

The good, the bad and the equal: who is the best partner of a vertically integrated firm?

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Abstract

We examine the incentives of a vertically integrated monopolist to expand its business by creating a new firm, transforming the latter into both its subsidiary and a direct competitor in the final goods market. We find that the monopolist may choose to expand its business irrespective of the subsidiary's cost efficiency. The incentives for business expansion are stronger when the subsidiary is less efficient compared to the cases in which it is more or equally efficient than the incumbent. Finally, business expansion always has a positive impact on consumer and total welfare, even when the subsidiary is less efficient than the incumbent.

Keywords: business expansion; vertical relations; vertical integration; two-part tariffs

JEL classification: D43; L13; L22; L24; L42

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1 Introduction

Many multinational companies are subsidiaries owned by a parent company. The subsidiaries can operate independently from the parent company or the rest of the subsidiaries by keeping in-house part of their activities, such as the core input sourcing. Such a practice is widely used in the textile industry. For example, the Inditex group has many subsidiaries like Zara, Pull&Bear, Stradivarius and Massimo Dutti that operate independently without sharing their activities or their input suppliers. Actually, each of these chains is responsible for its own strategy, product design, sourcing, manufacturing and distribution. The vertical integration of the chains helps them reduce the “bullwhip effect”, i.e. the lack of coordination among companies along a supply chain.¹

However, there are many companies that prefer to develop buyer-supplier relationships either with external firms that do not belong to the parent company or to directly source an input from one of the subsidiaries belonging to the same group. In the car industry, there are many groups like the Tata and the Volkswagen group, whose subsidiaries compete with each other and, at the same time, can source essential inputs either from external firms or from one of the subsidiaries of the group. For example, although Tata Motors and Jaguar belong to the same group, Jaguar sources its engines from Ford or BMW instead of sourcing the input from its partner company, Tata Motors. The Volkswagen group includes a variety of car manufacturing companies (e.g., Volkswagen, Audi, Bentley, Ducati, Lamborghini etc) that often prefer to trade among them for sourcing an essential input. For example, Volkswagen sources engines for its XL sport car from Ducati. Volkswagen and Audi also source engines for their luxurious cars from Bentley.²

All the above illustrations give rise to a number of interesting questions regarding the business expansion of a company: Does a company expand its business by creating a new firm that directly competes with the incumbent firm in the final goods market? For the incumbent firm, what is the most profitable way for the subsidiary’s input sourcing? What is the role of input pricing? Is the business expansion welfare-improving? In this paper, we address these questions.

¹For more on this, see e.g., Ghemawat and Nueno (2003) who analyze the structure of Inditex group, parent company of Zara chain and others.

²For more on this, see e.g., Bentley will build W12 engines for Audi, VW, *Automotive News Europe* (March 19, 2014) and The Ducati-Powered VW XL Sport Is a Slice of Ultralight Two-Cylinder Awesomeness, *Car and Driver* (October 1, 2014).

We consider a framework in which initially a vertically integrated monopolist produces a final good and considers expanding its business in the downstream market by creating a new firm and transforming it into a subsidiary. The subsidiary that competes with the incumbent in quantities in the downstream market, either produces the core input in-house or trades either with an external supplier or with its vertically integrated partner through a two-part tariff contract whose terms are determined through bargaining. We consider the following three cases: firstly, the ‘in-house case’ where the subsidiary produces the input in-house, secondly, the ‘external case’ where the subsidiary sources the input from an external upstream supplier and, finally, the ‘internal case’ where the subsidiary sources the input from its vertically integrated partner.

We find that the monopolist can have incentives to expand its business transforming the new competitor into a subsidiary irrespective of its cost efficiency compared with the incumbent firm. In the in-house case, the subsidiary is a vertically integrated firm that has the same input cost with the monopolist. Even though the incumbent firm benefits from business expansion, it prefers to not create a new firm and remain a monopolist in the market only if the final goods are close substitutes. In the external case, the subsidiary enjoys a wholesale price that is below the input marginal cost, as the external supplier subsidizes the new firm in order to extract part of the higher profits through the fixed fee of the two-part tariff contract. This forces the subsidiary to become more efficient than the incumbent firm. Again, the monopolist prefers to expand its business and benefits from a more efficient partner, unless the final goods are not sufficiently close substitutes and the external supplier’s bargaining power is not sufficiently high.

