Common Ownership and Intertemporal Price Discrimination

Patrick Arnold[*], Marc Möller[†], and Makoto Watanabe[‡]

May, 2025

Abstract

This paper considers the effects of common ownership on markets featuring intertemporal price discrimination (e.g. airline industry). We argue that allocation-effects—the effect of common ownership on the intertemporal allocation of sales—are key to understand whether common ownership is anti-competitive and whether price-dispersion can serve as a measure of competitive conduct. Our theory identifies advance purchase markets as a setting where common ownership can have positive effects on both welfare and consumer surplus.

Disclosure statement: The authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

1 Introduction

The rise of large investment firms, such as BlackRock, has lead to increasing degrees of cross- and common-ownership in a broad variety of markets (Backus, Conlon, and Sinkinson 2021). This trend has sparked a policy debate about the anti-competitive effects of common ownership (Azar and Schmalz 2017; Posner 2021). The idea that common ownership may raise prices by undermining firms' incentives to compete is theoretically

[*]Faculty of Business and Economics, University of Basel, Switzerland
[†]Department of Economics, University of Bern, Switzerland
[‡]Kyoto Institute of Economic Research, University of Kyoto, Japan

well founded (Rotemberg 1984). However, there exists an empirical controversy about the size of the corresponding effects (Azar, Schmalz, and Tecu 2018). Much of the empirical work has focused on the airline industry, where the large number of origin-destination combinations allows for variation of common-ownership across a large number of well defined markets. In this paper, we argue that the effects of common ownership on airline ticket prices might not be representative of its effects on prices in other markets.

Our starting point is the observation that airline markets are special, in that consumers face individual demand uncertainty and firms respond by making ticket prices depend on the timing of purchase. In particular, airlines offer low prices to consumers who purchase in advance and high prices to consumers who purchase on the spot. Common ownership might have differential effects on prices in the advance-purchase market and the spot market. Determining the overall effect on the average price paid then requires an understanding of the relation between common ownership and the intertemporal allocation of sales.

In this paper, we introduce the possibility of common ownership into the model of oligopolistic advance-purchase pricing of Möller and Watanabe (2016). We show that, when firms are able to practice intertemporal price discrimination, common ownership has an anti-competitive effect in the advance-purchase market, but may reduce prices in the spot market. One might be tempted to conclude that the anti-competitive effect of common ownership is weaker in markets with intertemporal price discrimination than in markets without.

However, our main result shows that common ownership reduces the firms' incentive to offer advance-purchase discounts. An increase in common ownership thus lowers the number of consumers who purchase in advance at a low price while raising the number of consumers who purchase on the spot at a higher price. Common ownership thus has an anti-competitive effect *through its influence on the inter-temporal allocation of sales*. In particular, the price consumers pay on average is increasing in the degree of common ownership and, importantly, this increase is larger than the effect of common ownership on average price in the absence of inter-temporal price discrimination. Our theory thus shows that, generally, the anti-competitive effect of common ownership might be less pronounced than indicated by the evidence from airline ticket data.

A second contribution of our analysis is the insight that in markets where consumers face preference uncertainty, such as the airline industry, common ownership has positive welfare effects that can be strong enough to compensate consumers for its anti-competitive effect on prices. By mitigating firms' incentive to sell in advance, when consumers' preferences are uncertain, common ownership improves the match between consumer preferences and product characteristics. While we find that too much common-ownership is always a bad thing for consumers, we show that, in the limit, where consumers have *no* information about their preferences in the advance purchase market, consumer surplus is monotonically increasing in common ownership. Certainly, this strong result arises due to the specific assumptions of our model, but it indicates that in markets with intertemporal price discrimination, the allocational effects of common ownership should not be neglected.

Finally, our model might help to shed light on a related, by now long-lasting empirical controversy about the effects of competition on price dispersion. While the seminal article by Borenstein and Rose (1994) finds that competition increases price dispersion in the US airline industry, Gerardi and Shapiro (2009) argues that, in fact, price dispersion is decreasing with competition. While a general analysis of oligopolistic competition with intertemporal price discrimination is still missing, introducing common ownership into the duopoly models of Möller and Watanabe (2016) or Ceschi and Möller (2023) might be a first step towards a model of dynamic pricing featuring varying degrees of competition.

Related literature. The seminal analysis of partial equity interests in markets with oligopolistic competition is due to Rotemberg (1984) and Reynolds and Snapp (1986) who assume that firms compete in quantities. Bresnahan and Salop (1986) and Farrell and Shapiro (1990) extend their analysis by allowing for asymmetric firms. More related are recent contributions that share our assumption that firms compete in price, such as Shelegia and Spiegel (2012), Bayona, López, and Manganelli (2022), and Lømo (2024). A detailed overview of the theory of common ownership can be found in Schmalz (2021). We differ from the existing literature by considering common ownership in a setting with intertemporal price discrimination, thereby bridging the gap to the empirical studies of common ownership in airline markets.

The seminal empirical investigation of the anti-competitive effects of common ownership is due to Azar, Schmalz, and Tecu (2018). They report that common ownership increases average prices in the US airline market by combining quarterly ticket-fare data from the publicly available US Department of Transportation's DB1B database, with ownership data based on the

Thomson-Reuters Ownership data-set originating from 13F filings. Backus, Conlon, and Sinkinson (2021) argue that the recent rise of common ownership is driven by investor concentration. Azar, Schmalz, and Tecu (2018) estimate that common ownership increases average prices in US airline origin-destination markets by 3-7% using a fixed-effects panel regression. They find larger effects in the range of 10-12 % using a difference-in-differences analysis based on BlackRock's acquisition of Barclays Global Investors in 2009.

Kennedy et al. (2017) and Dennis, Gerardi, and Schenone (2022) contribute to the empirical controversy about the anti-competitive effects of common ownership by raising endogeneity concerns regarding the use of an ownership-adjusted Herfindhal-Hirschmann index as a measure of market-concentration.

While most of the evidence for the anti-competitive effects of common ownership stems from airline markets, a notable exception is Azar, Raina, and Schmalz (2022) who document price increases due to common ownership in the US banking industry.

2 Model

We introduce symmetric common ownership into the duopoly model of intertemporal price-discrimination by Möller and Watanabe (2016). More specifically, we assume that the manager of firm $i \in \{A, B\}$ maximizes the weighted sum of the two firms' profits with firm i receiving a weight normalized to one and firm j receiving a smaller weight $\lambda \in (0, 1)$. We will interpret an increase in the parameter λ as an increase in (symmetric) common ownership. Our objective is to understand the effect of common ownership on pricing and the intertemporal allocation of sales and to derive implications for welfare and consumer surplus.

