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Abstract

This study analyzes the conditions under which failing firm acquisitions arise endogenously and examines their welfare effects. We consider a vertical market structure in which an upstream firm supplies a common input to multiple independent downstream markets. We show that acquiring a failing downstream firm preserves input demand in the market, and when the demand in that market is relatively elastic, it results in a lower input price. This input price effect gives rival firms an incentive to acquire a failing firm even in the absence of efficiency gains or direct synergies. We further demonstrate that failing firm acquisitions can increase both consumer surplus and total surplus by maintaining the supply of final goods and reducing input prices. These findings remain robust when the upstream market is oligopolistic and suggest that competition authorities should account for upstream market effects when evaluating the failing firm defense.

JEL codes: D43, L10, L13

Keywords: horizontal merger; failing firm defense; vertical relationship; input prices; upstream market power

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1 Introduction

Failing firm acquisitions have long posed a challenge to competition policy. Although the acquisition of a financially distressed firm by a competitor increases market concentration, competition authorities may nevertheless approve such a transaction when the counterfactual is the target firm's inevitable exit from the market, no less anticompetitive purchaser is available, and the firm's assets would otherwise exit the market. This exception is known as the failing firm defense.

Failing firm acquisitions generate incentives that differ from those of standard acquisitions. In a standard acquisition, the target remains in the market without the acquisition, reducing the number of competitors, and increasing the acquirer's market power. By contrast, if the target exits regardless of acquisition, the number of competitors remains unchanged. Thus, failing firm acquisitions are generally considered unattractive unless they generate efficiency gains or synergies.

However, failing firm acquisitions are frequently observed. For example, in the automotive parts industry, after Takata, a supplier of safety systems such as airbags, experienced financial distress and filed for bankruptcy, its competitor Joyson Safety Systems acquired Takata.[1] Such cases suggest that acquisitions of failing firms may involve economic benefits for the acquiring firms beyond merely preventing market exit.

We demonstrate that such incentives may arise from changes in input prices in a vertical market. Specifically, we consider a setting in which an upstream firm supplies a common component to multiple downstream markets. In one downstream market, a failing firm competes with several other firms, whereas in the other downstream market, an independent downstream firm exists. For example, upstream suppliers such as Bosch,

[1] More details about this acquisition can be found at the following URL: https://www.reuters.com/article/business/key-safety-systems-completes-deal-to-acquire-air-bag-maker-takata-idUSKBN1HI3CG/

which supplies sensors and electronic components, provide similar components not only to the automotive safety systems market, but also to markets with different applications, such as industrial control equipment and measurement instruments. In such an industry structure, changes in the market structure of one downstream market may affect the upstream firm's overall demand for inputs through their effects on demand in other markets.

The key mechanism is that preserving the failing firm's production alters the composition of aggregate input demand. When demand in that market is more price-elastic than in other downstream markets, preserving production raises the elasticity of aggregate input demand, weakens upstream market power, and lowers the equilibrium input price. Acquiring firms benefit from lower input costs. Hence, even without efficiency gains or synergies, competing firms may have incentives to acquire failing rivals.

We also examine the welfare effects of a failing firm's acquisition. By maintaining production, the acquisition expands the final goods supply and lowers input prices. Under conditions that generate endogenous acquisitions, both consumer surplus and total welfare increase. This mechanism also extends to an oligopolistic upstream market. These findings suggest that competition authorities should consider spillover effects through vertically related input markets, in addition to downstream market concentration, when evaluating a failing firm's defense.

The remainder of this paper is organized as follows: Section 2 reviews related literature, Section 3 presents the model, Section 4 analyzes acquisition incentives and welfare effects, Section 5 extends this analysis to an oligopolistic upstream market, and Section 6 concludes the paper.

2 Related Literature

This study contributes to the literature on horizontal mergers, input pricing, and failing firm acquisitions.

Horizontal merger analysis is a central topic in industrial organizations. Salant et al. (1983) show that horizontal mergers are not necessarily profitable under the standard Cournot model. Perry and Porter (1985) identified the conditions under which mergers become profitable with increasing marginal costs, and Farrell and Shapiro (1990) analyze their welfare effects under general demand and cost functions. These studies provide a theoretical foundation for horizontal merger analysis.

Subsequent research extends this analysis to vertically related markets, in which upstream suppliers affect merger incentives and welfare. Horn and Wolinsky (1988), Ziss (2005), Milliou and Petrakis (2007), Symeonidis (2010), and Ghosh et al. (2022) examine horizontal mergers in vertically related markets from different perspectives, including vertical integration, successive oligopoly, and bilateral oligopoly.

Our mechanism is closely related to the literature on input pricing and downstream market structures. Tyagi (1999) demonstrates that equilibrium input prices are independent of the number of downstream firms under constant slope elasticity. Koulamas and Kyparisis (2010) show that an increase in the number of downstream firms may raise input prices when downstream marginal costs decline with market size. Arya and Mittendorf (2010), Yenipazarli (2023), Monden and Mizuno (2026), and Monden et al. (2025) further demonstrate how the downstream market structure influences equilibrium input prices.

Empirical evidence also links the downstream market structure to input prices. Bhattacharyya and Nain (2011) find that downstream mergers reduce input prices, particularly when the upstream market is more concentrated and attribute this effect to buyer power. Instead, we propose a different mechanism by showing that downstream acquisitions can lower input prices without increasing buyer power through the higher elasticity of aggregate input demand faced by upstream suppliers.

This study also contributes to the literature on failing firm acquisitions and the failing firm defense. Previous studies mainly examine whether failing firm acquisitions improve welfare relative to market exits. Persson (2005) studies asset sales, Mason and Weeds (2013) analyze the dynamic effects on entry and entrepreneurship, and Vasconcelos (2013) examines the implications of competition policy.

Other studies examine firms' incentives to acquire failing rivals. Fedele and Tognoni (2010) show that capacity constraints can encourage such acquisitions, whereas Bouckaert and Kort (2014) demonstrate that firms generally lack incentives to acquire failing rivals in the absence of efficiency gains.

Our study identifies a novel source of acquisition incentives. The existing explanations rely on efficiency gains, capacity expansion, or asset preservation. By maintaining the failing firm's production, an acquisition changes the composition of the aggregate input demand, weakens upstream market power, and lowers the equilibrium input price. Thus, this study links the literature on failing firm acquisitions, vertical markets, and input pricing.

3 Main Model

We consider a market with one upstream firm, denoted by firm U, and four downstream firms. There are two downstream markets: In downstream market X, firms 1, 2, and f operate, whereas downstream market Y, firm 0 operates. Firm f is a failing firm, and we consider the situation in which firm 1 acquires firm f.

