iTP} \right) - \left( c, w_{-iTP} \right).$$

(10)

Note that the optimal fixed fee potentially is negative if $w_{iTP} > c$. Otherwise the downstream firms would prefer to source from the competitive fringe. For the case of exclusive two-part tariffs it is feasible for the upstream firm to attract downstream firms with a negative fixed fee and compensate this with profits from selling the input good at wholesale prices of $w_{iTP}$. However, if exclusive two-part tariffs are not feasible, the upstream firm cannot set a negative fixed fee $F_{iTP}$ and $w_{iTP} > c$ because downstream firms would buy the input good from the competitive fringe at lower marginal costs. Therefore, the highest attainable linear fee is $w_i = c$. Note that the fixed fee in this case is $F_i = 0$ because otherwise the downstream firms would choose the competitive fringe as their supplier. As a result, the equilibrium contract is linear even if the upstream firm could charge a two-part tariff. In this situation a passive forward ownership still increases the incentive to increase the linear wholesale price but the constraint $w_i \leq c$ remains binding if two-part tariffs are non-exclusive. Hence, even under passive forward integration the upstream firm $U$ continues to charge $w_i = c$ to the downstream firms. We summarize the results on two-part tariffs in

**Proposition 2.** Let the efficient supplier $U$ hold a symmetric passive ownership $\delta$ in each downstream firm and let the competitive fringe offer a positive outside option to the downstream firms. Under exclusive two-part tariffs, passive forward ownership leads to higher linear wholesale prices and higher retail prices as compared to full separation. If two-part tariffs are non-exclusive, this result applies for $w_{iTP} < c$. In the case of $w_{iTP} > c$ passive ownership is competitively neutral. In this case the upstream firm endogenously charges linear contracts (with $F_i = 0$) to the downstream firms.

The economic logic of this result also conveys to asymmetric ownership stakes with $\delta_A \neq \delta_B$. Whenever the upstream firm $U$ holds a passive ownership share in one of the downstream firms this decreases the incentive to depreciate the outside option of this firm. This leads to an increasing linear fee, which in turn leads to higher retail prices.

\[12\] Note that this may occur mainly for the case of downstream price competition.
The figure shows the optimal linear wholesale price $w^*_i(\delta)$ depending on the degree of passive forward integration $\delta$ (solid line) and the wholesale price $w^I_i$ that maximizes the industry profit (dashed line). The product differentiation parameter is set to $\gamma = 0.5$ and the competitive fringe has marginal costs of $c = 0.3$.

In order to illustrate the result of Proposition 2, Figure 1 displays the industry-maximizing wholesale price $w^I_i$ and the optimal linear wholesale price $w^*_i(\delta)$ under the assumption that ownership is passive.\(^{13}\) By way of example, we consider downstream price competition and the case in which the upstream firm $U$ holds a symmetric share $\delta_A = \delta_B = \delta$ in each downstream firm. The upstream firm $U$ faces as competitor a fringe supplier with marginal costs $c = 0.3$. In this case upstream competition is sufficiently intense in the sense that the downstream firms can earn positive profits by deviating to the fringe supplier. Recall that under the condition that there is upstream and downstream competition, the outside option of a downstream firm is endogenous and depends on the linear input costs of its competitor. Therefore, the upstream firm $U$ can profitably decrease the outside options of the downstream firms by setting the wholesale price $w^*_i(\delta)$ below the industry-maximizing level that equals $w^I_{i\text{ND}} = 0.25$ for $\gamma = 0.5$ (dashed line). Hence, the solid line shows that the optimal linear wholesale price $w^*_i(\delta)$ that depends on the share $\delta$ is below the industry-maximizing level for $\delta < 1$. The wholesale price $w^*_i(\delta)$ is increasing in $\delta$ and approaches $w^I_i$ from below for $\delta \to 1$ because the relative importance of this incentive is

\(^{13}\)Clearly, for large $\delta$ the assumption of passive ownership is unrealistic and this example aims at illustrating that passive ownership enables the upstream firm $U$ to alleviate the trade-off between maximizing the industry profit and minimizing the downstream firms’ outside options.
decreasing as the upstream firm $U$ internalizes a profit share from the downstream firms that is irrespective of their supplier choice.

4 Influential partial ownership

In this section we turn to partial ownership stakes of the upstream firm $U$ in one or more of the downstream firms that confer a certain degree of influence over the target firms in the downstream market.

First, we discuss different possibilities how minority shareholdings translate into (partial) corporate control over the target firm. Second, we introduce a framework that allows us to formally account for the fact that different shareholders exert influence over the downstream firms’ objective functions. Based on this framework, we show equivalence in the competitive effects of influential partial forward ownership and non-controlling passive backward ownership. This allows us to recapitulate important insights from the literature on passive backward shareholdings for the case of (partially) influential forward shareholdings.

4.1 Degrees of influence

In general, partial ownership is associated with a participation in the target firm’s profit and a certain degree of control rights over the target firm (O’Brien and Salop, 2000). There are various ways in which a shareholder with a minority stake can exert some control over the target firm. For instance, the acquisition of common stock (or ordinary shares) generally allows the shareholder to vote in general annual meetings in order to e.g. appoint members to the board of directors or approve changes of the corporate governance structure. Moreover, a minority shareholder might have access to commercially sensitive information or, in the presence of supermajority requirements, even the possibility to veto against certain corporate decisions. In all those cases a minority shareholding confers some influence over the strategic decisions of the target firm.

However, depending on the exact governance provisions and degree of dispersion of the remaining shares, the degree of influence might be different from the actual share that the acquirer holds of the target firm. For example a firm can have a dual class structure with voting and non-voting shares (preferred stock). The firms Google and since 2016 also Facebook are examples for firms that have issued shares of three different classes. The first class of shares has one vote per share and is traded publicly. Additionally, there is one publicly traded class without voting rights. In contrast to these shares, the third class has ten votes per share and is generally held by company insiders and not traded publicly. Bebchuk et al. (2000) point out that similar forms of diverging financial

\[\text{O’Brien and Salop (2000)}\]

\[\text{See “Facebook has a new class structure and Mark Zuckerberg is still in control” by Myles Udland at Business Insider and https://economix.blogs.nytimes.com/2014/04/02/the-many-classes-of-google-stock/?mcubz=1 (last accessed September 2017).}\]
interests and control rights can be achieved by stock pyramids or cross-ownership. In summary, compared to the actual fraction of shares, it is evident that depending on the institutional and contractual arrangements, a shareholder can have over- or under-proportional influence over the firm’s decisions.