To be more specific, consider a market where two firms each sell one differentiated product $i \in \{A, B\}$ during two periods; an advance purchase period 1 and a consumption period 2. Firms can commit to a price schedule $(p_{1,i}, p_{2,i}) \in \mathbb{R}^2_+$ where $p_{1,i}$ and $p_{2,i}$ denote the prices of product i in periods 1 and 2, respectively. The unit cost of production is assumed to be constant and identical across products. For simplicity, we normalize unit costs to zero and abstract from discounting.

There is a continuum of consumers with mass 1. Consumers have unit demands. A consumer of type $\sigma \in [0, 1]$ obtains the value $s + \frac{t}{2}\sigma$ from consuming his preferred product and $s - \frac{t}{2}\sigma$ from consuming his non-preferred product. The parameter $s > 0$ denotes a consumer's average consumption value and is assumed to be identical across consumers. The parameter $t > 0$ measures the general degree of product differentiation. Consumers differ only in their choosiness, σ, which constitutes their private information. In the eyes of more choosy consumers, differences in the products' characteristics weigh more heavily. We assume σ is distributed uniformly in $[0, 1]$ which allows us to solve the model explicitly. Further, to keep the model symmetric, we assume that, for any σ, the mass of consumers whose preferred product is A is the same as the mass of consumers whose preferred product is B.

In the consumption period, consumers know their preferred product, but in the advance purchase period they face uncertainty about their individual preferences. More specifically, in period 1, each consumer receives a (private) signal $S \in \{A, B\}$ about the identity of his preferred product. Following Möller and Watanabe (2016), we denote the product indicated by signal S as the consumer's favorite product to distinguish it from his (potentially different) preferred product. The signal's precision, that is, the probability with which the consumer's favorite product turns out to be his preferred product, is identical across consumers and given by $\gamma \in (\frac{1}{2}, 1)$. Note that for $\gamma \to \frac{1}{2}$ the consumers' signal is completely uninformative, whereas for $\gamma \to 1$ consumer face no uncertainty.

We assume that each consumer can purchase at most one product. This rules out the possibility that consumers purchase both products in advance or switch product after purchasing the wrong product. Further, we choose the consumers' outside option to make those consumers who purchase in advance find it optimal to consume even when they turn out to have purchased their non-preferred product.

2.1 Benchmark: Uniform pricing

Consider as a benchmark the situation where firms cannot price discriminate inter-temporally, i.e. where we require that $p_{1,i} = p_{2,i} = p_i$ for $i \in \{A, B\}$.

To determine a uniform-pricing equilibrium $p_A = p_B = p^u$, first note that in the absence of a discount for purchasing in advance, all consumers postpone their purchase until period 2. Suppose that firm B charges the equilibrium price p^u and consider a deviation of the manager of firm A to a lower price $p_A < p^u$. The consumer-type who is indifferent between his preferred product and the cheaper product is given by

$$\bar{\sigma}^u = \frac{p^u - p_A}{t}. \tag{1}$$

In an equilibrium, p_A has to maximize the manager's objective given by:

$$V^u = p_A(\frac{1}{2} + \frac{p^u - p_A}{t}) + \lambda p^u(\frac{1}{2} - \frac{p^u - p_A}{t}). \tag{2}$$

Substituting $p_A = p^u$ into the corresponding first-order condition gives

$$p_2^u = \frac{t}{2(1-\lambda)}. \tag{3}$$

Note that we have derived this equilibrium under the implicit assumption that the market is fully covered. As standard in models of differentiated price-competition, this assumption translates into a lower bound on the consumers' (average) consumption value s, or an upper bound on the level of product-differentiation t, i.e. existence of the above equilibrium requires that

$$\frac{s}{t} \geq \frac{1}{2(1-\lambda)}. \tag{4}$$

Note that this restriction becomes exceedingly demanding for higher levels of λ, which is why our analysis will typically focus on smaller to modest values of common ownership.

3 Equilibrium

In this section we derive the unique candidate for a symmetric price discrimination equilibrium $(p_{1,A}, p_{2,A}) = (p_{1,B}, p_{2,B}) = (p_1^*, p_2^*)$. Due to the continuity of the managers' objective functions with respect to the common ownership parameter λ, existence of such an equilibrium follows from Möller and Watanabe (2016) for all $\lambda \leq \bar{\lambda} \in (0, 1)$.

When the market is fully covered in equilibrium (sufficient conditions will be derived below), an advance purchase discount $\Delta p^* = p_2^* - p_1^* > 0$ induces an intertemporal segmentation of consumers. Consumers with low degrees of choosiness buy their favorite product in period 1, whereas consumers with high choosiness wait until period 2 to purchase their preferred product.

More specifically, suppose that firm B adopts the equilibrium price schedule (p_1^*, p_2^*) and consider a deviation by the manager of firm A to a price schedule $(p_{1,A}, p_{2,A}) \neq (p_1^*, p_2^*)$. For a consumer whose favorite is $S = A$, purchasing A in advance gives (expected) utility

$$U(\sigma, A \mid 1, A) = s + \gamma \frac{t}{2}\sigma - (1-\gamma)\frac{t}{2}\sigma - p_{1,A}. \tag{5}$$

Any consumer who postpones his purchase must condition his product choice in period 2 on the identity of his preferred product. Otherwise, he could have purchased the product he buys in period 2 already in period 1, at a lower price. Waiting until period 2, therefore, gives the (expected) utility

$$U(\sigma, A \mid 2) = s + \frac{t}{2}\sigma - \gamma p_{2,A} - (1-\gamma)p_2^*. \tag{6}$$

Waiting is preferable if and only if the (expected) gain in consumption value exceeds the (expected) price premium

$$\sigma > \sigma_{W,A} \equiv \frac{(1-\gamma)p_2^* + \gamma p_{2,A} - p_{1,A}}{t(1-\gamma)}. \tag{7}$$

Analogously, for a consumer whose favorite product is $S = B$ waiting is preferable if and only if

$$\sigma > \sigma_{W,B} \equiv \frac{\gamma p_2^* + (1-\gamma)p_{2,A} - p_1^*}{t(1-\gamma)}. \tag{8}$$