The upstream firm produces input at zero marginal cost and sells it to the downstream firms at input price w. Each downstream firm produces one unit of the final good using one unit of input. Let q_i ($i \in \{0, 1, 2, f\}$) denote the output of downstream firm i. The products supplied by the downstream firms in market X are differentiated. We also assume that the products sold in markets X and Y are independent. We define the inverse demand function for each downstream firm as follows:

$$p_1 = a_X - q_1 - \beta(q_2 + q_f), \;\; p_2 = a_X - q_2 - \beta(q_1 + q_f), \;\; p_f = a_X - q_f - \beta(q_1 + q_2), \;\; p_0 = a_Y - q_0,$$

where p_i represents the price of downstream firm i, a_X and a_Y represent the market sizes of the two downstream markets, and $\beta \in (0, 1)$ represents the degree of product substitutability. If firm f exits the market without an acquisition, $q_f = 0$. Let the ratio of market sizes be represented by $r = a_X/a_Y$. To ensure positive outcomes in the equilibrium, we assume that $r_{min} = (2 + \beta)/(8 + 2\beta) < r < (7 + \beta)/3 = r_{max}$.

Each firm's profit function is defined as follows:

$$\pi_1 = (p_1 - w)q_1, \quad \pi_2 = (p_2 - w)q_2, \quad \pi_f = (p_f - w)q_f - F,$$
$$\pi_0 = (p_0 - w)q_0, \quad \pi_U = w(q_1 + q_2 + q_f + q_0),$$

where F denotes the fixed cost of downstream firm f. We assume that F takes the minimum value such that the profit of firm f is exactly zero in the equilibrium without acquisition.[2] When downstream firm 1 acquires downstream firm f, the objective function of the acquiring firm is given by $\pi_{1f} = \pi_1 + \pi_f$.

[2] Assuming a value of F larger than the one that makes the profit of firm f exactly zero does not qualitatively affect the results of this paper. A larger F reduces the range of parameters for which a failing firm acquisition occurs.

Consumer surplus is defined as follows:

$$CS = \frac{q_1^2 + q_2^2 + q_f^2 + 2\beta(q_1 q_2 + q_1 q_f + q_2 q_f)}{2} + \frac{q_0^2}{2},$$

The total surplus is defined as follows:

$$TS = \begin{cases} \pi_1 + \pi_2 + \pi_f + \pi_0 + CS & \text{if an acquisition occurs,} \\ \pi_1 + \pi_2 + \pi_0 + CS & \text{if an acquisition does not occur.} \end{cases}$$

It is important to note that the fixed cost F is not included in the total surplus when an acquisition does not occur. We considered two periods: before and after the acquisition decision. Before the acquisition decision, firm f has already paid the fixed cost F, which becomes sunk at the time of the acquisition decision. If firm 1 acquires firm f, the acquiring firm must bear the fixed cost F of production in the subsequent period. In contrast, if firm 1 does not acquire firm f, it does not incur this fixed cost, and because firm f has already exited the market, the fixed cost F does not need to be paid in the subsequent period. Therefore, F corresponds to the fixed cost in the periods before and after the acquisition decision. This treatment of fixed costs in the total surplus has also been adopted in previous research (Bouckaert and Kort, 2014).

The timing of the game is as follows: In stage 1, firm 1 decides whether to acquire firm f. In stage 2, upstream firm U determines the input price w. In stage 3, each downstream firm chooses its output level. We solve the game using backward induction.

4 Equilibrium Analysis

4.1 Fixed cost of downstream firm f

First, we consider the condition under which downstream firm f exits the market before the acquisition occurs. The minimum fixed cost that causes firm f to become a failing firm is given as follows.

Lemma 1 *When* $F = \bar{F} = a_Y^2[1+\beta-r(5+2\beta)]^2/[16(4+5\beta+\beta^2)^2]$*, downstream firm* f *earns zero profit and exits the market.*

Proof. See Appendix.

In the following analysis, we assume that the fixed cost of downstream firm f is given by $\bar{F}$.

4.2 Quantity and input decisions

Next, we consider the case in which no acquisition occurs. In this case, downstream firm f exits the market and, thus, $q_f = 0$. Given this, the quantities in the downstream markets are determined by solving the first-order conditions as follows:

$$q_1 = q_2 = \frac{a_X - w}{2+\beta}, \quad q_0 = \frac{a_Y - w}{2}.$$

Substituting the downstream quantities into the upstream firm's profit function and using the first-order condition and $r = a_X/a_Y$, we obtain the input price:

$$w^N = \frac{a_Y(2+4r+\beta)}{2(6+\beta)},$$

where the superscript N denotes the case in which no acquisition occurs. Therefore, the equilibrium outcomes are given by:

$$\pi_1^N = \pi_2^N = \frac{a_Y^2[2+\beta-2r(4+\beta)]^2}{4(2+\beta)^2(6+\beta)^2}, \quad \pi_0^N = \frac{a_Y^2(10+\beta-4r)}{16(6+\beta)^2},$$
$$CS^N = \frac{a_Y^2(\beta+10-4r)^2}{32(\beta+6)^2} + \frac{a_Y^2(\beta+1)\left[2+\beta-2r(\beta+4)\right]^2}{4(\beta+2)^2(\beta+6)^2},$$
$$TS^N = \pi_1^N + \pi_2^N + \pi_0^N + CS^N.$$

Finally, we consider the case in which downstream firm 1 acquires downstream firm f. From the first-order conditions, we determine the quantities in the downstream markets as follows:

$$q_1 = q_f = \frac{(a_X-w)(2-\beta)}{2(2+2\beta-\beta^2)}, \quad q_2 = \frac{a_X-w}{2+2\beta-\beta^2}, \quad q_0 = \frac{a_Y-w}{2}.$$