The insight that there is no one-to-one relationship between an ownership share and control is also reflected in competition laws which define legal criteria for merger control to apply. For instance, the European Union merger regulation requires decisive influence for a transaction to be under the jurisdiction the European Commission, which is understood as the right to use all or parts of the assets of an undertaking and/or the right to decisively influence the composition, voting or decision of the organs of an undertaking. In practice there is not a unique cut-off for this criterion to be fulfilled. A typically sufficient criterion seems to be the acquisition of voting shares of more than 50% (for the purpose of sole control). There are cases in which the European Commission applied merger control even below this threshold. This implies that the influence considered necessarily is partial and does not allow the acquiring firm to completely control the target firm.

With respect to minority shareholdings that do not confer decisive control, the European Commission has identified a potential enforcement gap in the current EU merger control. Recent empirical studies provide evidence that support the assessment that also minority shareholdings that do not confer decisive control over the target firms can create competitive concerns. For instance, Azar et al. (2016) and Azar et al. (2017) document increasing common ownership concentration of large institutional investors in competing firms in the US airline and bank industry and show that this concentration is positively associated with the price level in these industries.

Our analysis contributes to the discussion on these non-controlling minority shareholdings (in the sense of the EC merger regulation) as we focus on influential partial forward shareholdings, where the degree of influence is below the level where the upstream firm can simply “dictate” the downstream firm’s strategy. By this we capture those cases of influence which fall short of the European Union’s definition of decisive influence. However, our analyses also extend to the cases which fulfill the criterion of decisive influence.

We take into account that the corporate control might not be proportional to the financial interests that a shareholder holds in the target firm. Towards illustrating our results, we will focus on the benchmark case of proportional control for which the financial interests in the target firm’s profits are proportional to the corporate influence. However, for our results to hold, we only need that a partial shareholding confers some degree of influence over the target firm.

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16 See the EC white paper towards more effective EU merger control of 2014.
4.2 Equivalence between controlling forward and non-controlling backward integration

In this section we derive an equivalence result for the objective function of the downstream (target) firms between the cases of passive backward and influential partial forward integration. Already O’Brien and Salop (2000) have argued that a target firm which is partially controlled by an acquiring firm will consider the objectives of the acquiring firm as if the the target firm itself had a financial interest in its acquirer. We formalize this idea by assuming that the target firm’s objective function consists of a weighted average of its shareholders’ objectives functions that are weighted by their respective influence over the target firm. This influence might by proportional to the financial stake, but – in light of the discussion in Section 4.1 – we also allow for degrees of influence that are not proportional to the financial interest in the target firm.

Consider that supplier $U$ acquires an ownership share $\delta_i$ of one downstream firm $i$. We first focus on the case in which the upstream firm $U$ holds no shares of the other downstream firm $-i$ ($\delta_{-i} = 0$) and assume that the owner of downstream firm $-i$ has no other interest in the industry and thus wants to maximize the operational profit $\pi_{-i}$. Afterwards we generalize to the case of $\delta_{-i} > 0$.

With the acquisition, supplier $U$ obtains a share $\delta_i$ of the downstream profit of firm $i$. The total profit of $U$ consists of its own operational profit $\pi_U$ and the participation in the target firm’s profit $\pi_i$:

$$\Pi_U (w_i, w_{-i}) = \pi_U (w_i, w_{-i}) + \delta_i \pi_i (w_i, w_{-i}).$$  \hspace{1cm} (11)

If the ownership also confers control, the upstream firm $U$ additionally obtains influence over the strategic decisions of downstream firm $A$. Consequently, the downstream firm has two shareholders with structurally different interests. By assumption, the initial shareholder of downstream firm $A$ only holds shares of the this firm and has no other interests in the same industry. Therefore, this shareholder’s objective is to maximize $i$’s operational profit $\pi_i$. Instead, upstream firm $U$ as the second shareholder cares both about the downstream profit $\pi_i$ and about the operational upstream profit $\pi_U$. Note that the upstream firm’s profit $\pi_U$ also depends on the strategic decisions of firm $A$. To the extent that the downstream firm $i$’s optimal strategic decisions affect the operational profits $\pi_i$ and $\pi_U$ differently, the upstream firm $U$ might want to exercise its corporate control over the downstream firm $i$.

We assume that the management of the downstream firm $i$ balances the diverging interests of the shareholders by considering a weighted average of the shareholders’ objective functions according to their degree of influence. Denote with the parameter $\beta \in (0, 1)$ the upstream firm $U$’s influence\textsuperscript{18} Corresondingly, the initial shareholder of the downstream

\textsuperscript{17}In general, this could entail a different profit share. Without loss of generality, we assume that the profit share equals the ownership share and let the control share vary.

\textsuperscript{18}Note that we do not impose a direct relationship between the financial interest $\delta_i$ and the parameter
firm $i$ retains an influence of $1 - \beta$. Formally, the objective function of downstream firm $i$ is given by

$$\Pi_A(w_i, w_{-i}) = \beta \Pi^U(w_i, w_{-i}) + (1 - \beta) \pi_i(w_i, w_{-i})$$

(12)

$$= \beta \pi^U(w_i, w_{-i}) + (1 - \beta + \beta \delta_i) \pi_i(w_i, w_{-i}).$$

We can further simplify $A$’s objective function by defining the coefficient of $U$’s corporate control over the downstream firm $i$

$$\epsilon_i(\beta, \delta_i) = \frac{\beta}{1 - \beta (1 - \delta_i)}.$$  

(13)

With this notation we can write the downstream firm $i$’s objective function as

$$\Pi_i(w_i, w_{-i}) = (1 - \beta (1 - \delta_i)) \left[ \pi_i(w_i, w_{-i}) + \epsilon_i \pi^U(w_i, w_{-i}) \right].$$

(14)

The corporate control coefficient $\epsilon_i$ measures the relative weight of the upstream firm $U$’s operational profit $\pi^U$ in $i$’s objective function. It captures the interaction between the profit participation $\delta_i$ and the corporate influence $\beta$ of upstream firm $U$ over the downstream firm $i$. For a given corporate influence $\beta$, the control coefficient $\epsilon_i$ is decreasing in the profit participation $\delta_i$. The higher the share is that the upstream firm $U$ receives from the operational profit $\pi_i$, the lower is the weight that the downstream firm $i$ puts on $\pi^U$. In contrast, for a given profit participation $\delta_i$, a higher influence $\beta$ implies that the weight on the upstream firm $U$’s operational profit $\pi^U$ increases. For $\epsilon_i(\beta, \delta_i) = 0$ the only objective of downstream firm $i$ is to maximize its operational profit $\Pi_i = \pi_i = (p_i - w_i)q_i$. For $\epsilon_i(\beta, \delta_i) = 1$ firm $i$ maximizes the joint profit function $\Pi^U = \Pi_i = p_iq_i + w_{-i}q_{-i}$ like a merged entity.