Finally, if $p_{1,A} > p_1^*$, an advance customer with $S = A$ prefers the more expensive but favored product A over the less expensive non-favored product B if and only if

$$\sigma > \bar{\sigma} \equiv \frac{p_{1,A} - p_1^*}{t(2\gamma - 1)}. \tag{9}$$

For (p_1^*, p_2^*) to be an equilibrium, $(p_{1,A}, p_{2,A}) = (p_1^*, p_2^*)$ has to maximize the objective of firm A's manager given by

$$\begin{aligned} V_A &= \frac{1}{2}p_{1,A}\left(\sigma_{W,A} - \bar{\sigma}\right) + \frac{1}{2}p_{2,A}\left[\gamma(1-\sigma_{W,A}) + (1-\gamma)(1-\sigma_{W,B})\right] \\ &+ \lambda\left\{\frac{1}{2}p_1^*\left(\sigma_{W,B} + \bar{\sigma}\right) + \frac{1}{2}p_2^*\left[\gamma(1-\sigma_{W,B}) + (1-\gamma)(1-\sigma_{W,A})\right]\right\}. \end{aligned} \tag{10}$$

Substitution of $(p_{1,A}, p_{2,A}) = (p_1^*, p_2^*)$ into the corresponding first order conditions leads to a system of linear equations whose unique solution constitutes the equilibrium price-schedule:

$$p_1^* = \frac{t(2\gamma - 1)[1 + \gamma + \lambda(1-\gamma)]}{\Omega(\lambda,\gamma)}, \tag{11}$$

$$p_2^* = \frac{t(3\gamma - 1 - \lambda(1-\gamma))}{\Omega(\lambda,\gamma)}, \tag{12}$$

where we have abbreviated notation by defining

$$\Omega(\lambda,\gamma) \equiv (4\gamma^2 + 1)(\lambda^2 - 1) - (5\lambda^2 + 2\lambda - 7)\gamma. \tag{13}$$

Following our analysis of the uniform-pricing benchmark, our derivation of the price-discrimination equilibrium (11) and (12) has assumed the market to be fully covered which requires that

$$s - p_1^* \geq 0 \Leftrightarrow \frac{s}{t} \geq \frac{(2\gamma - 1)[1 + \gamma + \lambda(1-\gamma)]}{\Omega(\lambda,\gamma)}. \tag{14}$$

Furthermore, our analysis has assumed that all consumer-types $\sigma \leq \sigma_W^*$, who purchase in advance, derive a positive consumption value even when they fail to have purchased their preferred product. To guarantee that this is indeed the case we require that

$$s - \frac{t}{2}\sigma_W^* = s - \frac{t}{2}\frac{p_2^* - p_1^*}{t(1-\gamma)} \geq 0 \Leftrightarrow \frac{s}{t} \geq \frac{\gamma(1-\lambda)}{\Omega(\lambda,\gamma)}. \tag{15}$$

In summary, we have thus shown the following:

Proposition 1. *Suppose that* $\lambda < \bar{\lambda}$ *and*

$$\frac{s}{t} \geq \max\left\{\frac{(2\gamma - 1)[1 + \gamma + \lambda(1-\gamma)]}{\Omega(\lambda,\gamma)}, \frac{\gamma(1-\lambda)}{\Omega(\lambda,\gamma)}\right\}. \tag{16}$$

Then the prices (p_1^*, p_2^*) *in (11) and (12) constitute the unique equilibrium. In this equilibrium, firms offer advance purchase discounts*

$$\Delta p^* = p_2^* - p_1^* = \frac{2t\gamma(1-\gamma)(1-\lambda)}{\Omega(\lambda,\gamma)} > 0, \tag{17}$$

and a fraction

$$\sigma_W^* = \frac{\Delta p^*}{t(1-\gamma)} = \frac{2\gamma(1-\lambda)}{\Omega(\lambda,\gamma)} \in (0,1) \tag{18}$$

of consumers is induced to purchase in advance.

Note that condition (16) becomes relaxed when γ or λ are reduced. That is, if an equilibrium exists then it continues to exist when common ownership is reduced or when individual demand uncertainty is increased.

4 The anti-competitive effect

In this section we consider the effect that common ownership has on pricing. We will decompose this effect into a level-effect and an allocation-effect and show that the overall effect of common ownership is anti-competitive, in that it leads to an increase in the average transacted price. We then compare with the uniform-pricing benchmark to say whether and by how much the anti-competitive effect of common ownership is enhanced by firms' ability to price-discriminate inter-temporally. The results in this section help to relate empirical studies of common ownership for industries with price-discrimination (e.g. airlines) with those for industries where pricing is uniform (e.g. banking).

Our next result describes how an increase in common ownership affects the price-discrimination equilibrium (p_1^*, p_2^*) characterized by Proposition 1:

Proposition 2. *Common ownership has an anti-competitive effect, i.e. the average transacted price*

$$\bar{p}^* = \sigma_W^* p_1^* + (1 - \sigma_W^*) p_2^* \tag{19}$$

increases with λ. Common ownership acts through two channels:

1. *Level-Effect: An increase in λ raises the advance purchase price p_1^*. It also raises the regular price p_2^* unless preference uncertainty is strong and λ is small.*

2. *Allocation-Effect: An increase in λ reduces firms' advance purchase discounts Δp^* and thus decreases the number of consumers σ_W^* who purchase at a discount.*

Proposition 2 shows that, in the presence of intertemporal price discrimination, the anti-competitive effect of common ownership can be decomposed into a level-effect and an allocation-effect. To see why this is the case, write the average transacted price $\bar{p}^*$ as the difference between the regular price and the aggregate discount, $\bar{p}^* = p_2^* - \Delta p^* \sigma_W^*$. It then follows that

$$\frac{d\bar{p}^*}{d\lambda} = \underbrace{\sigma_W^* \frac{dp_1^*}{d\lambda} + (1-\sigma_W^*) \frac{dp_2^*}{d\lambda}}_{\textit{level effect (+/-)}} \quad \underbrace{-\Delta p^* \frac{d\sigma_W^*}{d\lambda}}_{\textit{allocation effect (+)}} \quad . \tag{20}$$

From Proposition 2 we know that an increase in common ownership raises the advance purchase price p_1^*, but the effect on the regular price p_2^* is ambiguous. Proposition 2 shows that there exists an additional, allocational effect, that is positive and, when taken into account, makes the overall effect on the average transacted price anti-competitive.

In markets with intertemporal price discrimination, such as the airline industry, an important part of the increase in average transacted price in response to common ownership is thus due to a change in the timing of consumer purchases. By mitigating competition, common ownership induces firms to compete for advance customers less aggressively resulting in fewer customers who claim a discount.