Substituting the downstream quantities into the upstream firm's profit function and applying the first-order condition, the input price is given by:

$$w^A = \frac{a_Y[2+2\beta-\beta^2+2r(3-\beta)]}{2(8-\beta^2)},$$

where the superscript A denotes the case in which the acquisition occurs. From the above results and $F = \bar{F}$, the equilibrium outcomes are given by:

$$\pi_{1f}^A = \frac{a_Y^2(2-\beta)^2(1+\beta)[2+2\beta-\beta^2-2r(5+\beta-\beta^2)]^2}{8(8-\beta^2)^2(2+2\beta-\beta^2)^2} - \frac{a_Y^2[1+\beta-r(5+2\beta)]^2}{16(4+5\beta+\beta^2)^2},$$

$$\pi_2^A = \frac{a_Y^2[2+2\beta-\beta^2-2r(5+\beta-\beta^2)]^2}{4(8-\beta^2)^2(2+2\beta-\beta^2)^2}, \quad \pi_0^A = \frac{a_Y^2[14-2\beta-\beta^2-2r(3-\beta)]^2}{16(8-\beta^2)^2},$$

$$CS^A = \frac{a_Y^2\left[\beta^2+2\beta-14-2(\beta-3)r\right]^2}{32(8-\beta^2)^2} + \frac{a_Y^2(\beta^3-7\beta^2+8\beta+6)\left[2+2\beta-\beta^2+2(\beta^2-\beta-5)r\right]^2}{16(8-\beta^2)^2(2+2\beta-\beta^2)^2},$$

$$TS^A = \pi_{1f}^A + \pi_2^A + \pi_0^A + CS^A.$$

By comparing the input prices before and after the acquisition, we obtain the main result of this study regarding the effect of a failing firm acquisition on input prices.

Proposition 1 *When market Y is larger than market X, the input price after the acquisition is lower than that without the acquisition. That is, $w^A < w^N$ if $r < 1$.*

The rationale behind this result is as follows. Because the inverse demand functions for final goods are linear, a larger intercept of the inverse demand function implies that demand for the final good is less elastic. This property is inherited from the price elasticity of input demand. In this model, there are two final goods markets, and the price elasticity of input demand depends on the share of the input used in each final goods market. When market X is smaller than market Y—that is, when $r = a_X/a_Y < 1$—the input demand in market X is more elastic than that in market Y. When downstream firm 1 acquires downstream firm f, the input demand in the more elastic market increases. Consequently, the aggregate input demand becomes more elastic. Therefore, when $r < 1$, the acquisition of the failing firm reduces the input price.

4.3 Acquisition incentive and its effects

Next, we consider the incentive of firm 1 to acquire firm f. Firm 1 undertakes the acquisition when the following expression is positive:

$$\pi_{1f}^A - \pi_1^N = \frac{a_Y^2(\Phi_0^A + \Phi_1^A r + \Phi_2^A r^2)}{16(1+\beta)^2(2+\beta)^2(4+\beta)^2(6+\beta)^2(8-\beta^2)^2(2+2\beta-\beta^2)^2},$$

where the definitions of Φ_j^A ($j \in \{0,1,2\}$) are provided in the Appendix. By solving $\Phi_0^A + \Phi_1^A r + \Phi_2^A r^2 > 0$ with respect to r and comparing the solutions with r_{min} and r_{max}, we obtain the following proposition:

Proposition 2 *When* $\max\{r_{min}, r_l^A\} < r < r_h^A$*, the downstream firm* 1 *acquires downstream firm* f*, where*

$$r_l^A = \frac{-\Phi_1^A - \sqrt{(\Phi_1^A)^2 - 4\Phi_2^A\Phi_0^A}}{2\Phi_2^A}, \quad r_h^A = \frac{-\Phi_1^A + \sqrt{(\Phi_1^A)^2 - 4\Phi_2^A\Phi_0^A}}{2\Phi_2^A}.$$

Figures 1 and 2 present the thresholds for Proposition 2. The horizontal axis represents the degree of substitutability between goods in markets X, and the vertical axis represents the relative market size $r = a_X/a_Y$. The blue and red curves represent r_h^A and r_l^A, respectively. The gray region represents the parameter combinations outside the scope of the model.

The figures show that firm 1 has an incentive to acquire firm f when market X is relatively small and the degree of substitutability between the goods in market X is low. The intuition behind this result is as follows. Compared with the case without acquisition, the case with acquisition increases the total output of goods 1 and f. This increases the profit of the acquiring firm but also requires payment of the fixed cost. The acquiring firm produces two types of goods and the total output of goods 1 and f becomes

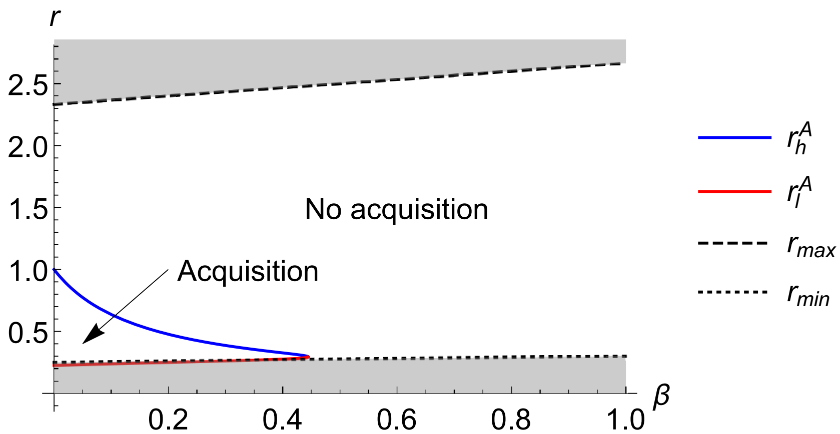

Figure 1: Acquisition incentives over the entire parameter space

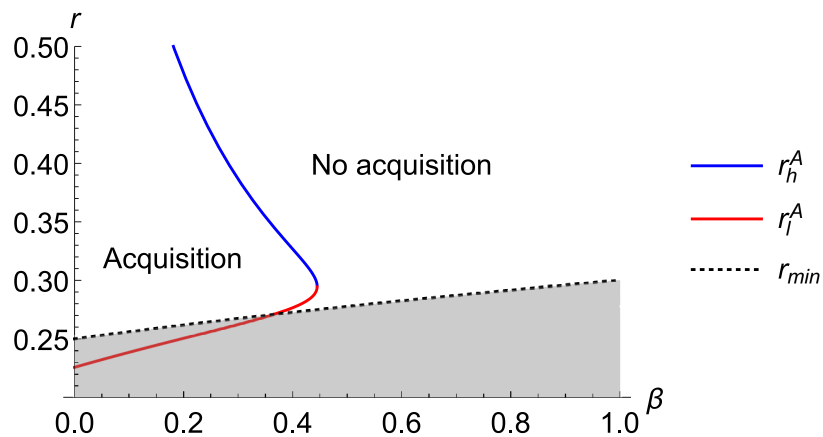

Figure 2: Acquisition incentives at low values of r

smaller than the outputs before the acquisition. This effect reduces the acquiring firm's competitiveness in market X, preventing it from recouping its fixed costs solely through the sale of good f. Therefore, the effects related to output reduction and fixed cost recovery reduce the acquiring firm's profit. This effect is referred to as the production effect. The production effect weakens as the degree of substitutability between goods in market X decreases.

