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Welfare raising common ownership with supply chains*

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Abstract

Even though the welfare-reducing effects of common ownership have been emphasized in the established researches, we challenge this well-known result by considering a model of two symmetric supply chains, each composed of a manufacturer and its firm-specific input supplier. The common ownership exists in the downstream market. We find that if the degree of common ownership is high, the demand for input becomes elastic, intensifying input price competition. Therefore, the consumer and total surpluses will increase with the degree of common ownership.

JEL codes: D43, L13, M21.

Keywords: common ownership, supply chain competition, vertical relationship.

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1 Introduction

It is commonly observed that common ownership, a situation where a third party like institutional investors, e.g., BlackRock and Vanguard, hold shares in multiple competing firms within the same industry in many markets (Backus et al., 2021). There has been a tremendous growth in common ownership due to the increasing prevalence of institutional investors. According to Blume and Keim (2014), these investors owned close to 70 percent of the U.S. stock market by 2010, a stark contrast to their 7-8 percent share in 1950. A 2017 OECD report found that the big three asset managers—BlackRock, Vanguard, and State Street—had achieved a significant level of common ownership, with a mean ownership share exceeding 17.6% across 1,662 U.S. listed companies as of 2015. Japan's SoftBank Group is a significant investor in several major online ride-hailing firms. Its investments include acquiring 20% stake in Didi in 2019, a 17.5% share in Uber in 2018, and making a $250 million USD investment in Grab (formerly GrabTaxi) in 2014 (Xu et al., 2023). These three services have been available for use in large metropolitan areas such as Tokyo since 2018 (MATCHA, 2025).

The property of common ownership to relax competition has been well established theoretically (e.g., Bresnahan and Salop 1986; Reynolds and Snapp, 1986). Intuitively, common ownership can lessen market competition because it incentivizes firms to consider the joint profits of the industry, rather than focusing solely on their own individual profits (López and Vives, 2019; Vives, 2020).[1] This anti-competitive effect will naturally cause lower level of output and consumer surplus, while higher prices and competing producer surplus. Empirical evidence from Azar et al. (2018) indicates that common ownership causes an increase in ticket prices within the US airline industry. In a later study, Azar et al. (2022) offer convincing evidence that it also strengthens monopsony power in the banking industry.

The significant growth of common ownership, combined with its potential anti-competitive and welfare-reducing effects, has raised antitrust concerns among academics (Elhauge, 2016, 2017) and policymakers in recent years (e.g., OECD, 2017; US Federal Trade Commission,

[1] A simpler explanation is that if competing firms care about their common owners' portfolio value, they will also indirectly care about the profits of their competitors (Chen et al., 2024). This leads to a diminished incentive to compete.

2018; European Commission, 2020). Despite these concerns, common ownership remains largely unregulated. Furthermore, the body of economic and legal literature on the topic is relatively scarce, especially when compared to the extensive research on mergers and cross-ownership (Matsumura et al., 2025). Therefore, a critical examination of the specific circumstances under which common ownership harms or benefits social welfare is both timely and necessary. This paper aims to address this gap by examining these circumstances within a simple market framework, thereby generating insights into the properties of common ownership that can be applied more broadly. We will explain specifically as follows.

Even though the harmful effects of common ownership on consumer and social welfare, have been emphasized in many researches as mentioned-above, we challenge this welfare-reducing effect of common ownership by providing a simple market structure using a non-liner inverse demand function. We consider a model of two symmetric supply chains, each composed of a manufacturer and its firm-specific input supplier, producing homogenous products. The common ownership exists in the downstream market. Specifically, we consider a two-stage game. In the first stage, the suppliers decide input prices. In the second stage, the downstream manufacturers compete in quantity.

In our model, if we do not consider the firm-specific input supplier, the manufactures will behave less aggressively in the downstream market as the the degree of common ownership increases, which reduces the output, consumer and total surpluses, i.e., a same result of the previous research showing the anti-competitive and welfare-reducing effect of common ownership. However, the mechanism in such model will trigger more final output by simply introducing the firm-specific input supplier. We will explain our finding as follows.

First, we find that the demand for inputs becomes elastic as the degree of common ownership increases. This is because an increase of the input price of any supplier will drive its firm-specific manufacturer to transfer the production to the other one, pursuing the joint profit increase (for more efficient production with lower input cost) with common ownership. It means that the downstream demand for the input becomes more elastic with common ownership compared with no common ownership. As the degree of common ownership increases, the manufacturers become more cooperative and focusing on the joint profit more, leading the input demand becomes more elastic, which strengthens the incentive of the two upstream suppliers to lower the input prices. The suppliers will behave more like Bertrand competition with homogenous product if the downstream manufactures are nearly close to merged firm with high level of common ownership. This is an indirect effect of common ownership which can lower the input prices, and then inducing larger output. If this indirect positive effect of common ownership dominates the negative direct effect of common ownership on output for less competition, the total output increases. It is true if the degree of common ownership is large in our model.