The relevance of this allocational effect is emphasized by the following corollary. The corollary identifies conditions under which an omission of allocational effects—for instance due to a focus on posted rather than transacted prices—would avert common ownership from being identified as anti-competitive:

Corollary 1. *Omission of allocational effects, leads to an underestimation of the anti-competitive effect of common ownership. In particular, the level-effect alone is negative if consumers are sufficiently uninformed in the advance market, i.e.*

$$\lim_{\gamma \to \frac{1}{2}} \left[\sigma_W^* \frac{dp_1^*}{d\lambda} + (1-\sigma_W^*) \frac{dp_2^*}{d\lambda} \right] < 0 \quad \textit{for all} \quad \lambda. \tag{21}$$

Moreover, for small degrees of common ownership, the level effect is negative even off the limit, when consumers are considerably well informed, i.e.

$$\lim_{\lambda \to 0} \left[\sigma_W^* \frac{dp_1^*}{d\lambda} + (1-\sigma_W^*) \frac{dp_2^*}{d\lambda} \right] < 0 \Leftrightarrow \gamma < \bar{\gamma} \quad \textit{for some} \quad \bar{\gamma} \in (\frac{1}{2}, 1). \tag{22}$$

Corollary 1 highlights the importance of using *transacted* prices rather than *posted* prices when estimating the price-effects of common ownership.

By picking up only the level-effect, empirical studies that use posted prices will underestimate the anti-competitive effect of common ownership, and, as indicated by the corollary, might even conclude that common ownership leads to lower prices “on average”.

The decomposition of price effects into a level effect and an allocational effect in Proposition 2 also suggests that, in the presence of intertemporal price discrimination, common ownership might not be “anti-competitive” at all. The reasons is that, due to the allocational effect, common ownership induces a better match between consumer preferences and product characteristics. By inducing more consumers to postpone their purchases until their preference uncertainty has been resolved, common ownership has a positive effect on welfare. In fact, since in our model quantity effects are absent, an immediate implication of Proposition 2 is that due to the reduction in the fraction of advance sales σ^*_W, welfare is monotonically increasing in the common ownership parameter λ.[1] From the consumers' perspective, we thus have to account for the improvement in consumption value to decide whether common ownership is indeed anti-competitive. We turn to this issue in the following section.

5 Consumer surplus

Because in our setting, common ownership not only affects prices but also the intertemporal allocation of sales, its consequences for consumer surplus must not necessarily be anti-competitive. By reducing firms' incentives to sell in advance, common ownership induces a larger fraction of consumers to postpone their purchase until their individual preferences are known. In this way, common ownership benefits consumers by improving the matching of consumers with their preferred products.

Turning attention to consumer surplus, it should be clear that common ownership cannot be beneficial as long as it raises prices both in the advance purchase and the spot market. However, Proposition 2 has shown that an

1. This result extends the insight of Möller and Watanabe (2016) that welfare in a duopoly without common ownership ($\lambda = 0$) is lower than in the monopoly benchmark ($\lambda = 1$) where both products are offered by the same supplier to settings with intermediate degrees of common ownership $\lambda \in (0, 1)$. Due to the absence of quantity-effects, a full welfare analysis is beyond the scope of our model but it serves to highlight one particular way in which common ownership can be welfare improving.

increase in common ownership might lead to a reduction in spot prices. More specifically, common ownership will reduce prices in the spot market when demand uncertainty is sufficiently strong. Is it possible that common ownership increases consumer surplus, in spite of its anti-competitive effect on the average transacted price? In other words, can the improved matching between consumers and products outweigh the adverse effect of higher prices paid on average?

To shed light on this issue consider aggregate consumer surplus:

$$\begin{aligned} CS^* &= \int_0^{\sigma_W^*} (s + \gamma \frac{t}{2}\sigma - (1-\gamma)\frac{t}{2}\sigma - p_1^*) d\sigma + \int_{\sigma_W^*}^1 (s + \frac{t}{2}\sigma - p_2^*) d\sigma \\ &= s + \frac{t}{4} - \bar{p}^* - (1-\gamma)\frac{t}{2}(\sigma_W^*)^2. \end{aligned} \tag{23}$$

The change in consumer surplus in response to an increase in common ownership is thus given by

$$\frac{dCS^*}{d\lambda} = -\frac{d\bar{p}}{d\lambda} - (1-\gamma)t\sigma_W^* \frac{d\sigma_W^*}{d\lambda} \tag{24}$$

i.e. it combines the negative effect of an increase in the average transacted price with the positive effect of a reduction in uninformed advance purchases. Note that a reduction in advance purchases is more beneficial when consumers are less informed. In fact, in the limit, where consumers are completely uninformed in the advance purchase market, we find that

$$\lim_{\gamma \to \frac{1}{2}} \frac{dCS^*}{d\lambda} = \frac{(1+\lambda)t}{(3+\lambda)^3} > 0. \tag{25}$$

To emphasize that for the existence of a price discrimination equilibrium we have required that $\lambda < \bar{\lambda}$ (Proposition 1) we state this result as follows:

Proposition 3. *Small degrees of common ownership increase consumer surplus if individual demand uncertainty is sufficiently strong, i.e. there exists a $\gamma^{CS} \in (\frac{1}{2}, 1)$ such that for all $\gamma < \gamma^{CS}$,*

$$\frac{dCS^*}{d\lambda} > 0 \quad \textit{for all} \quad \lambda < \bar{\lambda}. \tag{26}$$

The intuition behind Proposition 3 is straight forward and makes us confident to claim that the result extends beyond the simple case of a uniform distribution of consumer-types. First, note that from Proposition 2 we know that, when preference uncertainty is strong, small degrees of common ownership will decrease the price p_2^* consumers have to pay in the spot-market. Second, note that in the limit $\gamma \to \frac{1}{2}$ consumers are completely uninformed in the advance-market and therefore consider the firms' products as *homogeneous products*. As a consequence, the price in the advance market converges to marginal cost and thus becomes independent of the level of common ownership. Hence, in the limit, the only effect of common ownership is a reduction in spot prices, and hence consumers must be better off. Intuitively, common ownership reduces firms' incentives to sell in advance, and given the optimality of marginal-cost pricing in the advance market, the only way to achieve this, is to lower their prices in the spot market.

6 Price-dispersion

There exists a long-standing debate about the effect of competition on a firm's ability to price-discriminate. From a policy perspective, the interest is driven by the idea that, if a monotonous relation between these variables exists, price-dispersion—or the absence of it—might serve as an indicator of an industry's competitive conduct.

A simple argument in favor of a negative relation between competition and price dispersion is that perfect competition leads to marginal cost pricing, and hence to the elimination of price-differences (Varian 1989). In contrast, Holmes (1989) argues for a positive relation using a model of third-degree price discrimination in which firms maintain high prices to loyal consumers while competition reduces prices charged to non-loyal consumers. In this section, we show that in our model of second-degree price discrimination, the effect of common ownership on price dispersion can be decomposed into a negative level-effect and a positive-allocation effect. We argue that, as a consequence of the interplay of these two effects, the total effect of competition on price dispersion might be ambiguous.