For a given ownership structure, the factor $(1 - \beta (1 - \delta_i))$ is just a constant factor in the continuation game of stages 2 and 3. It is equivalent to consider the simplified objective function

$$\Pi_i(w_i, w_{-i}) = \pi_i(w_i, w_{-i}) + \epsilon_i \pi^U(w_i, w_{-i}),$$

(15)

for the maximization problems of the continuation game. As a preview to our main result, note that the structure of firm $A$’s objective function resembles that the case in which firm $A$ has non-controlling backward ownership of $U$ with a profit participation $\epsilon_A$.

**Proposition 3.** Let the upstream firm $U$ hold a ownership share $\delta_i$ of downstream firm $i$ that is associated with corporate influence $\beta$. Then, the objective function of downstream firm $i$ is structurally equivalent to the case in which the downstream firm holds a non-controlling ownership of the upstream firm with a share of $\epsilon_i(\beta, \delta_i) = \frac{\beta}{1 - \beta (1 - \delta_i)}$.
Next, we allow the upstream firm $U$ to hold influential ownership $\delta_i$ of both downstream firms. In this case the $U$’s objective function becomes

$$\Pi^U (w_i, w_{-i}) = \pi^U (w_i, w_{-i}) + \delta_i \pi_i (w_i, w_i) + \delta_{-i} \pi_{-i} (w_{-i}, w_{-i}).$$ (16)

Therefore, the downstream firm $i$ directly internalizes the operational profit of its downstream competitor $\pi_{-i}$. The downstream objective function becomes

$$\Pi_i (w_i, w_{-i}) = \beta \Pi^U (w_i, w_{-i}) + (1 - \beta) \pi_A (w_i, w_{-i})$$
$$= \beta \pi^U + (1 - \beta (1 - \delta_i)) \pi_i (w_i, w_{-i}) + \beta \delta_{-i} \pi_{-i} (w_{-i}, w_{-i}).$$ (17)

By the same logic as above, it is equivalent to consider the following simplified objective function for the continuation game of stages 2 and 3

$$\Pi_i (w_i, w_{-i}) = \pi_i (w_i, w_i) + \epsilon_i \delta_{-i} \pi_{-i} (w_{-i}, w_i) + \epsilon_i \pi^U (w_i, w_{-i}).$$ (18)

Compared to the situation in which the upstream firm $U$ only invests in one downstream firm (Eq. [15]), a partial ownership in both downstream firms causes a further structural change in $i$’s objective function. As $U$ participates in the profits of the downstream competitor $-i$, the profit $\pi_{-i}$ directly enters $i$’s objective function. This causes a direct horizontal internalization of the downstream firms’ profits. Note that this effect is distinct to the case of influential forward integration and does not emerge under non-controlling backward integration.

### 4.3 Competitive effects of partial ownership

In Section 4.2 we have shown that the objective function of a downstream firm that is partially controlled by its supplier is structurally equivalent to the case in which the downstream firm holds a non-controlling share of its supplier. Relying on this result, we verify that this equivalence is sufficient in order to obtain the same anti-competitive effects that have been derived for the case of non-controlling backward integration.

### 4.4 Relaxation of downstream competition

Hunold and Stahl (2016) show that non-controlling ownership in the efficient supplier can decrease the intensity of downstream price competition. If the supplier also sells to the downstream competitor, the acquiring firm internalizes the sales to its competitor and therefore competes less aggressively. In cases in which the effective input price remains unaffected from the acquisition, this internalization leads to higher retail prices. As shown in Proposition 3 under influential forward integration, the downstream firm also internalizes the operational profit of the efficient supplier that sells to the downstream firm. But additionally the supplier also obtains financial interest in the downstream firm’s profit.
Comparable to Flath (1989), we show that under linear tariffs this profit participation *ceteris paribus* has a pro-competitive effect on the downstream market. However, under the condition that upstream competition is sufficiently intense, we find that the anti-competitive effect of Hunold and Stahl (2016) prevails.

As Hunold and Stahl (2016), we focus on downstream price competition in differentiated products and consider the case that the upstream firm $U$ holds an influential ownership $\delta_A$ of downstream firm $A$ that is associated with corporate influence of $\beta$.

Denote with $q_i(p_i, p_{-i})$ the inverse consumer demand for the final product of downstream firm $i$. Given that the upstream firm $U$ supplies both downstream firms at $w_i^U = w_i$, the objective function, which consists of $U$’s operational profit $\pi_U$ and the financial interest in the operational profit of downstream firm $A$, is

$$\Pi^U = w_A q_A(p_A, p_B) + w_B q_B(p_B, p_A) + \delta_A [(p_A - w_A) q_A(p_A, p_B)].$$ (19)

As derived in Section 4.2, the (simplified) objective function of downstream firm $A$ is

$$\Pi_A = (p_A - w_A) q_A(p_A, p_B) + \epsilon_A(w_A q_A(p_A, p_B) + w_B q_B(p_B, p_A))$$ (20)

The objective function of downstream firm $B$ is the operational profit $\pi_B$ as under passive forward integration or vertical separation. In the third stage firms $A$ and $B$ simultaneously choose their supplier and set prices in order to maximize their objective functions. The equilibrium prices $(p_A^*, p_B^*)$ are mutually best responses taking into account input prices $(w_A, w_B)$ and partial corporate control $\epsilon_A(\beta, \delta_A)$ of the upstream firm $U$ over the target firm $A$. Given that both downstream firms choose the efficient supplier $U$, the equilibrium prices solve the system of first-order conditions

$$\frac{\partial \Pi_A}{\partial p_A} = (p_A^* - (1 - \epsilon_A) w_A) \frac{\partial q_A}{\partial p_A} + q_A(p_A^*, p_B^*) + \epsilon_A w_B \frac{\partial q_B}{\partial p_A} = 0,$$ (21)

$$\frac{\partial \Pi_B}{\partial p_B} = (p_B^* - w_B) \frac{\partial q_B}{\partial p_B} + q_B(p_B^*, p_A^*) = 0.$$ (22)

For the case of passive forward integration ($\epsilon_A = 0$), we have shown in Section 3 that for given input prices the downstream equilibrium remains unaffected compared to the case of vertical separation. However, in the case of a positive corporate control ($\epsilon_A > 0$), the downstream firm $A$ also attaches weight to the upstream firm $U$’s operational profit $\pi^U$. This has two important implications for its first-order condition in Equation (21). First, the effective input price for downstream firm $A$ decreases in the corporate control coefficient $\epsilon_A$. As $A$ also attaches weight to the upstream firm $U$’s objective function, it perceives lower input costs if it sources from $U$. Second, the downstream firm $A$ internalizes that the upstream firm $U$ derives revenue from supplying the downstream competitor $B$. As $\frac{\partial q_B}{\partial p_A} > 0$ by Assumption 1(i), the downstream firm $A$’s marginal profit increases if the
upstream firm $U$ supplies both downstream firms. Therefore, the vertical acquisition of the upstream firm $U$ in the target firm $A$ closely resembles a horizontal integration between the downstream competitors $A$ and $B$.