The second important finding is that consumer and total surpluses may increase with the degree of common ownership. This result also happens when the degree of common ownership is large. It can be understood easily, since with larger level of common ownership, the number of manufacturers is closer to one, which leads to fiercer input price competition between the suppliers. Then, indirect effect of common ownership lowering the input price becomes stronger. By contrast, with larger level of common ownership, the manufacturers tends to produce less, an increase of the degree of common ownership brings small direct effect. Therefore, the indirect positive effect of common ownership dominates the negative direct effect of common ownership on output, leading more output, consumer and total surpluses. Finally, we find that downstream producer surplus may decrease as the degree of common ownership increases when the level of common ownership is large, which is also a surprising result, since the previous research suggests that common ownership relax the competition thus benefits the competing firms. This is also because of the input price reduction effect of common ownership.

Our main results reversed the conventional wisdom of the welfare-reducing effect of common ownership by showing a normal and simple market structure with two supply chains, and common ownership exists in the downstream market. We also extend our analysis to the cases with product differentiation and n supply chains. In order to clarify the effects of the product differentiation and the number of supply chains, we discuss them separately, avoiding too many parameters.

Our study is related to the previous research that challenge the welfare-reducing property of common ownership. López and Vives (2019) demonstrate that common ownership can internalize positive R&D externalities, with welfare-improving effects potentially outweighing anti-competitive effects when common ownership levels are modest. Similarly, Sato and Matsumura (2020) show that in free-entry markets, common ownership internalizes business-stealing effects, and moderate levels of such ownership may enhance welfare. Chen et al. (2024) find that in vertically related markets, common ownership alleviates double marginalization—an effect that dominates anti-competitive outcomes in downstream markets when competition is sufficiently weak. Matsumura et al. (2025) analyze successive vertical oligopolies and show that under Cournot competition, increased common ownership is more likely to benefit both consumers and social welfare when upstream and downstream market concentration is high. Finally, Lømo (2023) demonstrates, using a general demand framework, that the effect of overlapping ownership on consumer surplus depends critically on the curvature of demand. Our work differs from the above research in several aspects. First, we consider the firm-specific supply chains, which has never been analyzed. Hence, the key point of our work, i.e., the input price reduction effect of common ownership for that input demand becomes more elastic as the degree of common ownership increases, firstly appears in our study. Then, we analyze in a general form. Chen et al. (2024) and Lømo(2023) also show the welfare-improving effect of common ownership using general demand function in vertical structure, but they both assume the upstream is monopoly and the mechanisms and intuitions are different from ours.

The remainder of the paper is organized as follows: In Section 2, we describe the basic model. In Section 3, we derive the equilibriums in the basic model with a non-linear inverse demand function. In Section 4, we show the effects of common ownership on various variables. In Section 5, we extend our model. Finally, we present the conclusion.

2 Model

We consider a model of two identical supply chains, each composed of a manufacturer and its firm-specific input supplier. Manufacturers M_i ($i = 1, 2$) produces homogenous products and compete in quantity. To produce one unit of the product, manufacturer M_i purchases one unit of the input from its firm-specific supplier S_i at input price w_i. We denote the output of manufacturer M_i as q_i. The inverse demand for final product is given by $p(Q)$, where $Q \equiv q_i + q_j$ is the aggregate output. We assume that the inverse demand has a constant curvature $z \equiv -p''(Q)Q/p'(Q)$, where $p'(Q)$ and $p''(Q)$ are the first and second derivatives of $p(Q)$, respectively. To ensure that the second-order conditions for manufacturers and suppliers are satisfied, we assume that $z < 2$. This type of inverse demand function is used in the literature on industrial organization (Hu et al., 2022; López and Vives 2019). All firms have no production costs other than payments for inputs. Then, the profit of manufacturer M_i is $\pi_{Mi} \equiv [p(Q) - w_i]q_i$. Meanwhile, the profit of supplier S_i is $\pi_{Si} \equiv w_i q_i$.

We assume that an institutional investor, like a bank, has shares in both manufacturers. Following the literature on common ownership (López and Vives, 2019; Vives, 2020), manufacturer M_i has the following objective function:

$$V_{Mi} \equiv \pi_{Mi} + \theta \pi_{Mj},$$

where $i, j = 1, 2$ and $i \neq j$. We interpret $\theta \in [0, 1)$ as the degree of common ownership.

We define consumer surplus is as $\int_0^Q p(x)dx - p(Q)Q$; producer surplus is $PS = \pi_{M1} + \pi_{M2} + \pi_{S1} + \pi_{S2}$; total surplus is $TS = CS + PS$.

The timing of this game is as follows: In the first stage, the suppliers decide input prices. In the second stage, the downstream manufacturers compete in quantity. We solve this model using backward induction.

3 Calculating equilibrium

3.1 Quantity competition

In the second stage, the first-order condition is

$$\frac{\partial V_{Mi}}{\partial q_i} = p(Q) + (q_i + \theta q_j)p'(Q) - w_i = 0. \tag{1}$$

Then, we obtain the outputs of manufacturers.

$$q_i(w_i, w_j, \theta) \equiv \frac{(1-\theta)p(Q) - w_i + \theta w_j}{-(1-\theta^2)p'(Q)}. \tag{2}$$

On the equilibrium path, we denote the input price as w^*. Then, the output is as follow.

$$q_i(w^*, w^*, \theta) = \frac{p(Q) - w^*}{-(1+\theta)p'(Q)}. \tag{3}$$

Here, we consider the effects of w_i, w_j, and θ on $q_i(w_i, w_j, \theta)$. Using the implicit function theorem in equation (1) and evaluating at $w_i = w_j = w^*$, we obtain the following comparative statics results.