Our analysis sheds light on the relation between competition and price dispersion because, in spite of our model's focus on a duopoly, common ownership varies the intensity with which the two firms compete. Due to the symmetry of our model, price dispersion arises solely from intertemporal price discrimination *within* firms. To analyze the effect of common ownership on price dispersion, we employ the corresponding Gini coefficient:

$$G^* = \frac{\Delta p^*}{\bar{p}^*}\sigma_W^*(1-\sigma_W^*). \tag{27}$$

Intuitively, aggregate price dispersion is high when there are large price differences across periods, relative to the average transacted price, and there exists a rather "balanced" intertemporal allocation of consumers. Similar to our analysis in Section 4, we can decompose the effect of common ownership on price dispersion into a level-effect and an allocation effect:

$$\frac{dG^*}{d\lambda} = \underbrace{\sigma_W^*(1-\sigma_W^*)\frac{d}{d\lambda}\left[\frac{\Delta p^*}{\bar{p}^*}\right]}_{\textit{level effect (-)}} + \underbrace{\frac{\Delta p^*}{\bar{p}^*}\frac{d}{d\lambda}\left[\sigma_W^*(1-\sigma_W^*)\right]}_{\textit{allocation effect (+)}}. \tag{28}$$

The level effect is negative, because, as shown by Proposition 2, common ownership leads to a decrease in advance purchase discounts Δp^* and an increase in the average transacted price $\bar{p}^*$. Hence, the relative price difference between two consumers purchasing at different moments in time, measured by the *relative discount* $\frac{\Delta p^*}{\bar{p}^*}$, becomes reduced.

Further note that the sign of the allocation effect depends on whether advance purchases are more frequent or less frequent than purchases in the spot market. In particular, because an increase in common ownership leads to a reduction in the fraction of advance purchases σ_W^* (Proposition 2), the allocation effect is positive if and only if $\sigma_W^* > \frac{1}{2}$. Möller and Watanabe (2016) have shown that in a duopoly without common ownership, i.e. for $\lambda = 0$, the fraction of advance sales σ_W^* is larger than the monopoly benchmark σ_W^M. We show in the proof of Proposition 4 that this insight extends to arbitrary degrees of common ownership. Given that, for a uniform distribution of consumers types, $\sigma_W^M = \frac{1}{2}$, the allocation effect is therefore positive.

In summary common ownership thus has a negative and a positive effect on price dispersion. The negative effect occurs via a reduction in the size of relative price differences between advance-customers and regular-customers (level-effect). The positive effect occurs via a more balanced allocation of consumers across the two groups (allocation-effect). It turns out that for a uniform distribution of consumer types, the level effect dominates the allocation effect, i.e. in the Appendix we prove the following:

Proposition 4. *An increase in common ownership will lead to a reduction in price dispersion, i.e.*

$$\frac{dG^*}{d\lambda} < 0. \tag{29}$$

Common ownership affects price-dispersion through two channels:

- *Level-Effect: An increase in* λ *reduces relative price differences* $\frac{\Delta p^*}{\bar{p}^*}$ *between customers purchasing at differing prices.*
- *Allocation-Effect: An increase in common ownership raises the number of consumers* $\sigma_W^*(1 - \sigma_W^*)$ *who purchase at differing prices.*

While Proposition 4 shows that, for a uniform distribution of consumer types, price dispersion correlates positively with competition, we see its main contribution in highlighting the fact that the effect of competition on price dispersion might be ambiguous. In relation to Holmes (1989), where the consumers' distribution between loyal and non-loyal types is exogenous, our theory indicates that accounting for the effect of competition on the endogenously determined allocation of consumers might be key in determining the overall direction of the effect. The potential ambiguity of the relation between common ownership and price dispersion suggests a skeptical view on the potential of price dispersion to serve as a measure of an industry's competitive conduct. This view is supported by the rather inconclusive results of an empirical literature on airline pricing. While the finding of Gaggero and Piga (2011), that flights on more competitive routes exhibit a *smaller* degree of inter-temporal price dispersion, is in line with the negative relation between competition and price dispersion documented by Gerardi and Shapiro (2009), both studies contrast with the positive relation in Borenstein and Rose (1994) and Stavins (2001), or the inverse U-shaped relation in Dai, Liu, and Serfes (2014). Admittedly, common ownership and market concentration are different, but they might have a similar impact on firms' competitive conduct. Our theory thus suggests that, in line with these empirical findings, there might not exist a clear relation between competition and price dispersion.

7 Conclusion

This article is motivated by an empirical literature estimating the anti-competitive effects of common ownership with data from the airline industry.

Our model features firms that engage in intertemporal price-discrimination, a practice that is ubiquitous in airline-ticket pricing. Our model shows that, common ownership has anti-competitive effects but that due to the presence of intertemporal price-discrimination these effects are different than in markets where pricing is uniform.

Appendix

Proof Proposition 2. Comparative statics - p_1^* The effect of common ownership on the advance purchase price p_1^* is

$$\frac{dp_1^*}{d\lambda} = \frac{2t\left(\gamma - \frac{1}{2}\right)\left[4(\lambda-1)^2\gamma^3 - \left(9 - 2\lambda + 9\lambda^2\right)\gamma^2 + \left(10 + 8\lambda + 6\lambda^2\right)\gamma - (\lambda+1)^2\right]}{\Omega^2} > 0.$$

The sign is defined by the squared bracket in the numerator, which we label as $A(\lambda, \gamma)$. The derivative

$$\frac{d^3 A}{d\lambda^2 d\gamma} = 12(1-\gamma)(1-2\gamma) < 0, \qquad (30)$$

implies that

$$\frac{d^2 A}{d\lambda^2} = 12\gamma - 2 - 18\gamma^2 + 8\gamma^3 > \frac{d^2 A}{d\lambda^2}|_{\gamma=1} = 0. \qquad (31)$$

Hence, we know that

$$\begin{aligned} \frac{dA}{d\lambda} &= 8\gamma - 2 + (12\gamma - 2)\lambda - (18\lambda - 2)\gamma^2 - 8(1-\lambda)\gamma^3 > \frac{dA}{d\lambda}|_{\lambda=0} \quad (32) \\ &= (1-\gamma)(8\gamma^2 + 6\gamma - 2) > 0. \end{aligned}$$

