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Endogenous Choice of Stakes Under Common Ownership

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We present a simple model of common ownership in which an investor chooses its stake in competing firms in light of the effects on firm behavior and firm profits. Two firms compete in Cournot duopoly, and ownership affects a firm's objective function in the manner posited by Bresnahan & Salop (1986) and Salop & O'Brien (2000). We show that an investor with equal stakes in both firms—a so-called common concentrated owner (CCO)—places a greater value on an additional share of a firm, compared to atomistic owners. The same is true of a noncommon concentrated owner (NCO) with a stake in just one firm. Both the CCO and the NCOs thus have incentives to acquire any shares held by atomistic owners. Our model yields two testable empirical predictions. First, equilibrium ownership structure in noncompetitive industries should be systematically more concentrated than in competitive industries. Second, within the investment portfolio of institutional investors, holdings in noncompetitive industries should be systematically more concentrated than holdings in competitive industries.

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I. INTRODUCTION

A common concentrated owner (CCO) holds stakes in competing firms.[1] Antitrust theorists have long posited that the interests of a CCO differ from those of an owner of a single firm. Economists have developed models in which, depending on its ownership structure, a firm maximizes a weighted average of its own and its competitors' profits.[2] Specifically, greater CCO ownership induces a firm to place a greater weight on competitor profits. At the same time, greater ownership by concentrated owners who do not hold stakes in competing firms—noncommon concentrated owners, or NCOs—reduces that weight.

Recent empirical work has found that an increased level of CCO ownership is associated with anticompetitive effects. Other papers find no effect. This literature has generated a heated debate about whether common ownership in concentrated industries is compatible with the antitrust laws and whether it should be restricted.[3]

In examining the relationship between CCO ownership and anticompetitive effects, it is important to be clear about the potential mechanisms that produce such effects. An influential model developed by Timothy Bresnahan, Steven Salop, and Daniel O'Brien is based on an internalization theory or so-called "unilateral effects."[4] In these models, a common owner who owns shares in firms A and B exerts some influence over firm A, and uses that influence to induce firm A to maximize, rather than its own profits, some weighted average of firm A and firm B profits—that is to have firm A internalize, to some extent, the effect of its actions on firm B. That common owner may do likewise with respect to firm B. But, importantly, its influence over firm A and its influence over firm B are independent: that is, whether the

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1 This definition thus excludes common ownership of firms producing complements.

2 Timothy F. Bresnahan & Steven C. Salop, *Quantifying the Competitive Effects of Production Joint Ventures*, 4 INT'L J. INDUS. ORG. 155 (1986); Steven C. Salop & Daniel P. O'Brien, *Competitive Effects of Partial Ownership: Financial Interest and Corporate Control*, 67 ANTITRUST L.J. 559, 559–614 (2000).

3 *See* Einer Elhauge, *Horizontal Shareholding*, 129 HARV. L. REV. 1267 (2016); C. Scott Hemphill & Marcel Kahan, *The Strategies of Anticompetitive Common Ownership*, 129 YALE L.J. 1392, 1395 (2020); Eric A. Posner, Fiona M. Scott Morton & E. Glen Weyl, *A Proposal to Limit the Anticompetitive Power of Institutional Investors*, 81 ANTITRUST L.J. 669 (2017); Edward B. Rock & Daniel L. Rubinfeld, *Antitrust for Institutional Investors*, 82 ANTITRUST L.J. 221 (2018); Fiona Scott Morton & Herbert Hovenkamp, *Horizontal Shareholding and Antitrust Policy*, 127 YALE L.J. 2026 (2018).

4 *See* Salop & O'Brien, *supra* note 2.

common owner changes firm A's objective function does not depend on whether firm B's objective function also changes.

In such models, the interests of noncommon owners differ from the interests of common owners. Noncommon owners want firm A to maximize its own profits, rather than some weighted average. Accordingly, the Bresnahan/Salop/O'Brien approach employs a measure of common ownership that increases with CCO ownership *and decreases with NCO ownership*.[5] Similarly, the effect of ownership on firms generally changes as ownership becomes more concentrated.[6] Thus, for example, a single common owner of firms A and B that owns a 10% stake in each firm has a greater impact than five different common owners of A and B that each own a 2% stake in each firm. A 10% noncommon owner of firm A has a greater impact than five 2% noncommon owners.