Lemma 1

$$\frac{\partial q_i(w^*, w^*, \theta)}{\partial w_i} = -\frac{4 - z(1+\theta)}{-2(1-\theta)\Psi p'(Q)} < 0, \quad \frac{\partial q_i(w^*, w^*, \theta)}{\partial w_j} = \frac{(2-z)(1+\theta)}{-2(1-\theta)\Psi p'(Q)} > 0,$$
$$\frac{\partial q_i(w^*, w^*, \theta)}{\partial \theta} = -\frac{p(Q) - w^*}{-(1+\theta)\Psi p'(Q)} < 0, \quad \frac{\partial q_i(w^*, w^*, \theta)}{\partial w_i} + \frac{\partial q_i(w^*, w^*, \theta)}{\partial w_j} = -\frac{1}{-\Psi p'(Q)} < 0,$$

where $\Psi \equiv 3 + \theta - z(1+\theta) > 0$ *and* $\Psi > 0$ *because* $z < 2$ *and* $0 \leq \theta < 1$.

Proof. Differentiating $z = -p''(Q)Q/p'(Q)$ with respect to Q, substituting $p''(Q) = -zp'(Q)/Q$, and solving it for $p'''(Q)$ yields

$$p'''(Q) = \frac{z(1+z)p'(Q)}{Q^2}. \tag{4}$$

Differentiating the first-order condition (1) with respect to w_i, w_j and θ, we substitute $p''(Q) = -zp'(Q)/Q$, (3) and (4) into the derivatives and evaluate on the equilibrium path where $q_i = q_j = q$, $2q = Q$ and $w_i = w_j = w^*$. Finally, solving them for $\partial q_i(w^*, w^*, \theta)/\partial w_i$, $\partial q_i(w^*, w^*, \theta)/\partial w_j$ and $\partial q_i(w^*, w^*, \theta)/\partial \theta$ and calculating $\partial q_i(w^*, w^*, \theta)/\partial w_i + \partial q_i(w^*, w^*, \theta)/\partial w_j$, we obtain this lemma.□

This result has a simple intuition. The output of manufacturer M_i decreases with its marginal cost, w_i, and increases with its rival's marginal cost, w_j. As the degree of common ownership, θ, increases, the output of manufacturer decreases because both manufacturers act in cooperative fashion. Finally, because the absolute value of each manufacturer's reaction function slope is less than 1, output of each manufacturer will always decrease when w_i and w_j increase by one unit simultaneously.

To capture the characteristics of this market, we consider the effect of the degree of common ownership on the price elasticity of demand for input. Using (2), Lemma 1, and the definition of z and evaluating $w_i = w_j = w^*$, we define the price elasticity of demand for input on the equilibrium path as follows.

$$\begin{aligned} \varepsilon_i(w^*, \theta) &\equiv -\frac{\partial q_i(w^*, w^*, \theta)}{\partial w_i} \frac{w^*}{q_i(w^*, w^*, \theta)} \\ &= \frac{w^* z(1-\theta)[p(Q) - w^*] - 2q_i(w^*, w^*, \theta) w^*(2-z)(1+\theta)p'(Q)}{2q_i(w^*, w^*, \theta)^2 \Psi (1-\theta^2) p'(Q)^2}. \end{aligned}$$

Then, differentiating $\varepsilon_i(w^*, \theta)$ obtained above with respect to θ, the effect of the degree of common ownership on the price elasticity of input demand is summarized as in the following lemma.

Lemma 2 *Given the equilibrium input price, the demand for inputs becomes elastic as the* *degree of common ownership increases:*

$$\frac{\partial \varepsilon_i(w^*, \theta)}{\partial \theta} = \frac{w^*(2-z)(1+\theta)}{(1-\theta)^2 \Psi[p(Q) - w^*]} > 0.$$

An intuition behind this result is as follows. An increase in input prices w_i increases the marginal cost of manufacturer i and thus reduces output q_i. Common ownership amplifies this output-reducing effect. Since we can rewrite the objective function of manufacturer M_i as $V_{Mi} = (1-\theta)\pi_{Mi} + \theta(\pi_{Mi} + \pi_{Mj})$, the manufacturers place more importance on their joint profit as the degree of common ownership increases. Thus, as w_i increases, the production efficiency of manufacturer M_i decreases, leading to a partial transfer of production from manufacturer M_i to manufacturer M_j. This effect is stronger when the degree of common ownership is large. Therefore, the presence of common shareholders makes the demand for inputs elastic, since an increase in input prices w_i reduces output q_i more.

3.2 Input price decision

We consider the input price decision in the first stage. Substituting the result of Lemma 1 and (3) into the first-order condition, $\partial \pi_{Si}/\partial w_i = 0$, and using the symmetric condition, $w_i = w_j = w^*$, we rewrite the first-order condition as follows.

$$\frac{\partial \pi_{Si}}{\partial w_i} = \frac{-\Phi w^* + 2(1-\theta)\Psi p(Q)}{-2(1-\theta)(1+\theta)\Psi p'(Q)} = 0,$$

where $\Phi \equiv 2(5-\theta^2) - z(3 + 2\theta - \theta^2)$ and $\Phi > 0$ because $z < 2$ and $0 \leq \theta < 1$. Solving this first-order condition and combining with (3), we obtain the equilibrium outcomes.