Next, according to Proposition 1, when market X is smaller, the acquisition makes input demand more elastic and reduces the input price. We refer to this effect as the input price effect, which increases the acquiring firm's profit. This effect becomes stronger as the size of market X decreases. Therefore, when the degree of substitutability between goods in market X is low and market X is small, the acquiring firm's profit is more likely to increase, leading to the proposition.

Next, we analyze the welfare effects of the acquisition. By comparing the consumer surplus and total surplus with and without acquisition, we obtain the following results:

$$CS^A - CS^N = \frac{a_Y^2(1-\beta)(\Phi_0^{CS} + \Phi_1^{CS} r + \Phi_2^{CS} r^2)}{16(2+\beta)^2(6+\beta)^2(8-\beta^2)^2(2+2\beta-\beta^2)^2},$$
$$TS^A - TS^N = \frac{a_Y^2(\Phi_0^{TS} + \Phi_1^{TS} r + \Phi_2^{TS} r^2)}{16(1+\beta)^2(2+\beta)^2(4+\beta)^2(6+\beta)^2(8-\beta^2)^2(2+2\beta-\beta^2)^2},$$

where the definitions of Φ_j^{CS} and Φ_j^{TS} ($j \in \{0, 1, 2\}$) are provided in the Appendix. By comparing the roots of $\Phi_0^{CS} + \Phi_1^{CS} r + \Phi_2^{CS} r^2 = 0$ and $\Phi_0^{TS} + \Phi_1^{TS} r + \Phi_2^{TS} r^2 = 0$ with r_{min} and r_{max}, we obtain the following proposition:

Proposition 3 *(i) The acquisition of a failing firm always increases consumer surplus. In other words, $CS^A > CS^N$. (ii) When $r_{min} < r < \min\{r_{max}, r^{TS}\}$, acquisition increases the total surplus, where*

$$r^{TS} = \frac{-\Phi_1^{TS} + \sqrt{(\Phi_1^{TS})^2 - 4\Phi_2^{TS}\Phi_0^{TS}}}{2\Phi_2^{TS}}.$$

(iii) When an acquisition incentive exists, the acquisition always increases the total surplus.

Figure 3 illustrates the threshold values in Result (ii) of this proposition. The horizontal axis represents the degree of substitutability between goods in markets X, and the vertical axis represents the relative market size $r = a_X/a_Y$. The black curve represents the threshold value r^{TS}. The gray region represents the parameter combinations outside the scope of the model. The figure shows that the acquisition of the failing firm increases the total surplus when market X is small and the degree of substitutability between the goods in market X is low.

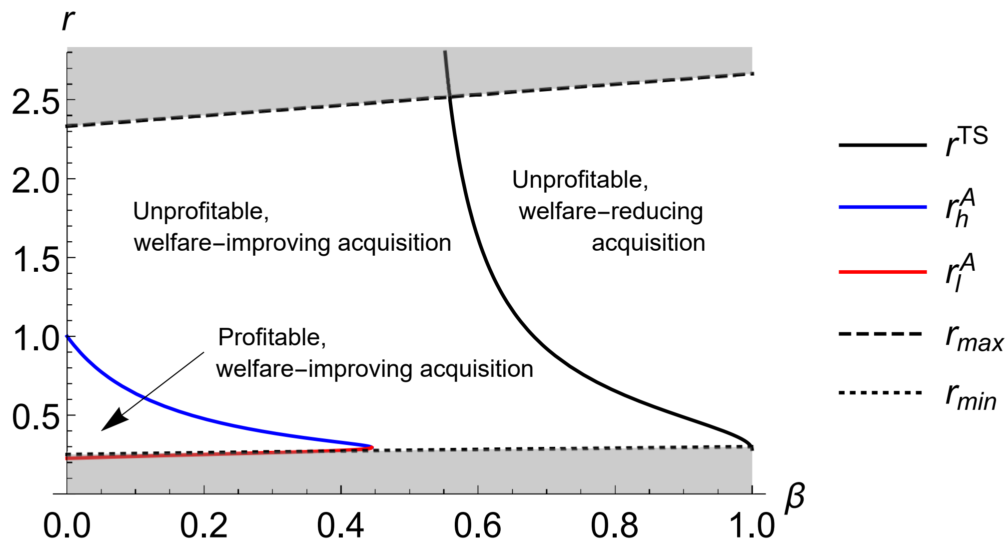

Figure 3: Acquisition incentives and welfare effects

The intuition behind this proposition is as follows. First, the mechanism underlying result (i) is straightforward. The acquisition of a failing firm allows consumers to consume a wide variety of goods. Therefore, the consumer surplus increases.

The mechanism underlying result (ii) can be explained by several factors. First, we consider the effect of acquisition on the input price. According to Proposition 1, the input price decreases when r is small and increases when r is large. In other words, depending on the value of r, the acquisition changes the extent of the double-marginalization problem. When r is small, the acquisition substantially reduces the double marginalization problem and thus increases the total surplus.

Next, we consider the relationship between acquisition and degree of substitutability

β. According to Proposition 2, when the degree of substitutability is high, the acquisition is less likely to recover the fixed cost F, and the producer surplus tends to decline. Furthermore, when the degree of substitutability is low, an increase in the number of available goods substantially affects the consumer surplus. Therefore, when the degree of substitutability is low, an increase in consumer surplus is sufficient to counterbalance a decrease in producer surplus, resulting in an increase in total surplus.

The policy implications of Proposition 3 are as follows. Competition authorities may evaluate the acquisitions of failing firms under the assumption that private incentives and social welfare do not necessarily coincide. However, in the environment considered in this study, where the acquisition incentive is sustained by lower input prices, acquisitions of failing firms are not merely less harmful alternatives to exit. These can be welfare-enhancing transactions because they soften upstream market power and lower input prices. Therefore, in this model, the situation in which firms choose to make an acquisition coincides with that in which the total surplus improves. Consequently, preventing such acquisitions may hinder the socially desirable restructuring.

5 Extension: The role of upstream market power

The main model assumes that the upstream market is monopolized. This section demonstrates that an upstream monopoly is not an essential assumption for the main results. The key factor was the degree of power in the upstream market.