An alternative, less specified, theory of how common ownership generates anticompetitive effects relies on coordinated effects. The underlying premise is that common ownership somehow facilitates collaboration and collusion among competitors—say, the formation of an effective cartel. Since collusion (putting legal issues and possible sanctions to the side) benefits both firms, the interests of common and noncommon owners coincide. Importantly, under such a theory, a common owner's effect on firms A and B is not independent: the common owner cannot succeed in inducing A to collude with B without also inducing B to collude with A.

The bulk of the empirical literature on anticompetitive effects of common ownership has, explicitly and implicitly, embraced the Bresnahan/Salop/O'Brien approach by employing a metric of common ownership that increases with CCO ownership and decreases with NCO ownership and where the effects of ownership are larger as ownership becomes more concentrated.[7] The metrics

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5 *Id.*

6 *Id.*; *see also* Matthew Backus, Christopher Conlon & Michael Sinkinson, *Common Ownership in America: 1980–2017*, 13 AM. ECON. J.: MICROECONOMICS 273, 280 (2021).

7 *See generally* José Azar, Martin C. Schmalz & Isabel Tecu, *Anticompetitive Effects of Common Ownership*, 73 J. FIN. 1513 (2018); José Azar, Sahil Raina & Martin Schmalz, *Ultimate Ownership and Bank Competition*, 51 FIN. MGMT. 227 (2021); Miguel Antón, Florian Ederer, Mireia Giné & Martin Schmalz, *Common Ownership, Competition, and Top Management Incentives* 33 (Ctr. for Econ. Stud. & Ifo Inst., Working Paper No. 6178, 2020), https://perma.cc/3S7W-M8GZ; José Azar & Xavier Vives, *Revisiting the Anticompetitive Effects of Common Ownership* (Apr. 5, 2021) (unpublished manuscript), https://perma.cc/52CD-2ZX6; Matthew Backus, Christopher Conlon & Michael Sinkinson, *Common Ownership and Competition in the Ready-to-Eat Cereal Industry* (Nat'l Bureau of Econ. Rsch., Working Paper No. 28350, 2021), https://perma.cc/H2RQ-3KRE; Backus, Conlon & Sinkinson, *supra* note 6; Patrick Dennis, Kristopher Gerardi & Carola Schenone,

employed include the difference between the Herfindahl-Hirschman Index and the Modified Herfindahl-Hirschman Index (MHHI delta) and a related profit weight calculation that, like MHHI delta, reflects the differing effects of CCO and NCO ownership.

Thus far, this literature has focused on how a particular ownership structure affects firm behavior and outcomes. The ownership structure is taken as given. However, if ownership structure affects firm value, then we would expect owners to alter their stakes in light of this anticipated effect. The literature to date has provided only a limited analysis of this issue. Most importantly, the literature largely has not examined the effects on ownership structure in the unilateral setting developed by Bresnahan/Salop/O'Brien that forms the basis of the current wave of empirical work. For example, earlier works by David Flath and David Reitman present models in the distinct context of cross-ownership, in which one firm owns a stake in a competing firm.[8] (Under common ownership, by contrast, a third party owns stakes in both competing firms.) In these models, the cross-owning firm exerts no influence on the owned firm, an assumption that is inconsistent with the Bresnahan/Salop/O'Brien approach, in which ownership does affect the actions of the owned firm. Rune Stenbacka and Geert Van Moer follow the same approach.[9]

More recent work by Alessio Piccolo and Jan Schneemeier develops a model where the firm objective function is determined purely by the percentage of shares held by common owners.[10] Their model thus deviates from the Bresnahan/Salop/O'Brien