However, in the internal case, the monopolist always has incentives to create a subsidiary to which he provides the input and directly competes with him in the final goods market. Importantly, the subsidiary now enjoys a wholesale price that is above the input’s marginal cost, making him less efficient than the incumbent firm. Both the incumbent and the subsidiary set the wholesale price in a collusive way in order to reduce the negative impact of the increased downstream competition. In that way, the resulting profits of the incumbent are larger than the profits of a single-product monopolist. The incentives for business expansion become even stronger when the subsidiary is less efficient compared to the cases where it is more or equally efficient than the incumbent firm.

Business expansion is desirable not only for the incumbent firm, but also for the consumers and the economy as a whole. Irrespective of the impact of business expansion on the

cost efficiency of the subsidiary firm, downstream competition increases due to the business expansion and results in lower final prices. However, in contrast to the incumbent's viewpoint, the more efficient is the subsidiary firm, the more welfare-enhancing is the business expansion.

This paper is related to the literature of horizontal divisionalization (e.g., Corchon, 1991, Baye et al., 1996, Ziss, 1998, Creane and Davidson, 2004). In particular, the increase in the number of competing firms through divisionalization resembles the entry of the subsidiary in the downstream market and the multidivisional firm's gains from divisionalization resemble the incumbent's business expansion achieving profits. However, this literature does not focus on vertical relationships. Exceptions include the papers by Bru et al. (2001) and Mizuno (2009) which examine downstream divisionalization in vertically related markets. However, in contrast to our paper, they do not allow for vertically integrated firms.

Our paper is also related to the vast literature on outsourcing. Several papers (e.g., Chen, 2001, Chen et al., 2004, Shy and Stenbacka, 2003, Sappington, 2005, Buehler and Haucap, 2006, Arya et al., 2008a, Arya et al., 2008b) explore a firm's "make or buy" decision to source an input. This paper extends this literature by focusing on the incentives of a vertically integrated monopolist to expand its business considering various market structures and exploring the implications of vertical integration and vertical contracting. In contrast to these papers, our analysis is based on strategic considerations without exogenously assumed cost advantages/disadvantages of the input suppliers.

Our paper also has common elements with the literature on vertical contracting that considers settings in which a downstream firm trades with a vertically integrated or separated supplier (e.g., Arya et al., 2007, Ordober and Shaffer, 2007, Brito and Pereira, 2010, Bourreau et al., 2011, Reisinger and Tarantino, 2015). However, these papers do not consider a monopolist's incentives to expand its business and the role of the input trading to its decision.

The rest of the paper is organized as follows. In Section 2, we describe our main model and in Section 3, we present the equilibrium analysis of the different market structures. In Section 4, we determine the business expansion incentives and demonstrate the role of input pricing. In Section 5, we evaluate the welfare implications of the business expansion. In Section 6, we extend our main model and, finally in Section 7, we conclude. All proofs are included in the Appendix.

2 The Model

We consider a market consisting initially of a vertically integrated firm, firm 1, that produces a final good using, in a one-to-one proportion, a core input that produces it in-house at marginal cost $c > 0$.

Firm 1 considers expanding its business in the final goods market by creating a new firm, firm 2, that will be a subsidiary of firm 1. Firm 2 will produce a differentiated version of the final good. In that case, firm 2 is transformed into both a downstream competitor and into a partner/subsidiary of firm 1, and thus, both firms will belong to the same group.³ There are three scenarios regarding the input sourcing of firm 2: (i) the ‘in-house case’ in which firm 2 produces in-house the input needed for the final goods production at a marginal cost c , and, thus, it is a vertically integrated firm that has the same input cost with its partner, firm 1, (ii) the ‘external case’ in which firm 2 sources the input from an external upstream firm (e.g., an upstream firm from another market), firm U that produces the input at marginal cost c , and (iii) the ‘internal case’ in which firm 2 sources the input from its vertically integrated partner, firm 1. In scenarios (ii) and (iii) firm 2 bargains with its supplier over the contract terms. The input sourcing terms include the terms of a two-part tariff: a fixed fee, T , and a wholesale price per unit of input, w , that firm 2 pays to its supplier. To model the bargaining game, we invoke the Nash equilibrium of simultaneous generalized Nash bargaining games, in which the bargaining power of the supplier is given by β and that of firm 2 by $1 - \beta$, with $0 < \beta < 1$.