Hence,

$$A > A|_{\lambda=0} = 4\gamma^3 - 9\gamma^2 + 10\gamma - 1 > 4\gamma^3 + \gamma - 1 = (2\gamma - 1)(2\gamma^2 + \gamma + 1) > 0. (33)$$

Comparative statics - p_2^* The effect of common ownership on the regular price p_2^* is

$$\frac{dp_2^*}{d\lambda} = \frac{t\left[-\left(4 + 24\lambda + 4\lambda^2\right)\gamma^3 + \left(17 + 38\lambda + 9\lambda^2\right)\gamma^2 - \left(10 + 16\lambda + 6\lambda^2\right)\gamma + (\lambda+1)^2\right]}{\Omega^2} \qquad (34)$$

The sign is defined by the squared bracket in the numerator, which we label $B(\lambda, \gamma)$. The derivative

$$\frac{dB}{d\lambda} = 2(4\gamma - 1)(1-\gamma)[3\gamma - 1 - \lambda(1-\gamma)] > 0, \tag{35}$$

implies that

$$B > B|_{\lambda=0} = -4\gamma^3 + 17\gamma^2 - 10\gamma + 1. \tag{36}$$

Hence, if $B|_{\lambda=0} > 0$ then $B > 0$ for all λ. Evaluating $B|_{\lambda=0}$ at $\gamma = \frac{1}{2}$ gives $-\frac{1}{4}$ and the derivative

$$\frac{dB|_{\lambda=0}}{d\gamma} = 2(3\gamma - 1)(5 - 2\gamma) > 0, \tag{37}$$

implies that $B|_{\lambda=0} < 0$ if and only if $\gamma < \bar{\gamma}$ for some $\bar{\gamma} \in (\frac{1}{2}, 1)$. Since

$$B|_{\lambda=1} = 4(2\gamma - 1)(-4\gamma^2 + 6\gamma - 1) > 0, \tag{38}$$

$B > 0$ for $\gamma < \bar{\gamma}$ if and only if $\lambda > \bar{\lambda}$, where $\bar{\lambda} \in (0, 1)$.

Comparative statics - Δp^* The effect of common ownership on the advance purchase discount $\frac{d\Delta p^*}{d\lambda}$ is

$$\frac{d\Delta p^*}{d\lambda} = -\frac{8t\left(\gamma - \frac{1}{4}\right)(\lambda - 1)^2(\gamma - 1)^2\gamma}{\Omega^2} < 0. \tag{39}$$

Comparative statics - σ_W^* The effect of common ownership on the cutoff $\frac{d\sigma_W^*}{d\lambda}$ is

$$\frac{d\sigma_W^*}{d\lambda} = \frac{\frac{d\Delta p^*}{d\lambda}}{t(1-\gamma)} < 0. \tag{40}$$

Comparative statics - $\bar{p}^*$ The effect on the average price $\bar{p}^*$ is

$$\begin{aligned} \frac{d\bar{p}^*}{d\lambda} &= \frac{dp_2^*}{d\lambda} - \frac{2\Delta p^*}{t(1-\gamma)}\frac{d\Delta p^*}{d\lambda} \\ &= \frac{dp_2^*}{d\lambda} - \frac{dp_1^*}{d\lambda} - \frac{2\Delta p^*}{t(1-\gamma)}\frac{d\Delta p^*}{d\lambda} + \frac{dp_1^*}{d\lambda} \\ &= \underbrace{[1 - 2\sigma_W^*]}_{<0}\underbrace{\frac{d\Delta p^*}{d\lambda}}_{<0} + \underbrace{\frac{dp_1^*}{d\lambda}}_{>0} > 0, \end{aligned} \tag{41}$$

Using $p_2^* = p_1^* + t(1-\gamma)\sigma_W^*$ in the first-order conditions we get

$$0 = t\sigma_W^*(1+\gamma) - p_1^*(1-\lambda) - \frac{p_1^*(1-\lambda)}{2\gamma-1} + \lambda t(1-\gamma)\sigma_W^* \tag{42}$$

$$\begin{aligned} 0 = & \frac{\gamma p_1^*}{1-\gamma} + \lambda p_1^* + t - t\sigma_W^* - \frac{\gamma^2 p_1^*}{1-\gamma} - \frac{\gamma^2 t(1-\gamma)\sigma_W^*}{1-\gamma} \\ & - (1-\gamma)p_1^* + t(1-\gamma)^2\sigma_W^* - 2\lambda\gamma p_1^* - 2\lambda\gamma t(1-\gamma)\sigma_W^* \end{aligned} \tag{43}$$

Solving (42) for p_1^* and substituting into (43) gives a condition on σ_W^* that has to be satisfied in any price-discrimination equilibrium:

$$\sigma_W^* = \frac{1}{2}\left[\frac{4\gamma}{4\gamma - C}\right] \tag{44}$$

where $C(\lambda,\gamma) \equiv (4\lambda+4)\,\gamma^2 + (-5\lambda-3)\,\gamma + \lambda + 1$. The derivative

$$\frac{dC}{d\lambda} = (1-2\gamma)^2 - \gamma < 0, \tag{45}$$

implies that

$$C > C|_{\lambda=1} = -8(\gamma-\gamma^2) + 2 > 0, \tag{46}$$

and

$$C < C|_{\lambda=0} = 4\gamma^2 - 3\gamma + 1 > 2\gamma \Leftrightarrow (4\gamma-1)(1-\gamma) > 0. \tag{47}$$

Hence, $\sigma_W^* \in (\frac{1}{2}, 1)$ which implies $\frac{d\bar{p}^*}{d\lambda} > 0$. □

Proof of Corollary 1. In the limit, where consumers are completely uninformed, products become homogeneous in the advance market and advance purchase price converges to marginal costs, i.e. $\lim_{\gamma\to\frac{1}{2}} p_1^* = 0$. Hence, $\lim_{\gamma\to\frac{1}{2}} \frac{dp_1^*}{d\lambda} = 0$ independently of λ and

$$\lim_{\gamma\to\frac{1}{2}}\left[\sigma_W^*\frac{dp_1^*}{d\lambda} + (1-\sigma_W^*)\frac{dp_2^*}{d\lambda}\right] = (1-\sigma_W^*)\frac{dp_2^*}{d\lambda} = -\frac{(1+\lambda)t}{(3+\lambda)^3} < 0. \tag{48}$$

Next, consider the limit where common ownership vanishes. In this limit, the level effect is

$$\lim_{\lambda\to 0}\left[\sigma_W^*\frac{dp_1^*}{d\lambda} + (1-\sigma_W^*)\frac{dp_2^*}{d\lambda}\right] = t\frac{(-32\gamma^5 + 132\gamma^4 - 187\gamma^3 + 95\gamma^2 - 17\gamma + 1)}{(4\gamma^2 - 7\gamma + 1)^3}.$$