In the downstream equilibrium, in which both downstream firms source from the efficient upstream firm $U$, the unique equilibrium prices depend on wholesale price $(w_A, w_B)$ and partial corporate control $\epsilon_A (\beta, \delta_A)$. We summarize in:

**Lemma 1.** Let the upstream firm $U$ hold an influential partial ownership in the downstream firm $A$ with coefficient of corporate control of $\epsilon_A (\beta, \delta_A)$. Given that the efficient upstream firm $U$ supplies both downstream firms, the unique downstream equilibrium under partial forward integration is the price vector

$$(p_A^* (w_A, w_B | \epsilon_A (\beta, \delta_A)), p_B^* (w_A, w_B | \epsilon_A (\beta, \delta_A))).$$

In the second stage, the upstream firm $U$ clearly can profitably supply both downstream firms as in the benchmark case of vertical separation in Section 2.1. As Hunold and Stahl (2016), we focus on the case of effective upstream competition, that is, $U$ can supply both downstream firms at most at effective input prices $w_i$ as high as $c$ in order to avoid that the downstream firms prefer to buy from the competitive fringe. For the downstream firm $B$ this implies that the linear wholesale price $w_B$ cannot exceed the input price offered by the competitive fringe $w_B \leq c$. The downstream firm $A$ perceives a lower effective input price of $(1 - \epsilon_A) w_A$ as it also internalizes the operational profit of upstream firm $U$ with $\epsilon_A$. This perceived reduction of the input price increases the scope for upstream firm $U$ to raise the input price up to $w_U = c$ without loosing the upstream firm $A$ as customer. Therefore, the optimization problem of the upstream firm $U$ is

$$\max_{w_A, w_B} \Pi_U^U = \pi_U + \delta \pi_A$$

subject to $w_A \leq \frac{c}{1-\epsilon}$ and $w_B \leq c$. Effective competition implies that the upstream firm $U$ chooses input prices such that both constraints are binding. In this case both downstream firms are indifferent between both suppliers any by our tie-breaking assumption purchase from the efficient supplier $U$. The resulting input prices are $w_A^* = \frac{c}{1-\epsilon}$ and $w_B^* = c$. Lemma 2 summarizes the result.

**Lemma 2.** It is feasible and optimal for upstream firm $U$ to supply both downstream firms. Under effective competition from the competitive fringe $V$, input prices are $w_A = \frac{c}{1-\epsilon}$ and $w_B = c$.

Note that the upstream firm $U$ chooses input prices such that the resulting effective prices are equal to $c$ for both downstream firms. The model predicts that the upstream firm $U$ charges higher input prices to the partially integrated firm $A$ than to $B$.

Given the result of Lemma 2, we can now characterize the downstream equilibrium for given influential forward integration. For wholesale prices $w_A = \frac{c}{1-\epsilon}$ and $w_B = c$ we can
write the first-order conditions of the downstream firms as

\[
\frac{\partial \Pi_A}{\partial p_A} = (p^*_A - c) \frac{\partial q_A}{\partial p_A} + q_A (p^*_A, p^*_B) + \epsilon_A \frac{\partial q_B}{\partial p_A} = 0 \tag{25}
\]

\[
\frac{\partial \pi_B}{\partial p_B} = (p^*_B - c) \frac{\partial q_B}{\partial p_B} + q_B (p^*_B, p^*_A) = 0. \tag{26}
\]

For a given corporate control coefficient \( \epsilon > 0 \), the marginal profit of downstream firm \( A \) increases in the downstream competitor’s quantity \( q_B \). Hence, the downstream firm \( A \) has an incentive to increase its price \( p_A \) in order to divert relatively more demand to the downstream competitor \( B \). The internalization increases in the corporate control parameter \( \epsilon_A (\beta, \delta_A) \) as well as with a closer substitutability of the downstream products, as measured by \( \frac{\partial q_B}{\partial p_A} \). We summarize the result in:

**Proposition 4.** Let the upstream firm \( U \) hold an influential ownership \( \delta_A \) of downstream firm \( A \) and let upstream competition be sufficiently intense \((c \text{ small enough})\). Under Assumption 2, both equilibrium downstream prices \((p^*_A, p^*_B)\) increase in the coefficient of corporate control \( \epsilon_A (\beta, \delta_A) \). The increase is stronger when downstream products are closer substitutes.

In order to illustrate the main result Proposition 4, we compute closed-form solutions for the linear demand specification from Equation 1. For the purpose of illustration, we consider the case of a proportional relationship between the share \( \delta_A \) and the weight of influence \( \beta \) that the upstream firm \( U \) gains in the objective function of downstream firm \( A \). The resulting coefficient of corporate control under proportional control is monotonically increasing in \( \delta \) and reads as

\[
\epsilon_{prop} (\delta_A) = \frac{\delta_A}{1 - \delta_A + \delta_A^2}. \tag{27}
\]

Figure 2 displays the downstream equilibrium under vertical separation and under influential forward integration. The solid lines indicate the downstream firms’ reaction functions for the case of no corporate control \( \epsilon_A (\beta, \delta_A) = 0 \). The dashed line shows that \( A \)’s reaction function is shifted upwards if \( U \) owns an influential share of \( \delta_A = 0.3 \) of the downstream firm \( A \). As the upstream firm \( A \) also internalizes the sales to the downstream competitor, it increases its own retail price \( p'_A \) for every given price \( p_B \) of its competitor compared to the case of vertical separation. Therefore, equilibrium prices \( p^*_A \) are higher if the upstream firm \( U \) partially influences the downstream firm \( A \).
Figure 2: Reaction functions

The figure shows the downstream firms’ reaction functions under vertical separation (solid lines) and under influential forward integration with \( \delta_A = 0.3 \). The product differentiation parameter is set to \( \gamma = 0.7 \) and the competitive fringe has marginal costs of \( c = 0.3 \).