The (inverse) demand function for firm i ’s final good is:

$$p_i(q_i, q_j) = a - q_i - \gamma q_j, \quad 0 < \gamma < 1, \quad a > c > 0,$$

where p_i and q_i are the price and the quantity of firm i ’s final good respectively, and q_j is the quantity of its rival’s final good with $i, j = 1, 2$ and $i \neq j$. The parameter γ measures the degree of product differentiation; namely, the higher γ is, the closer substitutes the final goods are.

³We implicitly assume that the vertically integrated firm 1’s incentives for expanding its business coincide with the parent company’s incentives for business expansion. Otherwise, the parent company would not make any actions for expanding its business activities, if these actions could harm the monopolist’s position. We also make the assumption that for expanding its business, firm 1 does not have any investment costs. This helps the analysis to focus on strategic considerations without exogenously assumed asymmetries or costly investments.

The timing of moves is as follows. First, firm 1 decides whether to expand its business in the final goods market by creating a subsidiary, firm 2, and how the latter will source the input. In the second stage, in the expansion case, if the subsidiary sources the input from the external firm U or from its vertically integrated partner, the supplier and firm 2 bargain over the terms of a two-part tariff contract. If the subsidiary produces the input in-house, there is no any bargaining. If, instead, firm 1 decides not to expand, it remains a monopolist in the market. In the last stage, the firm(s) in the downstream market choose their quantities simultaneously and separately. We solve for the subgame perfect Nash equilibrium of this game.

Our notational convention will be as follows: we will use the superscript M to denote whether we are in the benchmark case of the monopoly, D to denote whether we are in the ‘in-house case’, E to denote whether we are in the ‘external case’ and I to denote whether we are in the ‘internal case’.

3 Analysis and Results

In this section, we perform the equilibrium analysis with and without the business expansion.

We start our analysis with the benchmark case in which there is no expansion. Firm 1 only exists in the market and thus, makes the monopoly profits, $\pi^M = \frac{(a-c)^2}{4}$.

3.1 Expansion and In-house

When firm 1 decides to expand its business by creating a new firm and the latter is able to produce the core input in-house at marginal cost c , the market consists of two identical firms which produce differentiated products and compete in the downstream market. In the last stage of the game, firm 1 and firm 2 compete in the standard Cournot way. Specifically, each firm i chooses q_i to maximize its profits: $\pi_i(q_i, q_j) = (a - q_i - \gamma q_j)q_i - cq_i$, with $i, j = 1, 2$ and $i \neq j$. Solving the resulting system of first order conditions, we obtain the Cournot-Nash equilibrium quantities, q_1^D and q_2^D , and the equilibrium profits, π_1^D and π_2^D , included in Table 1 of the Appendix. After the expansion, firm 1’s net equilibrium profits are: $\pi^D = \pi_1^D + \pi_2^D$. Comparing the final profits of the parent company under the in-house case with the monopoly case, we find that the business expansion is desirable for firm 1 if and only if $0 < \gamma < 0.828427$. In other words, the duopoly profits are greater than the monopoly profits unless the final products are not close substitutes. This is so, because firm

1 benefits from the business expansion and the increase in final product variety. However, if the final products are not sufficiently differentiated, and thus, tend to become homogeneous, the increase in the downstream market competition is severe and the incumbent firm suffers from the *cannibalization effect*. This refers to the new final product of the subsidiary that partially cannibalizes firm 1's market share and eliminates the positive impact of the business expansion, rendering firm 1 to have larger profits when it is a monopolist.

3.2 Expansion and External case

Here, we consider the case in which after the expansion, firm 2 competes with firm 1 in the final goods market and sources its core input from an external supplier, firm U (e.g., an upstream firm from another market), that maximizes the following profits: $\pi_U(q_1, q_2, w) = (w - c)q_2$. In the last stage of the game, firm 1 faces the same maximization problem as in the 'in-house case' and firm 2 maximizes instead the following (gross from T) profits: $\pi_2(q_1, q_2, w) = (a - q_2 - \gamma q_1)q_2 - wq_2$. The resulting equilibrium quantities are:

$$q_1(w) = \frac{a(2 - \gamma) - 2c + \gamma w}{4 - \gamma^2} \quad \text{and} \quad q_2(w) = \frac{a(2 - \gamma) + \gamma c - 2w}{4 - \gamma^2}. \quad (1)$$