Proposition 1 *Equilibrium input price and output are*

$$w^*(\theta) \equiv \frac{2(1-\theta)\Psi p(Q)}{\Phi}, \quad q^*(\theta) \equiv \frac{(4 - z - z\theta)p(Q)}{-\Phi p'(Q)}.$$

Note that the equilibrium input price is zero when the degree of common ownership takes the maximum value: $w^*(1) = 0$. This is because with a sufficiently large degree of common ownership, the number of input buyers is close to one, which is equivalent to a merger between buyers. Thus, suppliers face price competition with nearly homogeneous goods. Therefore, the input price converges to the suppliers' marginal cost as the degree of common ownership converges to one.

4 Effect of common ownership

We discuss the effect of common ownership on the input price, the profits of manufacturer and supplier, consumer surplus, and total surplus.

4.1 Input price

First, we consider the effect of common ownership on the input price. Differentiating $w^*(\theta)$ in Proposition 1 and using Lemma 1, we obtain the following result of comparative static.

Proposition 2 *Input price decreases with the degree of common ownership:*

$$\frac{dw^*(\theta)}{d\theta} = -\frac{4\Psi p(Q)}{(3-\theta)\Phi} < 0.$$

An intuition behind this result is simple. As the degree of common ownership increases, input demand decreases because both manufacturer play cooperatively. In addition, an increase in the degree of common ownership makes input demand elastic. These effects lower input prices.

4.2 Consumer and total surpluses

We focus on the effect of the degree of common ownership on each manufacturer's output because consumer and total surpluses increase with total output, $2q$. Differentiating equilibrium output $q^*(\theta)$, consumer surplus CS^* and total surplus TS^* with respect to θ and substituting the results of Lemma 1, (3), Proposition 1, and Proposition 2 into them, we obtain the following first derivatives.

$$\frac{dq^*(\theta)}{d\theta} = \frac{[z(1+\theta)^2 - 8\theta]p(Q)}{(3-\theta)\Phi\Psi p'(Q)},$$

$$\frac{dCS^*(\theta)}{d\theta} = \frac{4[z(1+\theta)^2 - 8\theta][4 - z(1+\theta)]}{(3-\theta)\Phi\Psi p'(Q)}, \quad \frac{dTS^*(\theta)}{d\theta} = \frac{2[z(1+\theta)^2 - 8\theta]p(Q)^2}{(3-\theta)\Phi\Psi p'(Q)}$$

It is easy to find that the signs of the above derivatives depend on the part $z(1+\theta)^2 - 8\theta$ in the numerators, which is a quadratic function of θ. Solving $z(1+\theta)^2 - 8\theta < 0$ with keeping $0 \leq \theta < 1$, we can obtain the following proposition.

Proposition 3 *Consumer and total surpluses increase with the degree of common ownership if the degree of common ownership is large:*

$$\frac{dCS^*(\theta)}{d\theta} > 0 \quad \textit{and} \quad \frac{dTS^*(\theta)}{d\theta} > 0 \quad \textit{if} \quad \theta > \frac{4 - z - 2\sqrt{2(2-z)}}{z},$$

The condition in Proposition 3 is depicted as in Figure 1. In this figure, the horizontal axis represents the degree of common ownership, and the vertical axis represents the curvature of inverse demand function. The blue curve illustrates the threshold value in Proposition 3. In the region under the blue curve, both consumer and total surplus increase as the degree of common ownership increases.

An intuition behind this proposition is as follows. Since we have $q^*(\theta) = q_i(w^*(\theta), w^*(\theta), \theta)$, we can decompose the effect of common ownership on equilibrium output:

$$\frac{dq^*(\theta)}{d\theta} = \underbrace{\left[\frac{\partial q_i(w^*(\theta), w^*(\theta), \theta)}{\partial w_i} + \frac{\partial q_i(w^*(\theta), w^*(\theta), \theta)}{\partial w_j}\right]}_{(-)} \underbrace{\frac{dw^*(\theta)}{d\theta}}_{(-)} + \underbrace{\frac{\partial q_i(w^*(\theta), w^*(\theta), \theta)}{\partial \theta}}_{(-)}. \quad (5)$$

The first terms represent an indirect effect of common ownership and the second term is a direct effect of common ownership. Here, we consider the case where the degree of common ownership, θ, is large. Since, the manufacturers almost collude with large θ, an additional increase in θ has a small direct effect on output. Thus, the direct effect of common ownership