**Profitability of controlling forward acquisition**

So far, we have shown in Proposition 4 that the anti-competitive effect of passive backward integration (Hunold and Stahl, 2016) also applies to the case of influential forward integration. That is, a positive corporate control of the upstream firm \( U \) over the downstream firm \( A \) results in a higher downstream price level. In this section we assess whether a partial forward integration with corporate control coefficient \( \epsilon_A (\beta, \delta_A) \) is jointly profitable for the upstream firm \( U \) and the downstream firm \( A \). In the case that the acquisition is jointly profitable, we assume that the upstream firm \( U \) and the downstream firm \( A \) can efficiently bargain to trade the shares from \( A \) to \( U \). The joint operational profit of upstream firm \( U \) and downstream firm \( A \) is \( \pi^U_A = \pi_A + \pi^U \). Taking into account the equilibrium outcomes from stage two and three this can be written as

\[
\pi^U_A = q_A (p^*_A, p^*_B) p^*_A + q_B (p^*_B, p^*_A) c. \tag{28}
\]

The joint profit of \( U \) and \( A \) simplifies to equation (28) because the financial participation of upstream firm \( U \) in the downstream firm \( A \) simply redistributes the profits between the
firms. As the effective input prices remain constant at $w_i = c$ under effective upstream competition (Lemma 2), the partial forward integration does not directly influence the downstream equilibrium by altering the input costs for the downstream firms. However, the acquisition indirectly influences the downstream equilibrium. The upstream firm $U$ exercises corporate control over the downstream firm $A$ and induces $A$ to internalize $U$’s sales to the downstream competitor $B$. The resulting higher price level (Proposition 4) results in a higher downstream profit level but also to a lower total quantity sold. This constitutes a trade-off for the joint profit of $U$ and $A$ between higher downstream profit and a lower quantity sold to both downstream firms which determines the optimal level of corporate control of the upstream firm $A$ over the downstream firm $A$. It emerges that it is jointly profitable to transfer a positive amount of corporate control $\epsilon_A$ from the downstream firm $A$ to the upstream firm $U$ provided that upstream competition is sufficiently intense. Evaluating $\frac{\partial \pi^U}{\partial \epsilon}$ yields:

**Proposition 5.** An increasing partial corporate control $\epsilon_A$ of firm $U$ over downstream firm $A$ increases the joint profits of the downstream firm $A$ and the upstream firm $U$ if upstream competition is sufficiently intense.

For downstream firm $B$, the partial forward integration of upstream firm $U$ and downstream firm $A$ is always profitable if the upstream firm $U$ supplies both downstream firms. The downstream firm $A$’s marginal profit increases in the corporate control parameter $\epsilon_A$ and leads to a higher optimal price $p_A^*$. As downstream prices are strategic complements (Assumption 2(2)), the downstream firm $B$ optimally reacts by also increasing the price $p_B^*$ and gains a higher profit $\pi_B$. It is immediate that industry profits increase if the upstream competition is effective and the firm $U$ partially integrates the downstream firm $A$.

**Corollary 1.** Increasing controlling forward ownership of firm $U$ in the downstream firms $i \in \{A, B\}$ increases the industry profit $\pi^U_{AB} = p_A^*q_A + p_B^*q_B$ if upstream competition is sufficiently intense.

Starting from $\delta = 0$, we can show for our linear demand specification and the case of proportional control that the partial forward integration is profitable for $c < \frac{\gamma^2}{4}$.

**Two-part tariffs**

In the main specification of the model, we allow for linear wholesale tariffs. In the following we verify that the results of anti-competitive influential forward ownership also hold under observable and non-exclusive two-part tariffs. Recall from Proposition 2 that the upstream firm $U$ endogenously charges linear tariffs with $w_i = c$ and $F_i = 0$ if upstream competition is sufficiently intense and contracts are non-exclusive. This result of Proposition 2 applies to the case of vertical separation and passive forward integration. In the case of vertical

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19Non-negative profits for downstream firm $A$.
separation, we find for the linear demand specification (Eq. [1]) and under proportional control that upstream competition is sufficiently intense and leads to endogenous linear tariffs for \( c < \frac{1}{4} \).

Consider now a situation in which we allow the upstream firm \( U \) to hold a influential ownership share \( \delta_A \) in the downstream firm \( A \). We show that the corner solution in which the upstream firm \( U \) charges maximal linear input prices remains optimal for some influential forward integration as in the case of vertical separation. Moreover, due to the horizontal internalization, the upstream firm \( U \) also can extract a positive fixed fee from the downstream competitor \( B \) under influential forward integration. The reason is that the partial integration reduces the negative price externality for the downstream firm \( B \) if both downstream firms source from the efficient supplier \( U \). This effectively increases the profits of downstream firm \( B \) as compared to the case in which it sources from the competitive fringe at the same input costs. Therefore, the upstream firm \( U \) can extract this additional profit via the fixed fee \( F_B > 0 \). We summarize in

**Lemma 3.** Let the upstream firm \( U \) hold influential shares of downstream firm \( A \) and let upstream competition be sufficiently intense. Then, the upstream firm \( U \) offers the contract \( w_A = \frac{c}{1-\epsilon} \) and \( F_A = 0 \) to the downstream firm \( A \) and \( w_B = c \) and \( F_B > 0 \) to the downstream firm \( B \).

As a result, under controlling forward integration and sufficiently intense upstream competition, the effective linear input price remains at \( c \) for both downstream firms. Equally, the controlling forward integration softens the downstream competition, as downstream firm \( A \) also internalizes \( U \)'s sales to \( B \) which increases both joint profits of \( A \) and \( U \) and total industry profits. Therefore, Proposition 5 remains valid under two-part tariffs. We conclude:

**Corollary 2.** Let upstream competition be sufficiently intense. Then, under controlling forward integration of upstream firm \( U \) in downstream firm \( A \), increases the joint profit \( \pi_U^A \) as well as the industry profit \( \pi_U^{AB} \).

We conclude that the main results under linear tariffs also extend to two-part tariffs if upstream competition is sufficiently intense.

## 5 Conclusion

We have studied partial forward ownership that upstream firms hold of their industrial customers. Our main finding is that such forward ownership can have anti-competitive effects, which is in contrast to arguably the main basic result of the existing literature where forward ownership is shown to be pro-competitive (Flath, 1989).