Differentiating this expression with respect to γ yields $t\frac{H(\gamma)}{(4\gamma^2-7\gamma+1)^4}$ where

$$H(\gamma) \equiv 32\gamma^6 - 152\gamma^5 + 290\gamma^4 - 248\gamma^3 + 111\gamma^2 - 18\gamma + 1.$$

To determine the sign of H consider

$$\begin{aligned}
\frac{dH}{d\gamma} &= 2\left(96\gamma^5 - 380\gamma^4 + 580\gamma^3 - 372\gamma^2 + 111\gamma - 9\right) \\
\frac{d^2H}{d\gamma^2} &= 960\gamma^4 - 3040\gamma^3 + 3480\gamma^2 - 1488\gamma + 222 \\
\frac{d^3H}{d\gamma^3} &= 48\left(80\gamma^3 - 190\gamma^2 + 145\gamma - 31\right) \\
\frac{d^4H}{d\gamma^4} &= 240\left(48\gamma^2 - 76\gamma + 29\right).
\end{aligned}$$

From the last derivative, we can see that $\frac{d^4H}{d\gamma^4} > 0$ for $\gamma \in (\frac{1}{2}, \gamma_-)$ and $\gamma \in (\gamma_+, 1)$, and $\frac{d^4H}{d\gamma^4} < 0$ for $\gamma \in (\gamma_-, \gamma_+)$, where $\gamma_- \equiv \frac{19-\sqrt{13}}{24}$ and $\gamma_+ \equiv \frac{19+\sqrt{13}}{24}$. This means that $\frac{d^3H}{d\gamma^3}$ is increasing in $\gamma \in (\frac{1}{2}, \gamma_-)$, decreasing in $\gamma \in (\gamma_-, \gamma_+)$ and again increasing in $\gamma \in (\gamma_+, 1)$. Hence, $\frac{d^3H}{d\gamma^3}$ has a local minimum at $\gamma = \gamma_+$, where $\frac{d^3H}{d\gamma^3} \simeq 48 \cdot 3.8 > 0$. Because it also holds that $\lim_{\gamma\to\frac{1}{2}} \frac{d^3H}{d\gamma^3} = 48 \cdot 4 > 0$ we thus have shown that $\frac{d^3H}{d\gamma^3} > 0$ for all $\gamma \in (\frac{1}{2}, 1)$. Now, given that $\frac{d^2H}{d\gamma^2}$ is increasing for all $\gamma \in (\frac{1}{2}, 1)$, it follows from $\lim_{\gamma\to\frac{1}{2}} \frac{d^2H}{d\gamma^2} = 28$ that $\frac{d^2H}{d\gamma^2} > 0$ for all $\gamma \in (\frac{1}{2}, 1)$. Similarly, since $\lim_{\gamma\to\frac{1}{2}} \frac{dH}{d\gamma} = \frac{21}{2}$ we get $\frac{dH}{d\gamma} > 0$ for all $\gamma \in (\frac{1}{2}, 1)$. Finally, $\lim_{\gamma\to\frac{1}{2}} H = 2.625 > 0$ implies that $H > 0$ for all $\gamma \in (\frac{1}{2}, 1)$.

We can therefore conclude that for small degrees of common ownership, the level effect is monotone increasing in all $\gamma \in (\frac{1}{2}, 1)$. Since the level effect is negative for $\gamma \to \frac{1}{2}$ and positive for $\gamma \to 1$ there exists a unique $\bar{\gamma} \in (\frac{1}{2}, 1)$ such that the level effect is negative if and only if $\gamma < \bar{\gamma}$. □

Proof of Proposition 4. For a general distribution of consumer types, F, the objective of firm A's manager is to maximize $V_A = V_{1,A} + V_{2,A}$ where

$$V_{1,A} = \frac{1}{2}p_{1,A}\left[F(\sigma_W(A)) - F(\bar{\sigma})\right] + \lambda\frac{1}{2}p_1^*\left[F(\sigma_W(B)) + F(\bar{\sigma})\right] \tag{49}$$

and

$$V_{2,A} = \frac{1}{2}p_{2,A}\left[\gamma(1-F(\sigma_W(A))) + (1-\gamma)(1-F(\sigma_W(B)))\right] \tag{50}$$
$$+\lambda\frac{1}{2}p_2^*\left[\gamma(1-F(\sigma_W(B))) + (1-\gamma)(1-F(\sigma_W(A)))\right].$$

The first order conditions are

$$\begin{aligned}
\frac{dV_A}{dp_{1,A}} &= \frac{1}{2}\left[F(\sigma_W(A)) - F(\bar{\sigma}) - \frac{p_{1,A}f(\sigma_W(A))}{t(1-\gamma)} - \frac{p_{1,A}f(\bar{\sigma})}{t(2\gamma-1)}\right] \\
&+ \frac{1}{2}\frac{\lambda p_1^* f(\bar{\sigma})}{t(2\gamma-1)} + \frac{1}{2}\frac{\gamma p_{2,A}f(\sigma_W(A))}{t(1-\gamma)} + \lambda\frac{1}{2}\frac{(1-\gamma)p_2^* f(\sigma_W(A))}{t(1-\gamma)} = 0, \qquad (51)\\
\frac{dV_A}{dp_{2,A}} &= \frac{1}{2}\left[\gamma(1-F(\sigma_W(A))) + (1-\gamma)(1-F(\sigma_W(B)))\right] \\
&+ \frac{1}{2}\left[-\frac{p_{2,A}\gamma^2 f(\sigma_W(A))}{t(1-\gamma)} - \frac{p_{2,A}(1-\gamma)^2 f(\sigma_W(B))}{t(1-\gamma)}\right] \\
&+ \frac{1}{2}\left[-\lambda\frac{p_2^*\gamma(1-\gamma)f(\sigma_W(A))}{t(1-\gamma)} - \lambda\frac{p_2^*(1-\gamma)\gamma f(\sigma_W(B))}{t(1-\gamma)}\right] \\
&+ \frac{1}{2}\frac{\gamma p_{1,A}f(\sigma_W(A))}{t(1-\gamma)} + \lambda\frac{1}{2}\frac{(1-\gamma)p_1^* f(\sigma_W(B))}{t(1-\gamma)} = 0. \qquad (52)
\end{aligned}$$