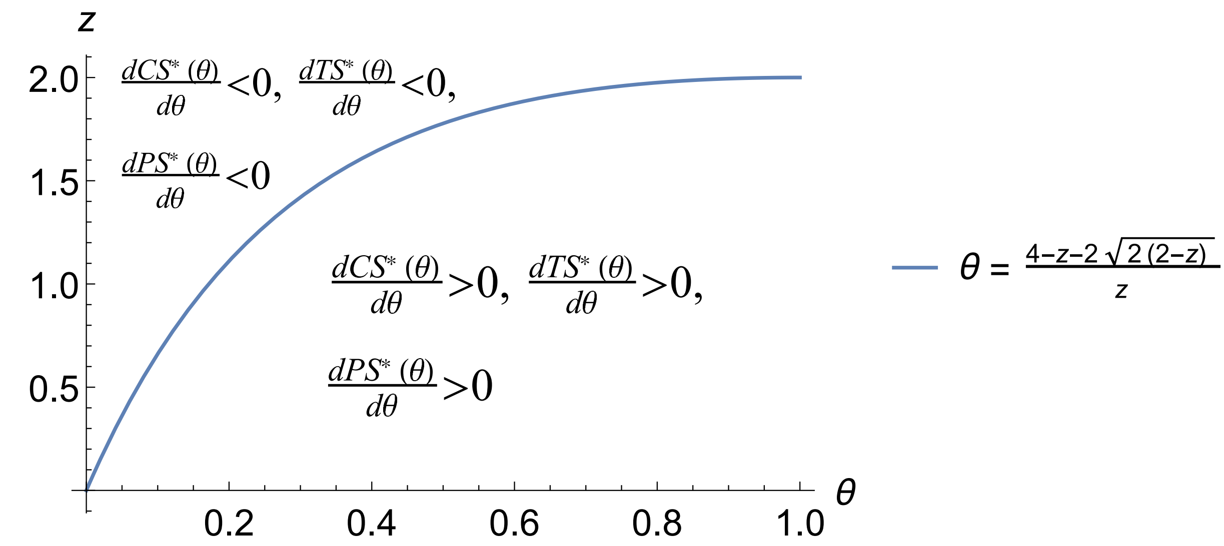

Figure 1: Effect of common ownership on consumer, producer, and total surpluses

is small. In the indirect effect, the first argument becomes large. This is because at large θ, the number of input buyers is close to one, which leads to intense price competition. Therefore, the indirect effect tends to dominate the direct effect; total output increases with the degree of common ownership when the degree of common ownership is large.

Next, we consider the case with a small degree of common ownership. The direct effect becomes large because the manufacturers face a competitive environment, and a decrease in output brings a large profit to the manufacturers. For the indirect effect, a change in input price has a small effect on its input demand. This is because each supplier deals almost exclusively with its manufacturer. Thus, even if the input price of supplier S_i is higher than the input price of supplier S_j, supplier S_i will receive some amount of input demand. Therefore, with a small degree of common ownership, the direct effect dominates the indirect effect; output decreases with the degree of common ownership.

4.3 Producer surplus and profits of manufacturer and supplier

We denote equilibrium producer surplus and profits of manufacturer and supplier as $PS^*(\theta)$, $\pi^*_{Mi}(\theta)$, and $\pi^*_{Si}(\theta)$, respectively. First, we consider the effect of the degree of common ownership on the profit of manufacturer. Differentiating $\pi^*_{Mi}(\theta)$ with respect to θ, we obtain the following first derivative:

$$\frac{d\pi^*_{Mi}(\theta)}{d\theta} = \frac{(4-z-z\theta)[4z^2(1+\theta)^2 - z(23+31\theta+9\theta^2+\theta^3)+4(9+4\theta+3\theta^2)]}{-(3-\theta)\Phi^2\Psi p'(Q)} > 0.$$

Note that, from $z < 2$ and $0 \leq \theta < 1$, the above inequality is satisfied.

Next, we show the effect of common ownership on the profit of supplier. From the first derivative of the profit of supplier, we obtain the following result.

$$\frac{d\pi^*_{Si}(\theta)}{d\theta} = \frac{2[-2z^2(1+\theta)^2 + z(13+15\theta+3\theta^2+\theta^3) - 8(3+\theta^2)]}{-(3-\theta)\Phi^2 p'(Q)} < 0,$$

where using $z < 2$ and $0 \leq \theta < 1$, we obtain the above inequality.

Finally, combining the first derivatives of profits of manufacturer and supplier, we present the effect of common ownership on producer surplus.

$$\frac{dPS^*(\theta)}{d\theta} = 2\left[\frac{d\pi^*_{Mi}(\theta)}{d\theta} + \frac{d\pi^*_{Si}(\theta)}{d\theta}\right] = \frac{2(2-z)(1-\theta^2)[z(1+\theta)^2 - 8\theta]p(Q)^2}{-(3-\theta)\Phi^2\Psi p'(Q)}.$$

Similar to Proposition 3, the sign of $dPS^*(\theta)/d\theta$ also depends on $z(1+\theta)^2 - 8\theta$ in the numerator. Summarizing the above results, we obtain the following proposition.

Proposition 4 *When the degree of common ownership increases, (i) the profit of manufacturer increases: $d\pi^*_{Mi}(\theta)/d\theta > 0$; (ii) the profit of supplier decreases: $d\pi^*_{Si}(\theta)/d\theta < 0$, and (iii) producer surplus increases if the degree of common ownership is large:*

$$\frac{dPS^*(\theta)}{d\theta} > 0 \quad if \quad \theta > \frac{4-z-2\sqrt{2(2-z)}}{z},$$

An intuition behind this result is as follows. An increase in the degree of common ownership weakens competition among manufacturers and strengthens competition among suppliers, as explained in the intuition for proposition 3. Thus, the profits of manufacturers increase and those of suppliers decrease as the degree of common ownership increases.

Using Proposition 3, we can easily explain result (iii). Since we consider a market with two supply chains, the double marginalization problem occurs. The producer surplus increases with the degree of common ownership if an increase in the degree of common ownership expands output. Thus, the condition under which producer surplus increases with θ is equivalent to that in Proposition 3.