There are two important insights which should be taken into account when analyzing partial vertical ownership links, both in the academic literature as well as in competition
policy. The first insight is that in the context of partial ownership, theoretical results obtained under the assumption of linear upstream tariffs may be completely reversed compared to the results obtained with non-linear upstream tariffs. The second insights relates to the fact that corporate ownership generally has elements of control over the target as well as rights to the its profits (O’Brien and Salop 2000). We have shown that the pro-competitive results of non-controlling forward integration do not transfer to the case of partially controlling ownership which even can have anti-competitive effects, both in case of linear tariffs and non-linear tariffs.

In case of partial ownership, a profit share is relatively easy to quantify, and usually assumed to equal the ownership share. Partial control is much more difficult to operationalize. The theoretical literature on vertical partial ownership has so far focused mostly on the polar cases of either full control and foreclosure (Baumol and Ordover 1994, Spiegel 2013, and Levy et al. (forthcoming)) or no control and the results generally relate to double marginalization. In particular, non-controlling backward ownership is shown to preserve double marginalization (Flath 1989; Greenlee and Raskovich 2006), whereas non-controlling forward ownership with linear tariffs reduces double marginalization – and moves the industry towards vertical integration (Flath 1989). A few authors have already pointed out for the case of linear upstream tariffs that if backward ownership is (partially) controlling, it tends to decrease double marginalization and therefore tends to be good for consumers (Hunold et al. 2012 and Brito et al. 2016).

In light of these analyses, it appears to be a natural conjecture that partial forward ownership with elements of control should even more move the industry towards integration and similarly should be pro-competitive. To the contrary, we have shown in the present article that forward ownership can yield the same anti-competitive effects of non-controlling backward ownership (Hunold and Stahl 2016; Hunold 2017). The intuition for this equivalence result is that the upstream owner uses its influence (partial control) to induce the management of its customer to internalize its upstream profits.

Moreover, even non-controlling ownership can be anti-competitive if the upstream tariffs are non-linear. This again is surprising as non-linear tariffs (such as an upfront fee and a marginal wholesale price) are often thought to reduce double marginalization and thus benefit customers, when compared to linear tariffs. Similarly, for the case of linear upstream tariffs, Flath (1989) has pointed out that non-controlling partial forward ownership reduces double marginalization as the upstream firm (partly) internalizes the downstream margin and therefore reduces the marginal wholesale price. A natural conclusion is that the combination of non-controlling forward ownership and non-linear tariffs should reduce double marginalization even more. However, we have shown that just the opposite can happen. The reason is that in case of upstream competition, a supplier using two-part tariffs strategically depreciates the value of the downstream firms’ outside options of other customers by decreasing the marginal input price below the level that would induce the downstream firms to charge the industry-profit-maximizing downstream price. This incentive is attenuated if the upstream firm has a financial interest in its cus-
tomer. Hence, the optimal two-part tariff under passive forward integration is closer to the industry profit maximizing contract as compared to vertical separation, which implies higher marginal wholesale prices than without forward ownership. Typically, an increase in the marginal input costs is passed on to the consumers in form of higher retail prices.

A take-away for both competition policy and academics studying partial vertical ownership is therefore to carefully analyze the elements of influence associated with the ownership stake and take into account the type of wholesale contracts between the linked firms as well as those of other downstream firms. Whether partial forward ownership is pro- or anti-competitive may crucially depend on these elements. It may well be pro-competitive if it is not associated with influence over the target and if wholesale contracts are linear. However, partial forward ownership may well be anti-competitive when the upstream firm with forward ownership also supplies (potential) downstream competitors and if one of the following conditions holds:

1. the forward ownership shareholding allows the supplier to influence the downstream firms (with either linear or non-linear wholesale tariffs);

2. the supplier uses non-linear tariffs and there are potential alternative supply options for the downstream firms (even without any influence).

The question whether partial ownership has elements of partial control or – more moderately speaking – influence of the target should be carefully analyzed. The growing empirical literature on common ownership (Azar et al., 2016, 2017) suggests that such influence may materialize even with relatively small ownership shares and lead to significant anti-competitive effects.
Appendix

Proof of Proposition 1. Recall that a passive partial forward integration weakly decreases the linear wholesale price \( w \) that the upstream firm \( U \) charges from the downstream firms \( i \in \{A,B\} \). Under effective upstream competition, the wholesale price remains at \( w = c \) compared to vertical separation. As the input costs are unaffected for the downstream firms, the downstream equilibrium is equivalent to the equilibrium under vertical separation. In this case a passive forward integration is competitively neutral.

Under ineffective upstream competition, the upstream firm \( U \) charges a lower wholesale price to the downstream firms. In the following we analyze the effect of lower input costs on the downstream equilibrium prices under (i) price and (ii) quantity competition separately.

(i) First, consider price competition. The first-order condition of downstream firm \( i \) is

\[
\frac{\partial \pi_i}{\partial p_i} = (p_i - w) \frac{\partial q_i}{\partial p_i} + q_i = 0.
\]  

(29)

By the implicit function theorem, we can evaluate the partial derivative of the equilibrium retail price \( p_i \) with respect to the input costs \( w_i \) by

\[
\frac{\partial p_i^*}{\partial w_i} = -\frac{-\frac{\partial q_i}{\partial q_i}}{2\frac{\partial \pi_i}{\partial \pi_i} + (p_i - w) \frac{\partial^2 \pi_i}{\partial p_i \partial q_i}}.
\]  

(30)

The denominator is the second derivative of the downstream firm \( i \)'s profit function which is negative by assumption. Hence, we conclude \( \frac{\partial p_i^*}{\partial w_i} > 0 \) for the case of price competition.

(ii) If the downstream firms compete in quantities, we specify the demand function as \( p(Q) \) with \( Q = q_A + q_B \) and assume \( \frac{\partial p}{\partial Q} < 0 \). In this case the first-order condition of downstream firm \( i \) is

\[
\frac{\partial \pi_i}{\partial q_i} = (p - w) + q_i \frac{\partial p}{\partial q_i} = 0.
\]  

(31)

Again applying the implicit function theorem yields

\[
\frac{\partial q_i^*}{\partial w_i} = \frac{-1}{2\frac{\partial q_i}{\partial q_i} + \frac{\partial^2 p}{\partial q_i}}.
\]  

(32)

By the convexity of the downstream firm \( i \)'s profit function, the derivative \( \frac{\partial q_i^*}{\partial w_i} < 0 \) is negative. Hence, the equilibrium quantity \( q_i^* \) increases if the input costs \( w \) decrease and accordingly the retail price \( p(Q) \) decrease. This establishes the result.