We assume that n symmetric firms exist in the upstream market. Each upstream firm produces a homogeneous input with a zero marginal cost. The production quantity of upstream firm U_u ($u \in \{1, \dots, n\}$) is denoted by x_{Uu}. Following the assumption of a successive Cournot oligopoly (Greenhut and Ohta 1979; Salinger 1988), we determine the input price. Specifically, downstream firms choose their production quantities by taking the input price w as a given. From the market-clearing condition for the input market $q_1 + q_2 + q_f + q_0 = \sum_{j=1}^{n} x_{Uj}$, solving for w yields the derived inverse demand function for input $w(\sum_{j=1}^{n} x_{Uj})$. The upstream firms face this derived inverse demand function and compete on quantity. The profit of the upstream firm U_u is given by:

$$\pi_{Uu} = w\left(\sum_{j=1}^{n} x_{Uj}\right) x_{Uu}.$$

In the main model, the ratio of the market sizes of markets X and Y, $r = a_X/a_Y$, must take an intermediate value to ensure that the equilibrium outcomes are positive. In this section, we assume that $\widehat{r}_{min}(n) = (2+\beta)/(2+6n+\beta+n\beta) < r < (3+4n+n\beta)/3 = \widehat{r}_{max}(n)$.

The timing of the game is as follows: In stage 1, firm 1 decides whether to acquire firm f. In stage 2, each upstream firm chooses its input production quantity x_{Uu}, and the input price is determined. In stage 3, each downstream firm chooses its production quantity. All the other aspects of the model are identical to those of the main model.

5.1 Fixed cost of downstream firm f

The downstream production quantities are identical to those in the main model. From the proof of Lemma 1, we obtain $q_1 = q_2 = q_f = (a_X - w)/[2(1+\beta)]$ and $q_0 = (a_Y - w)/2$. Solving the input market-clearing condition $q_1 + q_2 + q_f + q_0 = \sum_{j=1}^{n} x_{Uj}$ for w, we obtain the following derived inverse demand function:

$$w\left(\sum_{j=1}^{n} x_{Uj}\right) = \frac{3a_X + (a_Y - \sum_{j=1}^{n} x_{Uj})(1+\beta)}{4+\beta}.$$

Substituting this into each upstream firm's profit function and using the first-order condition, the input production quantity chosen by upstream firm U_u is given by:

$$x_{Uu} = \frac{3a_X + a_Y(1+\beta)}{2(1+n)(1+\beta)}.$$

Based on this result, we obtain the following lemma by deriving the minimum fixed cost level at which downstream firm f becomes bankrupt:

Lemma 2 *When the fixed cost of downstream firm f is $F = \widehat{F}$, downstream firm f earns zero profit and exits the market, where*

$$\widehat{F} = \frac{a_Y^2[1+\beta - r(1+\beta+4n+\beta n)]^2}{4(1+n)^2(1+\beta)^2(4+\beta)^2}.$$

In the following analysis, we assume a fixed cost level, $\widehat{F}$.

5.2 Quantity and input decisions

First, we consider the case in which no acquisition occurs. The downstream production quantities in this case are identical to those in the main model and are given by $q_1 = q_2 = (a_X - w)/(2+\beta)$ and $q_0 = (a_Y - w)/2$. From $q_1 + q_2 + q_0 = \sum_{j=1}^n x_{Uj}$, the inverse demand function faced by upstream firms is obtained:

$$w\left(\sum_{j=1}^n x_{Uj}\right) = \frac{4a_X + (2+\beta)(a_Y - 2\sum_{j=1}^n x_{Uj})}{6+\beta}.$$

The first-order condition gives the input production quantity chosen by upstream firm U_u:

$$x_{Uu} = \frac{a_Y(2+\beta+4r)}{2(1+n)(2+\beta)}.$$

The equilibrium outcomes are as follows:

$$
\begin{aligned}
\widehat{w}^N &= \frac{a_Y(2+\beta+4r)}{(1+n)(6+\beta)}, \\
\widehat{\pi}_1^N &= \widehat{\pi}_2^N = \frac{a_Y^2[2+\beta-r(2+\beta+(\beta+6)n)]^2}{(\beta+2)^2(\beta+6)^2(n+1)^2}, \quad \widehat{\pi}_0^N = \frac{a_Y^2[4-4r+(\beta+6)n]^2}{4(\beta+6)^2(n+1)^2}, \\
\widehat{CS}^N &= \frac{a_Y^2\left[(\beta+6)n-4(r-1)\right]^2}{8(\beta+6)^2(n+1)^2} + \frac{a_Y^2(\beta+1)\left[2+\beta-r\left(2+\beta+(\beta+6)n\right)\right]^2}{(\beta+2)^2(\beta+6)^2(n+1)^2}, \\
\widehat{TS}^N &= \widehat{\pi}_1^N + \widehat{\pi}_2^N + \widehat{\pi}_0^N + \widehat{CS}^N.
\end{aligned}
$$

Next, we consider the case in which an acquisition occurs. From the results of the main model, the downstream production quantities are $q_1 = q_f = (a_X - w)(2-\beta)/[2(2+2\beta-\beta^2)]$, $q_2 = (a_X - w)/(2+2\beta-\beta^2)$, and $q_0 = (a_Y - w)/2$. From $q_1 + q_2 + q_f + q_0 = \sum_{j=1}^n x_{Uj}$, the upstream firms' inverse demand function is given by:

$$
w\left(\sum_{j=1}^n x_{Uj}\right) = \frac{2a_X(3-\beta) + (2+2\beta-\beta^2)(a_Y - 2\sum_{j=1}^n x_{Uj})}{8-\beta^2}.
$$

The first-order condition gives the input production quantity chosen by upstream firm U_u:

$$
x_{Uu} = \frac{a_Y\left[2+2\beta-\beta^2+2r(3-\beta)\right]}{2(2+2\beta-\beta^2)(n+1)}.
$$

From these results and $F = \widehat{F}$, the equilibrium outcomes are given by:

$$
\begin{aligned}
\widehat{w}^A &= \frac{a_Y\left[2+2\beta-\beta^2+2r(3-\beta)\right]}{(n+1)(8-\beta^2)},\\
\widehat{\pi}_{1f}^A &= \frac{a_Y^2(\beta-2)^2(\beta+1)\left[2+2\beta-\beta^2-r\left(2+2\beta-\beta^2+(8-\beta^2)n\right)\right]^2}{2(8-\beta^2)^2(2+2\beta-\beta^2)^2(n+1)^2}\\
&\quad -\frac{a_Y^2\left[1+\beta-r(1+\beta+(\beta+4)n)\right]^2}{4(\beta+1)^2(\beta+4)^2(n+1)^2},\\
\widehat{\pi}_2^A &= \frac{a_Y^2\left[2+2\beta-\beta^2-r\left(2+2\beta-\beta^2+(8-\beta^2)n\right)\right]^2}{(8-\beta^2)^2(2+2\beta-\beta^2)^2(n+1)^2},\\
\widehat{\pi}_0^A &= \frac{a_Y^2\left[(8-\beta^2)n+2(\beta-3)(r-1)\right]^2}{4(8-\beta^2)^2(n+1)^2},\\
\widehat{CS}^A &= \frac{a_Y^2\left[(8-\beta^2)n+2(\beta-3)(r-1)\right]^2}{8(8-\beta^2)^2(n+1)^2}\\
&\quad +\frac{a_Y^2(\beta^3-7\beta^2+8\beta+6)\left[2+2\beta-\beta^2-r\left(2+2\beta-\beta^2+(8-\beta^2)n\right)\right]^2}{4(8-\beta^2)^2(2+2\beta-\beta^2)^2(n+1)^2},\\
\widehat{TS}^A &= \widehat{\pi}_{1f}^A+\widehat{\pi}_2^A+\widehat{\pi}_0^A+\widehat{CS}^A.
\end{aligned}
$$

By comparing the input prices before and after the acquisition, we obtain:

$$
\widehat{w}^N-\widehat{w}^A=\frac{2a_Y(1-r)(2-3\beta+\beta^2)}{(n+1)(\beta+6)(8-\beta^2)}.
$$

Therefore, we obtain the following results regarding the effect of acquisitions on input prices.

Proposition 4 *(i) If the size of market X is smaller than that of market Y, the input price after acquisition is lower than that without acquisition. In other words, $\widehat{w}^N > \widehat{w}^A$ if $r < 1$. (ii) As the number of upstream firms n approaches infinity, the input price does not change, even if an acquisition occurs. In other words, $\lim_{n\to\infty}(\widehat{w}^N-\widehat{w}^A) = 0$.*

This extends Proposition 1 by incorporating the effect of the number of upstream firms. Because result (i) is identical to Proposition 1, the intuition behind this result is the same. Result (ii) implies that when the number of upstream firms becomes infinitely large, the input price in both cases converges to the marginal cost of the upstream firms, which is zero. This property is consistent with the Cournot limit theorem and confirms that an increase in the number of firms reduces the ability of upstream firms to exercise market power.

5.3 Acquisition incentive and its effects

As in the main model, downstream firm 1 acquires downstream firm f if and only if $\widehat{\pi}_{1f}^A - \widehat{\pi}_1^N > 0$. The term determining the sign of $\widehat{\pi}_{1f}^A - \widehat{\pi}_1^N$ is a quadratic function of r, $\widehat{\Phi}_0^A + \widehat{\Phi}_1^A r + \widehat{\Phi}_2^A r^2$, and the roots of $\widehat{\pi}_{1f}^A - \widehat{\pi}_1^N = 0$ are given by:

$$\widehat{r}_l^A(n) = \frac{-\widehat{\Phi}_1^A - \sqrt{\left(\widehat{\Phi}_1^A\right)^2 - 4\widehat{\Phi}_2^A\widehat{\Phi}_0^A}}{2\widehat{\Phi}_2^A}, \quad \widehat{r}_h^A(n) = \frac{-\widehat{\Phi}_1^A + \sqrt{\left(\widehat{\Phi}_1^A\right)^2 - 4\widehat{\Phi}_2^A\widehat{\Phi}_0^A}}{2\widehat{\Phi}_2^A}.$$

The definitions of $\widehat{\Phi}_2^A$, $\widehat{\Phi}_1^A$, and $\widehat{\Phi}_0^A$ are provided in the Appendix. Therefore, we obtain the following result for the acquisition incentive:

Proposition 5 *When* $\max\{\widehat{r}_{min}(n), \widehat{r}_l^A(n)\} < r < \widehat{r}_h^A(n)$, *downstream firm* 1 *acquires downstream firm* f.

At first glance, one may expect the acquisition incentive to disappear once upstream competition becomes sufficiently intense. Proposition 5 characterizes the acquisition region for a given number of upstream firms but does not reveal whether this region eventually vanishes as the number of upstream firms increases. The next proposition is that this intuition is partially correct. Although the acquisition region persists for every finite number of upstream firms, it disappears in the case of perfect upstream competition.

Proposition 6 *(i) For any finite number of upstream firms n, a parameter region exists in which downstream firm 1 acquires downstream firm f. (ii) As $n \to \infty$, the acquisition incentive disappears.*

Proof. See Appendix.

For result (i) of this proposition, for any number of upstream firms n, if the degree of product substitutability is positive but sufficiently close to zero and the relative market size of market X, r, is sufficiently close to the lower bound $\widehat{r}_{min}(n)$, then downstream firm 1 acquires downstream firm f. For result (ii), as the number of upstream firms becomes infinitely large, and the input price converges to the upstream firms' marginal cost, the input price effect disappears, eliminating the incentive for acquisition.

Next, we analyze the welfare effects of acquiring a failing firm. To examine the effect on the consumer surplus, we consider $\widehat{CS}^A - \widehat{CS}^N$. The term determining the sign of $\widehat{CS}^A - \widehat{CS}^N$ is a quadratic function of r and takes the form $\widehat{\Phi}_0^{CS} + \widehat{\Phi}_1^{CS} r + \widehat{\Phi}_2^{CS} r^2$. The definitions of $\widehat{\Phi}_2^{CS}$, $\widehat{\Phi}_1^{CS}$, and $\widehat{\Phi}_0^{CS}$ are provided in the Appendix, and all are positive. Therefore, we obtain the following result:

Proposition 7 *The acquisition of downstream firm f by downstream firm 1 increases the consumer surplus.*

This result corresponds to result (i) of Proposition 3 and shows that the result is robust even when the upstream market is oligopolistic. Therefore, the rationale behind this result is the same as that in Proposition 3.

Finally, we discuss the effect of the acquisition of the failing firm on the total surplus. Although this effect is given by $\widehat{TS}^A - \widehat{TS}^N$, its expression is complex. To avoid unnecessary complexity, numerical simulations suggest that the alignment between private incentives and welfare effects remains robust under upstream competition. By substituting $n = 2, 5, 20$ into $\widehat{TS}^A - \widehat{TS}^N$ and the threshold values for the acquisition incentive, we obtain Figures 4, 5, and 6, which illustrate the regions in which the acquisition increases the total surplus and the conditions under which the acquisition incentive exists.