In stage two, firm U and firm 2 solve the following Nash bargaining problem:

$$\max_{w, T} [\pi_U(w) + T]^\beta [\pi_2(w) - T]^{1-\beta}, \quad (2)$$

where $\pi_U(w) = (w - c)q_2(w)$ are firm U 's profits and $\pi_2(w) = \pi_2(q_1(w), q_2(w), w)$. Their disagreement payoffs are equal to zero since neither firm has an outside option. Maximizing (2) with respect to T , we find: $T(w) = \beta\pi_2(w) - (1 - \beta)\pi_U(w)$. Thus, we can rewrite the profits of firm U and firm 2 as:

$$\pi_U(w) + T = \beta(\pi_U(w) + \pi_2(w)) \quad \text{and} \quad \pi_2(w) - T = (1 - \beta)(\pi_U(w) + \pi_2(w)). \quad (3)$$

From (2) and (3), it follows that the equilibrium wholesale price maximizes the joint profits of firm U and firm 2:

$$w^E = \frac{8c - 2(a + c)\gamma^2 + (a - c)\gamma^3}{4(2 - \gamma^2)}. \quad (4)$$

Note that $w^E < c$, i.e., firm U subsidizes, through the wholesale price, the production of its customer, firm 2. As the literature on strategic delegation (e.g., Vickers, 1985, Fershtman and Judd, 1987, Sklivas, 1987) and on vertical separation (e.g., Jansen, 2003) has also explained, in settings with strategic substitutability, the upstream firm U , by charging a

lower wholesale price, increases the aggressiveness of its customer firm 2 in the final products market and enhances its output at the expense of the rival firm 1's output. Firm U has incentives to do so because it can use, in turn, the fixed fee T in order to capture part of the resulting higher firm 2's profits. Clearly, the higher firm U 's bargaining power is, the larger is the share of firm 2's profits that it captures through T .

Proposition 1 *When firm 2 sources the input from an external supplier, firm 1 does not expand its business when the final goods are close substitutes ($\gamma > 0.747627$). For higher degrees of product differentiation, firm 1 expands its business if and only if $\beta < \beta_1(\gamma)$, with $\frac{\partial \beta_1(\gamma)}{\partial \gamma} < 0$, $\beta_1(0.747627) = 0$ and $\beta_1(0) = 1$.*

According to Proposition 1, firm 1 opts for expanding its business when the subsidiary firm sources its input from an external supplier if and only if the final products are not close substitutes and firm 2's bargaining power is high. When the final products are more differentiated, firm 1 suffers less from the *cannibalization effect*, and if the subsidiary's bargaining power is high, the latter can obtain a large share of the higher profits (gross from T) that, in turn, will increase the group's profits. Instead, when the final goods are less differentiated, the positive impact of the business expansion is eliminated by the *cannibalization effect*, rendering firm 1 to remain a monopolist.

3.3 Expansion and Internal case

We now examine the case in which after the expansion, firm 2 sources its core input from the vertically integrated incumbent, firm 1. In such a case, in the last stage, firm 1 and firm 2 choose their quantities, q_1 and q_2 , in order to maximize their (gross from T) profits:

$$\pi_1(q_1, q_2, w) = (a - q_1 - \gamma q_2 - c)q_1 + (w - c)q_2; \quad (5)$$

$$\pi_2(q_1, q_2, w) = (a - q_2 - \gamma q_1 - w)q_2. \quad (6)$$

Solving the system of the first order conditions, we find:

$$q_1(w) = \frac{a(2 - \gamma) - 2c + \gamma w}{4 - \gamma^2}; \quad (7)$$

$$q_2(w) = \frac{a(2 - \gamma) + c\gamma - 2w}{4 - \gamma^2}. \quad (8)$$

In the previous stage, firm 1 and firm 2 negotiate over (w, T) . In particular, they solve the following generalized Nash bargaining problem:

$$\max_{w, T} [\pi_1(w) - d_1 + T]^\beta [\pi_2(w) - T]^{1-\beta}, \quad (9)$$

where $\pi_1(w)$ and $\pi_2(w)$ are found after substituting (7) and (8) into (5) and (6), respectively. Firm 1 has an outside option in its bargaining with firm 2: in case of disagreement, firm 1 can gain monopoly profits from its own sales in the final goods market, given by $d_1 \equiv \pi^M$. On the other hand, the disagreement payoff of firm 2 is null since firm 2 does not have an outside option. Maximization of (9) with respect to T , yields:

$$T = \beta\pi_2(w) - (1 - \beta)[\pi_1(w) - d_1]. \quad (10)$$

Using the above expression, we find:

$$\pi_1(w) - d_1 + T = \beta[\pi_1(w) + \pi_2(w) - d_1]; \quad (11)$$

$$\pi_2(w) - T = (1 - \beta)[\pi_1(w) + \pi_2(w) - d_1]. \quad (12)$$

Substituting (11) and (12) into (9), we note that the latter reduces to an expression proportional to the joint profits of firms 1 and 2 minus firm 1's disagreement payoff. Thus, in the setting of the wholesale price, firm 1 and firm 2 behave as a multiproduct monopolist. The wholesale price that maximizes this expression is:

$$w^I = \frac{a(2 - \gamma)^2\gamma + c(8 - \gamma(4 + \gamma(2 + \gamma)))}{8 - 6\gamma^2}. \quad (13)$$

One can easily check that $w^I > c$. Setting a positive mark-up, firm 1 decreases the aggressiveness of its rival in the final goods market. Moreover, we can observe that w^I is decreasing in the degree of product differentiation, $\frac{\partial w^I}{\partial \gamma} > 0$. This means that the closer substitutes the two final products are, and thus, the fiercer the downstream market competition is, the higher the wholesale price is. In other words, when downstream market competition becomes fiercer, firm 1's incentives to decrease firm 2's aggressiveness get stronger. As Reisinger and Tarantino (2015) also note in their paper, if the products were homogeneous, w^I would be such that firm 2 would be foreclosed from the market. In such a case, firm 1 would make monopoly profits. However, when products are even slightly differentiated, foreclosure is not profitable.

Using (13), (10), (8) and (7), we obtain the equilibrium outputs and the fixed fee, when firm 1 serves firm 2 in the external case:

$$q_1^I = \frac{(a - c)(4 - \gamma(2 + \gamma))}{8 - 6\gamma^2}, \quad q_2^I = \frac{2(a - c)(1 - \gamma)}{4 - 3\gamma^2}; \quad (14)$$

$$T^I = \frac{(a - c)^2(1 - \gamma)^2(4\beta + 3(1 - \beta)\gamma^2)}{(4 - 3\gamma^2)^2}. \quad (15)$$

The resulting firms' equilibrium profits are included in Table 1 of the Appendix.

In the first stage, firm 1 decides whether to expand its business or to remain a monopolist in the market.

Proposition 2 *When firm 2 sources the input from the vertically integrated supplier, firm 1 always expands its business.*

According to Proposition 2, the monopolist always prefers to expand its business in the downstream market. In other words, the incumbent firm is always better off when it faces downstream competition than when it is a monopolist in the final products market, namely, $\pi^I = \pi_1^I + \pi_2^I > \pi^M$. Actually, firm 1 would opt for expanding its business even if it cannot capture firm 2's profits, as $\pi_1^I > \pi^M$. Although, the presence of firm 2 in the final goods market increases the number of downstream firms, firm 1 prefers supplying its downstream competitor, because its benefit from the input revenues is greater than its loss from the fiercer downstream competition, achieving profits that exceed the monopoly profits. Importantly, firm 1 and firm 2 set the wholesale price in a collusive way in order to reduce the negative impact of the *cannibalization effect*. In that way, the resulting profits of the incumbent are larger than the profits of a single-product monopolist, rendering firm 1 to expand its business even if it cannot obtain firm 2's profits.

4 Expansion Incentives

Having analyzed the vertically integrated firm's incentives to expand its business and, thus, having a subsidiary that also competes with him in the final goods market, we are now able to examine which market structure is more profitable for the incumbent firm.