5 Discussion

5.1 Case with a linear inverse demand and product differentiation

In the previous Section 2–4, we consider the case where the downstream manufactures produce homogenous products. In this subsection, we examine whether our main results still hold when the final products are differentiated. We analyze the case with a linear inverse demand to present our intuition behind the main results straightforwardly.

We assume that the utility function of the representative consumer is $u(q_i, q_j, m) \equiv (q_i + q_j) - (q_i^2 + 2dq_iq_j + q_j^2)/2 + m$, where m is the quantity of a numeraire good and $d \in (0, 1)$ is the measure of product substitutability. This utility function yields the following inverse demand function: $p_i = 1 - q_i - dq_j$. The consumer surplus is given by $CS = (q_i + q_j) - (q_i^2 + 2dq_iq_j + q_j^2)/2 - p_iq_i - p_jq_j$. Substituting the linear inverse demand function into $PS = \pi_{M_i} + \pi_{M_j} + \pi_{S_i} + \pi_{S_j}$ and using CS in this linear demand case in $TS = PS + CS$, we can have the producer and total surpluses.

In the second stage, substituting of the linear inverse demand function, the first-order condition $\partial V_{M_i}/\partial q_i = 0$ yields the output of downstream manufacturer as

$$q_i^L(w_i, w_j) \equiv \frac{2(1 - w_i) - d(\theta + 1)(1 - w_j)}{4 - d^2(\theta + 1)^2}, \tag{6}$$

where the superscript L represents the case with a linear inverse demand and product differentiation.

In the first stage, taking (6) into account, the upstream suppliers maximize π_{S_i} with respect to w_i. Then, we have the symmetric input price as

$$w_i^{L*} \equiv \frac{2 - d\theta - d}{4 - d\theta - d}. \tag{7}$$

Now, substituting all back, we can have the equilibrium outcomes as follows.

$$q_i^{L*} \equiv \frac{2}{t}, \quad CS^{L*} \equiv \frac{4(d+1)}{t^2}, \quad PS^{L*} \equiv \frac{4\left[6 + 2d\theta - d^2(\theta+1)^2\right]}{t^2},$$
$$TS^{L*} \equiv \frac{28 - 4d^2(\theta+1)^2 + d(8\theta+4)}{t^2}.$$

where $t \equiv (4 - d\theta - d)(d\theta + d + 2) > 0$. Now, we can analyze the effects of common ownership and product differentiation on the input price, consumer surplus, producer and total surpluses.

Input price First, differentiating w^{L*} with respect to θ and d, we have

$$\frac{dw^{L*}}{d\theta} = -\frac{2d}{(4 - d\theta - d)^2} < 0, \quad \frac{dw^{L*}}{dd} = -\frac{2(\theta+1)}{(4 - d\theta - d)^2} < 0.$$

Hence, we obtain the following proposition.

Lemma 3 *With linear inverse demand and product differentiation, input price decreases with the degree of common ownership and the degree of product substitutability.*

We find that similar to the result in Proposition 2, the increase of the degree of common ownership makes the input demand more elastic and thus reduces the input price. Here, we also find that the input price decreases as the degree of product substitutability increases. This result can be explained as follows. With common ownership, an increase of the degree of product substitutability makes the downstream manufacturers more flexible to transfer their production to the one facing lower input price because the final products become more substitutable (similar), which in turn induces the suppliers to set a lower input price. Let us consider the extreme case where the final products are independent, i.e., $d = 0$. Even with common ownership, an increase in input prices does not result in the relocation of output between the manufacturers because the manufacturers produce independent products. Thus, the suppliers have no incentive to lower the input price and keep the input price to $1/2$. However, in another extreme case where the products are perfect substitutable, i.e., $d = 1$, the input price increase of any supplier will drive its firm-specific manufacturer to transfer its production to the other manufacturer, pursuing the joint profit increase, i.e., the demand for the suppliers become more elastic, as explained in Lemma 2. As the result, the suppliers have the incentive to lower the input price to avoid the demand reduction. When $d \in (0, 1)$, as the degree of product substitutability increases, the downstream products become more similar and their input are more likely to be substitutable, leading the suppliers behave more competitively facing downstream common ownership, which decreases the input price.

Consumer and total surpluses Next, differentiating CS^{L*} and TS^{L*} with respect to θ, respectively, we obtain the following:

$$\frac{dCS^{L*}}{d\theta} = \frac{16d(d+1)(d\theta + d - 1)}{t^3}, \quad \frac{dTS^{L*}}{d\theta} = \frac{8d(d\theta + d - 1)\left[6 - d^2(\theta+1)^2 + 2d\theta\right]}{t^3}.$$

It is easy to find that the signs of the derivatives above are all dependent on $d\theta + d - 1$ in their numerators. Solving $d\theta + d - 1 > 0$ for d, we obtain the following proposition.

Proposition 5 *With linear inverse demand and product differentiation, consumer and total surpluses increase with the degree of common ownership if the degree of common ownership and the degree of product substitutability is large: $d > 1/(1 + \theta)$.*

The intuition behind this proposition is as follows. Referring to the explanations for Proposition 3, there are two effects of common ownership working on equilibrium output as shown in equation (5): the negative direct effect of common ownership for less competition and the positive effect of common ownership for the input price reduction. When the degree of common ownership is large (large θ), the indirect effect tends to dominate the direct effect, leading the output increase. In addition, as explained in Lemma 3, with common ownership, an increase of the degree of product substitutability (larger d) strengthens the positive indirect input reduction effect, leading more possibility of more output. Therefore, the consumer, producer and total surpluses increase as the degree of common ownership increases if the degree of common ownership and the degree of product substitutability are sufficiently large.