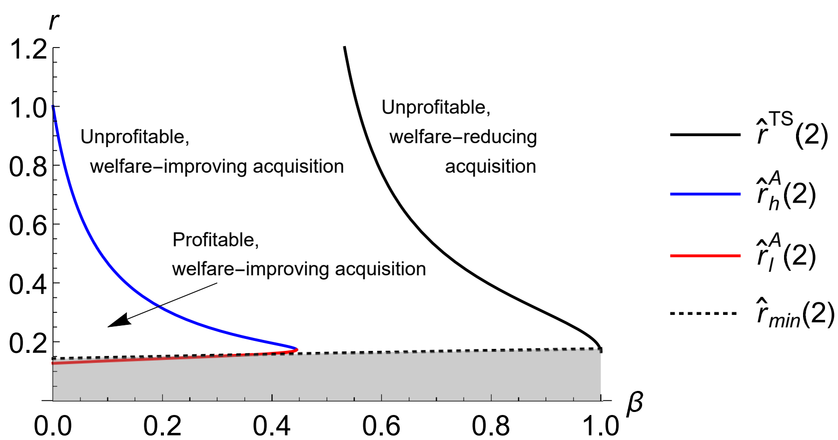

Figure 4: Acquisition incentives and welfare effects with $n = 2$

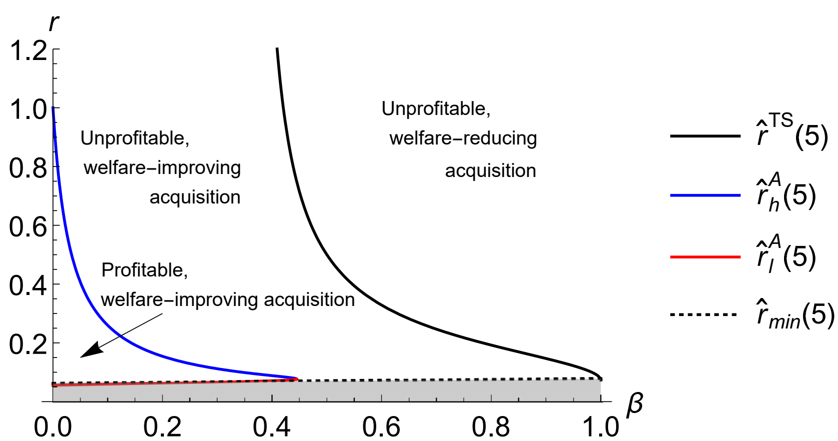

Figure 5: Acquisition incentives and welfare effects with $n = 5$

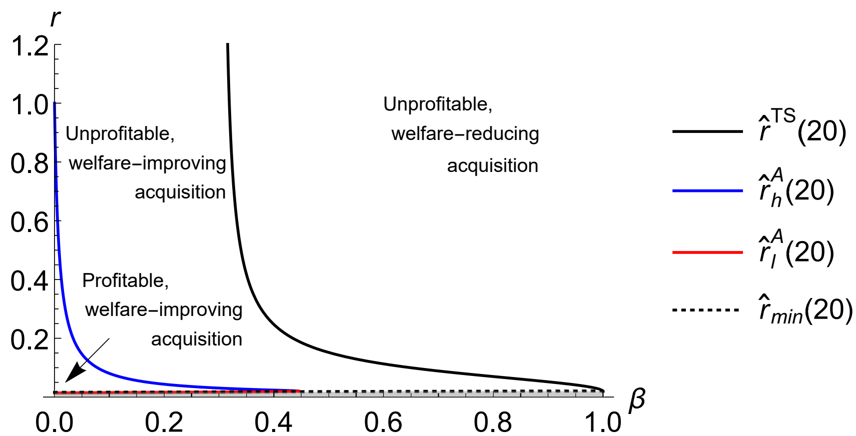

Figure 6: Acquisition incentives and welfare effects with $n = 20$

The horizontal axis represents the degree of product substitutability, whereas the vertical axis represents the relative market sizes of markets X. The grey regions indicate parameter combinations outside the scope of this analysis. The figures can be divided into three regions. In the left region, the downstream firm 1 has an incentive to acquire the failing firm, and the acquisition increases the total surplus. In the middle region, there is no acquisition incentive, but acquisition increases the total surplus. In the right region, there is no acquisition incentive, and the acquisition decreases the total surplus. As the number of upstream firms, n increases, the curves representing the thresholds shift to the left. Therefore, intensified competition in the upstream market weakens the incentive to acquire a failing firm and narrows the region in which the acquisition increases the total surplus. However, when the acquisition incentive remained, the acquisition increased the total surplus.

6 Conclusions

This study analyzes incentives for failing firm acquisitions and their welfare effects, providing a new explanation based on input pricing in vertically related markets. We consider a setting in which an upstream firm supplies common inputs to multiple downstream markets and analyze the acquisition of a failing firm by a downstream competitor. When demand in the failing firm's market is relatively elastic, preserving its production increases the elasticity of the aggregate input demand, weakens upstream market power, and lowers the input price. Therefore, the acquiring firm benefits from lower input costs even after paying the acquisition cost.

The analysis yields the following three main results: First, competing firms may have incentives to acquire failing firms even in the absence of efficiency gains or direct synergies. Unlike conventional acquisitions, these incentives arise from lower input prices rather than increased market concentration. Second, failing firm acquisitions always increase consumer surplus, while their effect on total welfare is ambiguous and depends on the model parameters. Third, the mechanism extends to an oligopolistic upstream market, although stronger upstream competition weakens the upstream market power, thereby reducing the acquisition incentives arising from lower input prices.

An important direction for future research would be to examine alternative forms of downstream competition. While this study assumes Cournot competition to obtain tractable analytical results, it would be valuable to investigate whether the proposed mechanism also holds true in other competitive settings, such as price competition.

Appendix

A1. Proof of Lemma 1

From the first-order conditions for quantity competition in downstream markets, we obtain $q_1 = q_2 = q_f = (a_X - w)/[2(1+\beta)]$ and $q_0 = (a_Y - w)/2$. Substituting these quantities into the upstream firm's profit function and using the first-order condition with respect to the input price, we obtain $w = a_Y(1+3r+\beta)/[2(4+\beta)]$, where we use $r = a_X/a_Y$. Substituting the above results into the profit function of the downstream firm f and solving for the value of F that makes its profit equal to zero yields:

$$\bar{F} = \frac{a_Y^2[1+\beta - r(5+2\beta)]^2}{16(4+5\beta+\beta^2)^2}.$$

Therefore, the lemma is as follows. □

A2. Proof of Proposition 6

To demonstrate result (i), it is sufficient to show that $\widehat{r}_l^A(n) < \widehat{r}_{min}(n) < \widehat{r}_h^A(n)$ holds for $\beta = 0$. Substituting $\beta = 0$ into these thresholds yields:

$$\widehat{r}_{min}(n)|_{\beta=0} = \frac{1}{1+3n}, \quad \widehat{r}_l^A(n)|_{\beta=0} = \frac{7}{7+24n}, \quad \widehat{r}_h^A(n)|_{\beta=0} = 1.$$