Proposition 3 *The best business expansion strategy for the monopolist is to create a subsidiary that is less efficient than the incumbent firm.*

Surprisingly, we find that firm 1 always prefers to expand its business through a subsidiary that is less efficient than the incumbent firm. One could expect that the parent company would prefer to have a subsidiary that is more or at least as efficient as itself. However, this does not hold in our setting. The entry of the subsidiary in the downstream market intensifies competition faced by the incumbent firm, and thus, firm 1 suffers from the *cannibalization effect*. In the internal case, firm 1 and firm 2 alleviate the negative impact of

the *cannibalization effect* on their joint profits through the setting of a wholesale price that is greater than the marginal input cost, leading them to produce lower joint output than the in-house case and the external case. By setting the wholesale price in a collusive way, the incumbent firm achieves profits that are almost equal to those of a multi-product monopolist and exceed the profits of a group that includes two equally efficient firms (in-house case) and those of a group that includes the incumbent firm and a more efficient subsidiary (the external case). We refer to this as the *collusive effect of input pricing*. Comparing the business expansion incentives in the in-house case and in the external case, we find that firm 1 still prefers its subsidiary not to be more efficient than itself. In the external case, the external supplier, firm U , uses the vertical contract in order to increase the aggressiveness of its customer. But, the incumbent is not able to alleviate the negative impact of the *cannibalization effect* even when it captures all firm 2's profits. For that reason, the incumbent prefers its subsidiary to be at least as efficient, but not more efficient than itself.

The above findings highlight the role of input pricing and how it can affect a monopolist's business expansion incentives. We find that the business expansion is similar to a reverse merger where a monopolist splits profitably into two downstream firms. The vertical contract is used as an instrument that reinforces the business expansion incentives more than cases in which no vertical relations among firms occur. A similar result is also found in Bakaouka and Milliou (2018) who demonstrate the role of input trading for licensing incentives among firms that are vertically related.

5 Welfare implications

Here we examine the impact of business expansion on welfare under the different market structures and discuss the policy implications of our findings.

Proposition 4 *Business expansion always has a positive impact on consumer surplus and on total welfare. Its impact is larger when the subsidiary is the most efficient firm in the group.*

Business expansion is always desirable both for the consumers and for the economy as a whole. Importantly, business expansion has a positive impact on consumers as it results in the increase of downstream competition and final product variety, as well as, in lower final prices. Business expansion can enhance the incumbent firm's profits as we demonstrated

in Section 3. Thus, a firm’s decision to expand its business is welfare enhancing for the economy as a whole. As Proposition 4 mentions, the positive impact of business expansion is more desirable from a welfare viewpoint when the subsidiary is more efficient than the incumbent firm. Intuitively, in the external case, the wholesale price of the subsidiary is lower than the marginal input cost, leading to lower final prices and, thus, to a larger positive impact on the consumer surplus. Therefore, in contrast to the incumbent’s viewpoint, the more efficient is the subsidiary, the more welfare-enhancing is the business expansion.

The welfare conclusions could be of use in the treatment of merger and acquisition agreements by the competition policy authorities. In our setting, business expansion corresponds to a reverse merger which increases the competition intensity in the final goods market and enhances firms’ profits, rendering business expansion desirable both for the consumers and the industry. Given this, the competition authorities can consider acquisition agreements among competitors pro-competitive even in cases in which firms are vertically related and the subsidiary is less efficient than the incumbent, as these cases are still more desirable than a monopoly.

6 Extensions

Here we discuss briefly further extensions of our main model to extract some additional insights about the incentives for business expansion.

Price Competition:

If the downstream firms compete in prices in the final goods market, similar to the main analysis, business expansion incentives are always stronger in the internal case. Importantly, in contrast to a one-tier market, a vertically related market is more competitive when downstream firms compete in quantities than when they compete in prices (e.g., Alipranti et al., 2014).

The *collusive effect of input pricing* is stronger in price competition, because the wholesale price is higher under price than under quantity downstream competition. In particular, since prices are strategic complements while quantities are strategic substitutes, firm 1’s incentives to behave in a more collusive way are more pronounced in case of price competition. In turn, consumer and total welfare is smaller under price rather than quantity competition, but they are still greater in the internal case than the monopoly case.

Wholesale Price Contract:

One might wonder how the results can change if input trading takes place through a wholesale price contract. In the external case, the wholesale price charged is greater than the supplier's marginal cost. This is so because now there is only one tool available in the vertical contracting, the wholesale price per unit of input, to extract input sales and thus, firm 1 does not always prefer to expand its business unless product differentiation is sufficiently high. Importantly, firm 1 has always incentives to expand its business under the internal case. In this case, the wholesale price is even greater than the external case because firm 1 uses it in order to eliminate the *cannibalization effect*. Hence, firm 1 prefers more to expand its business under the internal case when product differentiation is not sufficiently high, otherwise it is better off under the in-house case.