5.2 Case with linear inverse demand and n vertical supply chains

In the previous Section 2–4, we consider the case where there are only two identical vertical supply chains. Here, we extend the model to n (≥ 2) symmetric vertical supply chains, each includes a manufacturer and its firm-specific input supplier. Hence, the output of the downstream firm i ($i = 1, \ldots, n$) is q_i and we assume the inverse demand in the final good is linear: $p = 1 - Q$, where $Q = \sum_{j=1}^{n} q_j$. In addition, we assume that an institutional investor holds partial stakes in all manufacturers. We denote the degree of their holdings in manufacturer i as $\theta \in [0, 1)$. Keeping all the other settings are same with Section 2, we have the objective function of manufacturer i: $V_{Mi} = \pi_{Mi} + \theta \sum_{j \neq i} \pi_{Mj}$. Here, we define consumer, producer and total surpluses as $CS = Q^2/2$, $PS = \sum_{j=1}^{n}(\pi_{M_j} + \pi_{S_j})$, and $TS = CS + PS$, respectively.

In the second stage, the downstream manufacturers compete in quantities. Summing up the first-order conditions, i.e., $\partial V_{Mi}/\partial q_i = 1 - Q - q_i - w_i - \theta(Q - q_i) = 0$, then solving $\sum_{j=1}^{n} \partial V_{Mj}/\partial q_j = 0$ for Q, we have the aggregate output as follows.

$$Q(w_i + W_{-i}) = \frac{n - (w_i + W_{-i})}{\alpha}, \tag{8}$$

where $W_{-i} = \sum_{j \neq i} w_j$ and $\alpha = \theta(n-1) + n + 1 > 0$. Substituting the aggregate output into the first-order condition for the downstream manufacturer i, we can obtain the output of downstream manufacturer i is

$$q_i(w_i, W_{-i}) = \frac{1 - \theta - [(\theta+1)n - 2\theta]w_i + (\theta+1)W_{-i}}{(1-\theta)\alpha}. \tag{9}$$

In the first stage, the suppliers decide input prices. Substituting the output of downstream firm i in (9) into the profit of its upstream supplier and solving the first-order condition for w_i, we can get the equilibrium input price, and then equilibrium output and surpluses as follows.

$$w_i^N \equiv \frac{1-\theta}{\beta}, \quad q_i^N \equiv \frac{-2\theta+\theta n+n}{\beta\alpha}, \quad CS^N(\theta) = \frac{n^2(-2\theta+\theta n+n)^2}{2\beta^2\alpha^2},$$
$$PS^N \equiv \frac{n[\theta(n-2)+n][\theta(n^2-4)+\theta^2(n-3)(n-1)+2n+1]}{\beta^2\alpha^2},$$
$$TS^N \equiv \frac{n[\theta(n-2)+n][n^2+2\theta^2(n-3)(n-1)+\theta(n-2)(3n+4)+4n+2]}{2\beta^2\alpha^2},$$

where the superscript N represents the case with n supply chains and $\beta = \theta(n-3)+n+1 > 0$ with $1 > \theta \geq 0$ and $n \geq 2$.

Input price First, we examine the effect of θ and n on the input price. Differentiating $w_i^N(\theta)$ with respect to θ and n for the first and second derivatives, we obtain

$$\frac{dw_i^N}{d\theta} = -\frac{2(n-1)}{\beta^2} < 0, \quad \frac{dw_i^N}{dn} = -\frac{1-\theta^2}{\beta^2} < 0.$$

Hence, we obtain the following results.

Lemma 4 *Equilibrium Input price decreases with the degree of common ownership and the number of supply chain.*

Lemma 4 can be explained as follows. The increase of the degree of common ownership makes the upstream demand more elastic and thus decreases the input price as Proposition 2: $dw_i^N/d\theta < 0$. As the number of the supply chains increases, the upstream market becomes more competitive, leading smaller input price: $dw_i^N/dn < 0$.

Consumer and total surpluses Next, we analyze the effect of common ownership on the consumer and total surpluses. Differentiating q_i^N, CS^N and TS^N with respect to θ, we have

$$\frac{dq_i^N}{d\theta} = \frac{(n-1)\Omega}{\beta^2\alpha^2}, \quad \frac{dCS^N}{d\theta} = \frac{(n-1)n^2(n+\theta n-2\theta)\Omega}{\beta^3\alpha^3},$$
$$\frac{dTS^N}{d\theta} = \frac{(n-1)n\Omega\left[3\theta^2+1+(2n-4\theta)+\theta n(\theta n+n-4\theta)\right]}{\beta^3\alpha^3}.$$

where $\Omega \equiv -\left(\theta^2+2\theta+1\right)n^2+\left(5\theta^2+6\theta+1\right)n+2-6\theta^2$. Ω is a quadratic function of n with a negative coefficient of n^2. It is obvious that the sign of the above derivatives are all dependent on Ω. Hence, by solving $\Omega > 0$ for n, we can get the condition such that $dq_i^N/d\theta > 0$, $dCS^N/d\theta > 0$, and $dTS^N/d\theta > 0$ as follows.

$$2 \leq n < \frac{5\theta+1}{2(\theta+1)} + \frac{1}{2}\sqrt{\frac{\theta+9}{\theta+1}} \equiv \overline{n}^N.$$

It is easy to find that $\overline{n}^N$ is an increasing function of θ, hence the maximum value of $\overline{n}^N$ is $\overline{n}^N = 2.62$ at $\theta = 1$ and the minimum value of it is $\overline{n}^N = 2$ at $\theta = 0$. Then, we can obtain the following result.