Therefore, Result (i) is as follows:

Next, we consider result (ii). As n approaches infinity, we obtain:

$$\lim_{n\to\infty} \widehat{r}_l^A = \lim_{n\to\infty} \widehat{r}_h^A = 0.$$

Thus, the incentive to acquire a failing firm disappears. □

A3. Definition of variables

Φ_j^k ($j \in \{0, 1, 2\}$ and $k \in \{A, CS, TS\}$) are defined as follows.

$$
\begin{aligned}
\Phi_0^A =& -(4+10\beta+6\beta^2-\beta^3-\beta^4)^2(1792-1024\beta+992\beta^2+864\beta^3-60\beta^4-132\beta^5 \\
&-29\beta^6-2\beta^7), \\
\Phi_1^A =& 2(77824+393216\beta+745984\beta^2+720896\beta^3+530368\beta^4+406976\beta^5+121856\beta^6 \\
&-151328\beta^7-133172\beta^8-14564\beta^9+18660\beta^{10}+6564\beta^{11}-83\beta^{12}-389\beta^{13} \\
&-70\beta^{14}-4\beta^{15}), \\
\Phi_2^A =& -126976-1249280\beta-3111424\beta^2-3294208\beta^3-1811392\beta^4-653568\beta^5 \\
&+41280\beta^6+440000\beta^7+283764\beta^8+10608\beta^9-46328\beta^{10}-13724\beta^{11}+631\beta^{12} \\
&+892\beta^{13}+148\beta^{14}+8\beta^{15}, \\
\Phi_0^{CS} =& (4+6\beta-\beta^3)^2(288-80\beta-68\beta^2+16\beta^3+5\beta^4), \\
\Phi_1^{CS} =& -2(4608+15616\beta+9024\beta^2-10368\beta^3-5632\beta^4+3440\beta^5+1412\beta^6-520\beta^7 \\
&-164\beta^8+28\beta^9+7\beta^{10}), \\
\Phi_2^{CS} =& 2(11520+30848\beta+3488\beta^2-20352\beta^3-2192\beta^4+5752\beta^5+682\beta^6-740\beta^7 \\
&-109\beta^8+35\beta^9+6\beta^{10}), \\
\Phi_0^{TS} =& (4+10\beta+6\beta^2-\beta^3-\beta^4)^2(5376-7424\beta-2912\beta^2+1936\beta^3+720\beta^4-56\beta^5 \\
&-38\beta^6-3\beta^7), \\
\Phi_1^{TS} =& 2(61440+413696\beta+1073664\beta^2+1335552\beta^3+660608\beta^4-259328\beta^5-489568\beta^6 \\
&-172240\beta^7+50776\beta^8+46720\beta^9+5240\beta^{10}-3032\beta^{11}-808\beta^{12}-2\beta^{13}+15\beta^{14}+\beta^{15}), \\
\Phi_2^{TS} =& 1265664+2154496\beta-3742208\beta^2-10311936\beta^3-5227392\beta^4+3287104\beta^5 \\
&+3514496\beta^6+271056\beta^7-608760\beta^8-177124\beta^9+26622\beta^{10}+17556\beta^{11} \\
&+1363\beta^{12}-420\beta^{13}-82\beta^{14}-4\beta^{15}.
\end{aligned}
$$

$\widehat{\Phi}_j^k$ ($j \in \{0,1,2\}$ and $k \in \{A, CS\}$) are defined as follows.

$$\begin{aligned}
\widehat{\Phi}_0^A =& -(4+10\beta+6\beta^2-\beta^3-\beta^4)^2(1792-1024\beta+992\beta^2+864\beta^3-60\beta^4-132\beta^5\\
&-29\beta^6-2\beta^7),\\
\widehat{\Phi}_1^A =& 2(4+10\beta+6\beta^2-\beta^3-\beta^4)[7168+13824\beta+4480\beta^2+5440\beta^3+13584\beta^4+4088\beta^5\\
&-3652\beta^6-1894\beta^7-2\beta^8+149\beta^9+31\beta^{10}+2\beta^{11}+(12288+35840\beta+28672\beta^2\\
&+22272\beta^3+17280\beta^4-368\beta^5-6264\beta^6-2084\beta^7+174\beta^8+198\beta^9+35\beta^{10}+2\beta^{11})n],\\
\widehat{\Phi}_2^A =& -(4+10\beta+6\beta^2-\beta^3-\beta^4)^2(1792-1024\beta+992\beta^2+864\beta^3-60\beta^4-132\beta^5\\
&-29\beta^6-2\beta^7)-2[49152+266240\beta+546816\beta^2+578560\beta^3+415744\beta^4+240448\beta^5\\
&+24000\beta^6-112736\beta^7-74640\beta^8-3340\beta^9+11512\beta^{10}+3456\beta^{11}-142\beta^{12}-221\beta^{13}\\
&-37\beta^{14}-2\beta^{15}]n+\beta(192+80\beta-16\beta^2-10\beta^3+\beta^4)^2(16+36\beta+24\beta^2+6\beta^3+2\beta^4\\
&-\beta^5-2\beta^6)n^2,\\
\widehat{\Phi}_0^{CS} =& (\beta+2)^2(\beta^2-2\beta-2)^2[96-16\beta-28\beta^2+8\beta^3+3\beta^4+(192-64\beta-40\beta^2+8\beta^3\\
&+2\beta^4)n],\\
\widehat{\Phi}_1^{CS} =& -2(\beta+2)(\beta^2-2\beta-2)[-384-512\beta+208\beta^2+232\beta^3-76\beta^4-46\beta^5+8\beta^6+3\beta^7\\
&+(-768-1664\beta+800\beta^2+560\beta^3-248\beta^4-76\beta^5+20\beta^6+4\beta^7)n],\\
\widehat{\Phi}_2^{CS} =& (\beta^2-2\beta-2)^2(48-32\beta+2\beta^2+3\beta^3)(2+\beta)^3+(48-8\beta-6\beta^2+\beta^3)^2(8+16\beta-6\beta^2\\
&-6\beta^3+3\beta^4)n^2+2(1536+7168\beta+5184\beta^2-4992\beta^3-2624\beta^4+1856\beta^5+596\beta^6\\
&-296\beta^7-68\beta^8+16\beta^9+3\beta^{10})n.
\end{aligned}$$

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