Intuitively, the business expansion incentives are greater under a two part tariff contract than under a wholesale price contract because then the input price is lower, and thus, the greater surplus that is created, can be extracted by the vertically integrated firm through the fixed fee of the vertical contract. Hence, by generating a lower input price, two-part tariff contract is more beneficial than the wholesale price contract for both the consumers and the society as a whole.

7 Concluding Remarks

This paper explored the incentives of a vertically integrated monopolist to expand its business by creating a new firm, transforming the latter into both its subsidiary and a direct competitor in the downstream market. We used a framework in which, after the business expansion, the subsidiary either produces the input in-house or sources it either from an external supplier or from the vertically integrated incumbent.

We showed that although the subsidiary's entry intensifies downstream competition and cannibalizes the demand of the incumbent's product, business expansion can be desirable; this is due to the fact that the incumbent benefits from the expansion of the final goods market by capturing its subsidiary's profits. This holds both when the subsidiary produces the input in-house, at the same input marginal cost, and when it sources the input from an external supplier at a lower cost. When the subsidiary sources the input from its vertically integrated partner, the input price is greater than the input marginal cost. In this case, the incumbent firm is better off compared to the monopoly case, even if it does not obtain the subsidiary's profits. This holds because both the incumbent and the subsidiary set

the input price in a collusive way, earning profits that are almost equal to those of a multi-product monopolist and are greater than the profits of a single-product monopolist. From the incumbent's viewpoint, a less efficient subsidiary is more desirable compared to a subsidiary that is as or even more efficient than itself. On the other hand, from a welfare viewpoint, business expansion is always beneficial and the more efficient is the subsidiary, the larger is its positive impact on consumer surplus and total welfare.

Summing up, we analyzed the common practice of business expansion that transforms a new firm into a subsidiary of the incumbent as well as into a direct competitor in the final goods market. The analysis was based on strategic considerations without exogenously assumed asymmetries, e.g., cost efficiencies of the supplier, costly investments in input production facilities. These asymmetries might result in less surprising results compared to those in our setting. In future research, we will explore business expansion incentives under different market structures and under different specifications of vertical contracting.

8 Appendix

$q_1^M = \frac{(a-c)}{2}; q_1^D = q_2^D = \frac{(a-c)}{2+\gamma}; \pi_1^D = \pi_2^D = \frac{(a-c)^2}{(2+\gamma)^2}$
$q_1^E = \frac{(a-c)(4-\gamma(2+\gamma))}{4(2-\gamma^2)}; q_2^E = \frac{(a-c)(2-\gamma)}{2(2-\gamma^2)}$
$\pi_1^E = \frac{(a-c)(4-\gamma(2+\gamma))^2}{16(2-\gamma^2)^2}; \pi_2^E = \frac{(1-\beta)(a-c)^2(2-\gamma)^2}{8(2-\gamma^2)}; \pi_U^E = \frac{\beta(a-c)^2(2-\gamma)^2}{8(2-\gamma^2)}$
$\pi^E = \pi_1^E + \pi_2^E = \frac{(a-c)^2(32-16\beta-32\gamma+16\beta\gamma-8\gamma^2+4\beta\gamma^2+12\gamma^3-8\beta\gamma^3-\gamma^4+2\beta\gamma^4)}{16(2-\gamma^2)^2}$
$\pi_1^I = \frac{(a-c)^2(4+4\beta(1-\gamma)^2-3\gamma^2)}{4(4-3\gamma^2)}; \pi_2^I = \frac{(a-c)^2(1-\beta)(1-\gamma)^2}{4-3\gamma^2}$
$\pi^I = \pi_1^I + \pi_2^I = \frac{(a-c)^2(8-8\gamma+\gamma^2)}{4(4-3\gamma^2)}$

Table 1: Equilibrium Values under Monopoly, under the In-house case, under the External case and under the Internal case

Proof of Proposition 1: Calculating $\pi^D - \pi^M = \frac{(a-c)^2(2-\gamma)(8-8\beta-12\gamma+4\beta\gamma-2\gamma^2+4\beta\gamma^2+5\gamma^3-2\beta\gamma^3)}{16(2-\gamma^2)^2}$, we find that it is positive if and only if $\beta < \beta_1(\gamma) = \frac{8-12\gamma-2\gamma^2+5\gamma^3}{8-4\gamma-4\gamma^2+2\gamma^3}$ where $\frac{\partial\beta_1(\gamma)}{\partial\gamma} < 0$, $\beta_1(0.747627) = 0$ and $\beta_1(0) = 1$

Proof of Proposition 2: Calculating the difference: $\pi^I - \pi^M = \frac{(a-c)^2(1-\gamma)^2}{4-3\gamma^2}$, we find that it is positive .