Proposition 6 *With n supply chains and a linear inverse demand, consumer and total surpluses increase with the degree of common ownership only if the degree of common ownership is positive and the downstream market is duopoly, i.e.* $\theta > 0$ *and* $n = 2$.

The intuition of this result is as follows. As explained in Lemma 4, input price become low with large n. Then, the input price has a weak reaction to an increase in θ, meaning the positive indirect effect of common ownership on output because of the input price reduction shown in equation (5) is weak. However, the negative direct effect of common ownership on output because of less competition is strong. Hence, with large n, the total output intends to decrease. As n decreases, the relationship of two above effects of common ownership on output might reverses, leading the increase of total output. We find that the total output increases with θ only in a duopolistic market. In addition, as mentioned in Proposition 3, the negative input price reduction effect will be dominated by the positive less competition effect on output when θ is large. This also applies here since we can find that $\overline{n}^N$ is an increasing function of θ.

6 Conclusions

We consider a model of two symmetric supply chains, each composed of a manufacturer and its firm-specific input supplier, producing homogenous products. The common ownership exists in the downstream market. First, we show that the demand for inputs becomes elastic as the degree of common ownership increases. Then, we find that consumer and total surpluses may increase with the degree of common ownership. This result happens when the degree of common ownership is large. We also extend our analysis to the cases with product differentiation and n vertical supply chains.

References

Azar, J., Schmalz, M. C., and Tecu, I. (2018) Anticompetitive effects of common ownership. *Journal of Finance*, 73(4), 1513-1565.

Azar, J. and Vives, X. (2022) Revisiting the anticompetitive effects of common ownership. IESE Business School Working Paper , European Corporate Governance Institute – Finance Working Paper No. 827/2022, Available at SSRN: https://ssrn.com/abstract=3805047

Backus, M., Conlon, C., and Sinkinson, M. (2021) Common ownership in America: 1980–2017. *American Economic Journal: Microeconomics*, 13(3), 273-308.

Bresnahan, T. F. and Salop, S. C. (1986) Quantifying the competitive effects of production joint ventures. *International Journal of Industrial Organization*, 4(2), 155-175.

Blume, M. E. and Keim, D. B. (2014) The changing nature of institutional stock investing. *Critical Finance Review*, 6, 1-41.

Chen, L., Matsumura, T., and Zeng, C. (2024) Welfare consequence of common ownership in a vertically related market. *Journal of Industrial Economics*, 72(2), 996-1004.

Elhauge, E. (2016) Horizontal shareholding. *Harvard Law Review*, 129(5), 1267–1317.

Elhauge, E. (2017) How horizontal shareholding harms our economy—and why antitrust law can fix it. *Harvard Business Law Review*, 10(2), 207-261.

European Commission (2020) Common shareholding in Europe. Joint Research Centre Technical Report, EUR 30312.

Lewellen, K., and Lowry, M. (2021). Does common ownership really increase firm coordination?. Journal of Financial Economics, 141(1), 322-344.

López, Á. L., and Vives, X. (2019) Overlapping ownership, R&D spillovers, and antitrust policy. *Journal of Political Economy*, 127(5), 2394-2437.

Reynolds, R. J. and Snapp, B. R. (1986) The competitive effects of partial equity interests and joint ventures. *International Journal of Industrial Organization*, 4(2), 141-153.

Matsumura, T., Henry Wang, X., and Zeng, C. (2025) Welfare improving common ownership in successive oligopolies: The role of the input market. *Canadian Journal of Economics*, 58(1), 169-192.

Mukherjee, A., Wang, L. F., and Sun, J. (2024) Bertrand-Cournot profit reversal in a vertical structure with cross ownership. *Economics Letters*, 238, 111681.

OECD (2017) Common ownership by institutional investors and its impact on competition, Best Practice Roundtables on Competition Policy, DAF/COMP(2017)10.

Sato, S. and Matsumura, T. (2020) Free entry under common ownership. *Economics Letters*, 195, 109489.

Schwalbe, U. (2018) Common ownership and competition–The current state of the debate. *Journal of European Competition Law & Practice*, 9(9), 596-603.

Liu, Y. and Matsumura, T. (2024) Welfare effects of common ownership in an international duopoly. *Canadian Journal of Economics*, 57(2), 459-477.

Lømo, T. L. (2024) Overlapping ownership and input prices. *International Journal of Industrial Organization*, 94, 103067.

US Federal Trade Commission (2018), FTC hearing # 8: Common Ownership, Hearings on Competition and Consumer Protection in the 21st Century.

Vives, X. (2020) Common ownership, market power, and innovation. *International Journal of Industrial Organization*, 70, 102528.

Xu, L., Zhang, Y., and Matsumura, T. (2023) Competition mode and common ownership in a mixed oligopoly. *Manchester School*, 91(4), 306-319.