Proof of Lemma 1. Consider the slope of the reaction function \( p_i^* (p_{-i} | \epsilon) \) by the implicit function theorem.

\[
\frac{dp_i}{dp_{-i}} = -\frac{\frac{\partial^2 \Pi}{\partial p_i \partial p_{-i}}}{\frac{\partial^2 \Pi}{\partial p_i}}
\]
The slope of $-i$’s reaction function $p^*_{-i}(p_i|\epsilon)$ is
\[
\frac{dp^*_{-i}}{dp_i} = -\frac{\partial^2 \Pi_{-i}}{\partial p_i \partial p_{-i}} \frac{\partial^2 \Pi_{-i}}{\partial^2 p_{-i}}
\]
Inverting yields
\[
\left( \frac{dp^*_{-i}}{dp_i} \right)^{-1} = -\frac{\partial^2 \Pi_{-i}}{\partial p_i \partial p_{-i}} \frac{\partial^2 \Pi_{-i}}{\partial^2 p_{-i}}
\]
From Assumption 2, we know $\frac{\partial^2 \Pi_i(p_i, p_{-i})}{\partial p_i \partial p_{-i}} / \frac{\partial^2 \Pi_i(p_i, p_{-i})}{\partial p_{-i} \partial p_i} > \frac{\partial^2 \Pi_{-i}(p_{-i}, p_i)}{\partial p_{-i} \partial p_i} / \frac{\partial^2 \Pi_{-i}(p_{-i}, p_i)}{\partial p_{-i} \partial p_i}$. That is, the slope of $\left( \frac{dp^*_{-i}}{dp_i} \right)^{-1}$ is strictly larger than the slope of $p^*_i(p_{-i}|\epsilon)$. This implies that the two reaction functions have a unique intersection. Last, we have to verify that the intersection lies in a positive range. Consider the case in which downstream firm $-i$ sets a price of zero $p_{-i} = 0$. Clearly, for the optimal price of downstream firm $i$ it holds that $p^*_i(0|\epsilon) > 0$ if $q_i(p_i, 0) > 0$. By Assumption 2, the reaction function intersect at positive values for $(p_i, p_{-i})$. This establish the result of a unique downstream price equilibrium at positive prices.

Proof of Proposition 4 Consider the system of first-order conditions in Assumption 2 that implicitly defines equilibrium downstream prices under effective upstream competition. By the implicit function theorem, the partial derivative of $p_A$ with respect to the coefficient of corporate control $\epsilon_A$ is
\[
\frac{\partial p^*_A}{\partial \epsilon} = -\frac{\partial q_A}{\partial p_A} + \frac{\partial q_A}{\partial p_A} (p_A - c) + \epsilon_A w_B \frac{\partial p^*_B}{\partial \epsilon_A}
\]
Under Assumption 2, the partial derivative $\frac{\partial p_A}{\partial \epsilon}$ is positive. Strategic complementarity of downstream prices implies that an increase in $\epsilon_A(\beta, \delta_A)$ increases both equilibrium prices which establishes the result. The argument extends to the case where the upstream firm $U$ holds shares with some corporate control in both downstream firms.

Proof of Proposition 5 Assume that the upstream firm $U$ partially integrates the downstream firm $A$ and exerts corporate control of $\epsilon_A$. There is no integration of the downstream firm $B$. Consider the joint profit $\pi^U_A = q_A(p^*_A, p^*_B)p^*_A + q_B(p^*_B, p^*_A) c$ in order to assess whether the acquisition of corporate control of $U$ over $A$ is jointly profitable for both firms. The partial derivative of the joint profit with respect to the coefficient of corporate control yields
\[
\frac{\partial \pi^U_A}{\partial \epsilon_A} = \frac{\partial q_A \partial p^*_A}{\partial p_A} + q_A(p^*_A, p^*_B) \frac{\partial p^*_A}{\partial \epsilon_A} + \frac{\partial q_B \partial p^*_A}{\partial p_B} c + \frac{\partial q_A \partial p^*_B}{\partial p_A} c + \frac{\partial q_B \partial p^*_B}{\partial p_B} c (34)
\]
If \( \frac{\partial \pi^U}{\partial c} > 0 \) we can infer that it is jointly profitable for \( A \) and \( U \) to increase the corporate control parameter. We employ the first-order condition of downstream firm \( A \) under a positive corporate control parameter \( \epsilon_A \) (Equation 25) in order to simplify this inequality to

\[
c < - \frac{\frac{\partial q_A}{\partial p_A} \frac{\partial p^*_j}{\partial w} + \frac{\partial q_B}{\partial p_B} \frac{\partial p^*_j}{\partial w}}{\frac{\partial q_A}{\partial p_A} + (1 - \epsilon) \frac{\partial q_B}{\partial p_B}}\partial w. \quad (35)
\]

By Assumption 1, the right hand side is strictly positive. Hence, we always can find \( c \) sufficiently small such that a partial ownership marginally increases joint profits of \( A \) and \( U \). This establishes the result.

Proof of Proposition 3 Here, we prove the last part of The partial derivative of \( U \)'s reduced objective function with respect to \( w_i \) is

\[
\frac{\partial \pi^U}{\partial w_i} = \frac{\partial p^*_i}{\partial w_i} q_i(p^*_i, p^*_{-i}) + p^*_i(w_i, w_{-i}) \left( \frac{\partial q_i}{\partial p^*_i} \frac{\partial p^*_i}{\partial w_i} + \frac{\partial q_i}{\partial p_{-i}} \frac{\partial p^*_{-i}}{\partial w_i} \right) + \frac{\partial p^*_{-i}}{\partial w_i} q_{-i}(p^*_{-i}, p^*_i) + p^*_{-i}(w_{-i}, w_i) \left( \frac{\partial q_{-i}}{\partial p^*_i} \frac{\partial p^*_i}{\partial w_i} + \frac{\partial q_{-i}}{\partial p_{-i}} \frac{\partial p^*_{-i}}{\partial w_i} \right) - \frac{\partial p^*_{-i}}{\partial w_i} q_{-i}(p^*_{-i}, p^*_i) - (p^*_{-i}(c, w_i) - c) \left( \frac{\partial q_{-i}}{\partial p^*_i} \frac{\partial p^*_i}{\partial w_i} + \frac{\partial q_{-i}}{\partial p_{-i}} \frac{\partial p^*_{-i}}{\partial w_i} \right) \quad (36)
\]