Proof of Proposition 3: Calculating the following differences, we find: $\pi^I - \pi^D = \frac{(a-c)^2(2-\gamma)^2\gamma^2}{4(2+\gamma)^2(4-3\gamma^2)} > 0$, $\pi^I - \pi^E = \frac{(a-c)^2(2\beta(2-\gamma)^2(8-10\gamma^2+3\gamma^4)+\gamma^2(4-\gamma(2+\gamma))^2)}{16(2-\gamma^2)^2(4-3\gamma^2)} > 0$, and $\pi^D - \pi^E =$

$\frac{(a-c)^2(64\beta-64\beta\gamma^2+16\gamma^3-4\gamma^4+20\beta\gamma^4-8\gamma^5+\gamma^6-2\beta\gamma^6)}{16(2+\gamma)^2(2-\gamma^2)^2} > 0$. Thus, firm 1 always has the strongest incentives to expand its business under the internal case. The incentives for business expansion are stronger under the in-house case than under the external case.

Proof of Proposition 4: In the monopoly case, consumer surplus is: $CS^M = aq^M - \frac{1}{2}(q^M)^2 - p^M q^M = \frac{(a-c)^2}{8}$ and total welfare is: $W^M = CS^M + \pi^M = \frac{3(a-c)^2}{8}$.

In the case of business expansion, consumer surplus is: $CS^k = aq_1^k + aq_2^k - \frac{1}{2}[(q_1^k)^2 + (q_2^k)^2 + 2\gamma q_1^k q_2^k] - p_1 q_1^k - p_2 q_2^k$, where $k = D, E$ and I . We find that $CS^D = \frac{(a-c)^2(1+\gamma)}{(2+\gamma)^2}$, $CS^E = \frac{(a-c)^2(32(1-\gamma^2)+\gamma^3(4+5\gamma))}{32(2-\gamma^2)^2}$ and $CS^I = \frac{(a-c)^2(8-4\gamma-3\gamma^2)}{8(4-3\gamma^2)}$.

In the case of business expansion, the total welfare is: $W^k = CS^k + \pi_1^k + \pi_2^k + \pi_U^k$, where $k = D, E$ and I . We find that $W^D = \frac{(a-c)^2(3+\gamma)}{(2+\gamma)^2}$, $W^E = \frac{(a-c)^2(96-64\gamma-48\gamma^2+28\gamma^3+3\gamma^4)}{32(2-\gamma^2)^2}$ and $W^I = \frac{(a-c)^2(24-20\gamma-\gamma^2)}{8(4-3\gamma^2)}$.

Calculating the following we find: $CS^D - CS^M = \frac{(a-c)^2(4+4\gamma-\gamma^2)}{8(2+\gamma)^2} > 0$, $CS^E - CS^M = \frac{(a-c)^2(2-\gamma)(8+4\gamma-6\gamma^2-\gamma^3)}{32(2-\gamma^2)^2} > 0$ and $CS^I - CS^M = \frac{(a-c)^2(1-\gamma)}{8-6\gamma^2} > 0$. Thus, it is easy to calculate that $CS^E > CS^D > CS^I$.

Calculating the following we find: $W^D - W^M = \frac{(a-c)^2(12-4\gamma+3\gamma^2)}{8(2+\gamma)^2} > 0$, $W^E - W^M = \frac{(a-c)^2(2-\gamma)(24-20\gamma-10\gamma^2+9\gamma^3)}{32(2-\gamma^2)^2} > 0$ and $W^I - W^M = \frac{(a-c)^2(1-\gamma)(3-2\gamma)}{2(4-3\gamma^2)} > 0$. Thus, it is easy to calculate that $W^E > W^D > W^I$.

9 References

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