To determine the candidate for a symmetric equilibrium, evaluate the FOCs at $(p_{1,A}, p_{2,A}) = (p_1^*, p_2^*)$. This leads to the following system of linear equations:

$$F(\sigma_W^*) - \frac{p_1^* f(\sigma_W^*)}{t(1-\gamma)} - \frac{(1-\lambda)p_1^* f(0)}{t(2\gamma-1)} + \frac{\gamma p_2^* f(\sigma_W^*)}{t(1-\gamma)} + \frac{\lambda(1-\gamma)p_2^* f(\sigma_W^*)}{t(1-\gamma)} = 0, \tag{53}$$

$$1 - F(\sigma_W^*) - \frac{p_2^*(\gamma^2+(1-\gamma)^2)f(\sigma_W^*)}{t(1-\gamma)} - \frac{2\lambda p_2^*\gamma(1-\gamma)f(\sigma_W^*)}{t(1-\gamma)}$$
$$+\frac{\gamma p_1^* f(\sigma_W^*)}{t(1-\gamma)} + \frac{\lambda(1-\gamma)p_1^* f(\sigma_W^*)}{t(1-\gamma)} = 0. \tag{54}$$

Using $p_2^* = p_1^* + t(1-\gamma)\sigma_W^*$ yields

$$F(\sigma_W^*) + [\gamma + \lambda(1-\gamma)]\sigma_W^* f(\sigma_W^*) - \frac{p_1^*(1-\lambda)}{t}\left[f(\sigma_W^*) + \frac{f(0)}{2\gamma-1}\right] = 0, \tag{55}$$

$$\frac{1-F(\sigma_W^*)}{f(\sigma_W^*)} - \sigma_W^*(\gamma^2+(1-\gamma)^2) - 2\lambda\sigma_W^*\gamma(1-\gamma) + \frac{p_1^*(1-\lambda)}{t}(2\gamma-1) = 0. \tag{56}$$

Combining the two equations we get

$$0 = \frac{1-F(\sigma_W^*)}{f(\sigma_W^*)} - \sigma_W^* + \left\{(2\gamma-1)\frac{F(\sigma_W^*)+[\gamma+\lambda(1-\gamma)]\sigma_W^* f(\sigma_W^*)}{f(\sigma_W^*)+\frac{f(0)}{2\gamma-1}} + \sigma_W^* 2\gamma(1-\gamma)(1-\lambda)\right\} \quad (57)$$

If F is log-concave, the first two terms are strictly decreasing in σ_W^*. As the term in parentheses is strictly positive for all λ it follows that $\sigma_W^* > \sigma_W^M$ where denotes the monopoly benchmark σ_W^M that solves

$$0 = \frac{1-F(\sigma_W^M)}{f(\sigma_W^M)} - \sigma_W^M. \quad (58)$$

For F uniform it is immediate that $\sigma_W^M = \frac{1}{2}$. □

References

Azar, José, Sahil Raina, and Martin Schmalz. 2022. "Ultimate Ownership and Bank Competition." *Financial Management* 51 (1): 227–269.

Azar, José, and Martin C Schmalz. 2017. "Common ownership of competitors raises antitrust concerns." *Journal of European Competition Law & Practice* 8 (5): 329–332.

Azar, José, Martin C. Schmalz, and Isabel Tecu. 2018. "Anticompetitive Effects of Common Ownership." *Journal of Finance* 73 (4): 1513–1565.

Backus, Matthew, Christopher Conlon, and Michael Sinkinson. 2021. "Common ownership in America: 1980–2017." *American Economic Journal: Microeconomics* 13 (3): 273–308.

Bayona, Anna, Ángel L López, and Anton-Giulio Manganelli. 2022. "Common ownership, corporate control and price competition." *Journal of Economic Behavior & Organization* 200:1066–1075.

Borenstein, Severin, and Nancy L Rose. 1994. "Competition and price dispersion in the US airline industry." *Journal of Political Economy* 102 (4): 653–683.

Bresnahan, Timothy, and Steven C. Salop. 1986. "Quantifying the competitive effects of production joint ventures." *International Journal of Industrial Organization* 4 (2): 155–175.

Ceschi, Nadia, and Marc Möller. 2023. "Advance selling in the wake of entry." *The Journal of Industrial Economics* 71 (4): 1072–1089.

Dai, Mian, Qihong Liu, and Konstantinos Serfes. 2014. "Is the effect of competition on price dispersion nonmonotonic? Evidence from the US airline industry." *Review of Economics and Statistics* 96 (1): 161–170.

Dennis, Patrick, Kristopher Gerardi, and Carola Schenone. 2022. "Common ownership does not have anticompetitive effects in the airline industry." *The Journal of Finance* 77 (5): 2765–2798.

Farrell, Joseph, and Carl Shapiro. 1990. "Asset Ownership and Market Structure in Oligopoly." *The RAND Journal of Economics* 21 (2): 275–292.

Gaggero, Alberto A, and Claudio A Piga. 2011. "Airline market power and intertemporal price dispersion." *The Journal of Industrial Economics* 59 (4): 552–577.

Gerardi, Kristopher S, and Adam Hale Shapiro. 2009. "Does competition reduce price dispersion? New evidence from the airline industry." *Journal of Political Economy* 117 (1): 1–37.

Holmes, Thomas J. 1989. "The effects of third-degree price discrimination in oligopoly." *The American Economic Review* 79 (1): 244–250.

Kennedy, Pauline, Daniel P O'Brien, Minjae Song, and Keith Waehrer. 2017. "The competitive effects of common ownership: Economic foundations and empirical evidence." *Available at SSRN 3008331.*

Lømo, Teis Lunde. 2024. "Overlapping ownership and input prices." *International Journal of Industrial Organization* 94:103067.

Möller, Marc, and Makoto Watanabe. 2016. "Competition in the presence of individual demand uncertainty." *The RAND Journal of Economics* 47 (2): 273–292.

Posner, Eric A. 2021. "Policy implications of the common ownership debate." *The Antitrust Bulletin* 66 (1): 140–149.

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

Rotemberg, Julio. 1984. "Financial transaction costs and industrial performance." *Sloan School of Management Working Paper* 1554-84.

Schmalz, Martin C. 2021. "Recent Studies on Common Ownership, Firm Behavior, and Market Outcomes." *The Antitrust Bulletin* 66 (March): 12–38.

Shelegia, Sandro, and Yossi Spiegel. 2012. "Bertrand competition when firms hold passive ownership stakes in one another." *Economics Letters* 114 (January): 136–138.

Stavins, Joanna. 2001. "Price discrimination in the airline market: The effect of market concentration." *Review of Economics and Statistics* 83 (1): 200–202.

Varian, Hal R. 1989. "Price discrimination." *Handbook of industrial organization* 1:597–654.