We want to show that for \( c \) sufficiently small, the upstream firm \( U \) is constrained in its price setting and decides to set a linear wholesale price equal to the marginal cost of the inefficient supplier, that is \( w_A = w_B = c \), that is

\[
\left. \frac{\partial \pi^U}{\partial w_i} \right|_{w_A = c} > 0 \quad (37)
\]

If we evaluate \( \frac{\partial \pi^U}{\partial w_i} \) at \( w_A = w_B = c \), add and subtract \( c \left( \frac{\partial q_i}{\partial p^*_i} \frac{\partial p^*_i}{\partial w_i} + \frac{\partial q_{-i}}{\partial p_{-i}} \frac{\partial p^*_{-i}}{\partial w_i} \right) \) and employ \( \frac{\partial q_i}{\partial w_i} = 0 \) from downstream firm \( i \)'s FOC and exploit demand symmetry we get

\[
c < - \frac{q_i}{\left( \frac{\partial q_i}{\partial p^*_i} + \frac{\partial q_{-i}}{\partial p_{-i}} \right)} \cdot \frac{\partial q_i}{\partial p^*_i} + \frac{\partial q_{-i}}{\partial p_{-i}} \quad (38)
\]

Under Assumption 1, the right hand side remains positive as \( c \) goes to zero. Hence, \( w_A = w_B = c \) holds for \( c \) sufficiently small. This establishes the result.

Proof of Lemma 3 We denote with \( \pi_i(p^*_i, p^*_{-i}) \) the profit of downstream firm \( i \in \{A, B\} \) in the situation in which firm \( i \) sources from supplier \( j \) at linear input costs of \( w^j_i \) and firm \( -i \) from supplier \( k \) at input costs of \( w^k_i \) with \( j, k \in \{U, V\} \). Net of fixed payments, downstream profit of firm \( i \) is

\[
\pi_i(p^*_i, p^*_{-i}) = q_i\left( p^*_i, p^*_{-i}\right) \left( p^*_i - w^i_j \right) \quad (39)
\]
The upstream firm $U$ charges observable and non-exclusionary two-part tariffs $C_i = (F_i, w_i)$ to both downstream firms while the fringe offers the input good at marginal costs $c$. Together with the financial interest in $A$’s profit, the total profit of upstream firm $U$ if it supplies both downstream firms at $(w_A, w_B)$ is

$$
\Pi^U (w_A, w_B) = w_A q_A \left( p^*_{A(U)}, p^*_{B(U)} \right) + w_B q_B \left( p^*_{B(U)}, p^*_{A(U)} \right) + \delta \left( \pi_A \left( p^*_{A(U)}, p^*_{B(U)} \right) - F_A \right) + F_A + F_B.
$$

(40)

We consider the candidate equilibrium in which the upstream firm $U$ supplies both downstream firms. Downstream firm $A$’s participation changes with partial forward integration. As introduced in Equation [14] the objective function $\Pi_A$ is a weighted average of $A$’s operational profit $\pi_A$ and $U$’s operational profit $\pi^U$. When $A$ makes its supplier decision, it also internalizes the effect on $U$’s profit with the weight of $\epsilon$. Given the notation above, the maximization problem reads as follows

$$
\max_{w_A, w_B, F_A, F_B} \Pi^U (w_A, w_B) \\
\text{s.t.} \quad \epsilon \Pi^U (w_A, w_B) + \pi_A \left( p^*_{A(U)}, p^*_{B(U)} \right) - F_A \geq \epsilon \Pi^U (c, w_B) + \pi_A \left( p^*_{A(V)}, p^*_{B(U)} \right) \\
\pi_B \left( p^*_{B(U)}, p^*_{A(U)} \right) - F_B \geq \pi_B \left( p^*_{B(V)}, p^*_{A(U)} \right).
$$

(41)

In equilibrium, the upstream firm $U$ sets the fixed fees $F_i, i \in \{A, B\}$ such that the downstream firms are indifferent between the supply from $U$ and the competitive fringe that offers the input good at $C^V = (0, c)$. Solving for the fixed fees and inserting into $U$’s objective function yields the reduced optimization problem

$$
\max_{w_A, w_B} \pi^U = \frac{1}{1 - \epsilon + \epsilon \delta} \left[ \pi^I \left( p^*_{A(U)}, p^*_{B(U)} \right) - \pi_A \left( p^*_{A(V)}, p^*_{B(U)} \right) - \pi_B \left( p^*_{B(V)}, p^*_{A(U)} \right) \right] \\
- \frac{\delta - \epsilon \delta}{1 - \epsilon + \epsilon \delta} \left[ \pi_B \left( p^*_{B(U)}, p^*_{A(U)} \right) + w_B q_B \left( p^*_{B(U)}, p^*_{A(U)} \right) - \pi_B \left( p^*_{B(V)}, p^*_{A(U)} \right) \right],
$$

with $\pi^I \left( p^*_{A(U)}, p^*_{B(U)} \right) = p^*_{A(U)} q_A \left( p^*_{A(U)}, p^*_{B(U)} \right) + p^*_{B(U)} q_B \left( p^*_{B(U)}, p^*_{A(U)} \right)$ denoting the industry profit. As the financial profit participation $\delta$ and the corporate control parameter $c$ become small, this maximization problem converges to the maximization problem under vertical separation (??). Hence, we conclude that the partial derivatives $\frac{\partial \pi^U}{\partial w_A}$ and $\frac{\partial \pi^U}{\partial w_B}$ are still positive at $w_A = \frac{c}{1 - \epsilon}$ and $w_B = c$ for small $\epsilon$ and $\delta$. By continuity, the corner solutions are sustained for small controlling forward integration and $c$ sufficiently small. Moreover, the fixed fees charged to downstream firm $A$ is equal to $F_A = 0$. The optimal fixed fee to downstream firm $B$ is larger than zero because the upstream firm $U$ can extract the additional profit from $B$ that it receives if both downstream firms source from $U$ because of softened downstream competition. As downstream firm $A$ prices less aggressively if both downstream firms source from $U$, the profit of downstream firm $B$ is higher in this case even if the effective input prices are at $c$ in both scenarios. This implies $F_B = \pi_B \left( p^*_{B(U)} \left( c, \frac{c}{1 - \epsilon} \right), p^*_{A(U)} \left( \frac{c}{1 - \epsilon}, c \right) \right) - \pi_B \left( p^*_{B(V)} \left( c, \frac{c}{1 - \epsilon} \right), p^*_{A(U)} \left( \frac{c}{1 - \epsilon}, c \right) \right) > 0$. 

□
References