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Common Ownership Does Not Have Anti-Competitive Effects in the Airline Industry (Fed. Rsrv. Bank of Atl., Working Paper 2019–15, 2019), https://perma.cc/PK5Z-738W; Jacob Gramlich & Serafin Grundl, *Testing for Competitive Effects of Common Ownership* (Wash.: Bd. of Governors of the Fed. Rsrv. Sys., Working Paper No. 2017–029, 2017), https://perma.cc/52VF-TQN7; Pauline Kennedy, Daniel P. O'Brien, Minjae Song & Keith Waehrer, *The Competitive Effects of Common Ownership: Economic Foundations and Empirical Evidence* (July 2017) (unpublished manuscript), https://perma.cc/RVQ5-R5NY; Andrew Koch, Marios Panayides & Shawn Thomas, *Common Ownership and Competition in Product Markets*, 139 J. FIN. ECON. 109 (2021); Melissa Newham, Jo Seldeslachts & Albert Banal-Estañol, *Common Ownership and Market Entry: Evidence from the Pharmaceutical Industry* (DIW Berlin, Working Paper No. 1918, 2019), https://perma.cc/4AKA-S8DF; Mohammad Torshizi & Jennifer Clapp, *Price Effects of Common Ownership in the Seed Sector*, 66 ANTITRUST BULL. 39 (2021).

[8] *See* David Flath, *When Is It Rational for Firms to Acquire Silent Interests in Rivals?*, 9 INT'L J. INDUS. ORG. 573 (1991); David Reitman, *Partial Ownership Arrangements and the Potential for Collusion*, 42 J. INDUS. ECON. 313 (1994).

[9] *See generally* Rune Stenbacka & Geert Van Moer, *Cross Ownership and Divestment Incentives*, 201 ECON. LETTERS 109748 (2021).

[10] *See generally* Alessio Piccolo & Jan Schneemeier, *Ownership and Competition* (Dec. 9, 2021) (unpublished manuscript), https://perma.cc/KC28-XYGC.

approach and from the bulk of the empirical work, in which ownership concentration rather than common ownership share affects the firm objective function. Oz Shy and Rune Stenbacka model a market with two firms, two active investors, and many passive investors, to determine how the active investors should allocate their portfolios among the two firms.[11] Finally, Anna Bayona, Ángel López, and Anton-Giulio Manganelli examine the stability of common ownership arrangements in a Bresnahan/Salop/O'Brien framework.[12] Neither of these papers analyzes a setting where concentrated owners can acquire or dispose of shares by trading with atomistic, dispersed investors.

In this paper, we endogenize the ownership choices of concentrated owners. Concentrated owners choose their stakes in light of the effects of ownership on firm behavior and firm (and competitor) profits. We analyze these choices within a simple model of competition in a duopoly where the two competing firms are owned by a mix of NCOs, CCOs, and atomized owners. Our model is highly stylized, featuring Cournot (quantity) competition between the firms and a single CCO with equal stakes in both firms. This simple model, an extension of the Bresnahan/Salop/O'Brien approach, captures the general features of theories of common ownership.

We derive and characterize the equilibrium ownership structure. We show that an NCO, compared to an atomistic owner, places a greater value on an additional share of the firm. Hence, the NCO has an incentive to acquire shares held by atomistic owners. Likewise, a CCO with similar stakes in the firms, compared to an atomistic owner, places a greater value on an additional share. Thus, both types of concentrated owner have incentives to acquire shares held by atomistic owners.

Our model yields two testable empirical predictions. First, equilibrium ownership structure in noncompetitive industries (that is, industries where ownership influences competition) should be systematically more concentrated than in competitive industries (where ownership does not influence competition). Second, within the investment portfolio of institutional investors, holdings in noncompetitive industries should be systematically more concentrated than holdings in competitive industries.

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[11] *See* Oz Shy & Rune Stenbacka, *Active Investors, Passive Investors, and Common Ownership*, 110 AEA PAPERS & PROC. 565 (2020).

[12] *See* Anna Bayona, Ángel L. López & Anton-Giulio Manganelli, *Common Ownership, Corporate Control and Price Competition* (May 2021) (unpublished manuscript), https://perma.cc/G7HA-ZH8K.

The current empirical literature on common ownership has sought to test whether common ownership affects competition directly—for example, by examining the relationship between blockholding and firm outcomes (such as price levels). This approach has various difficulties, including the challenge of identifying an exogenous shift in common ownership.[13] Our article points to a different empirical approach that has the potential for producing additional evidence about the effects of common ownership.

II. MODEL

A. Setup

Two firms, A and B, produce quantities $q_A \geq 0$ and $q_B \geq 0$ of a good at a unit cost of 0. The firms compete in Cournot quantities and face a demand function of $p = 1 - q_A - q_B$.

Shares in the firms are held by three concentrated owners—NCOA, NCOB, and CCO—and a large set of atomistic owners. NCOA holds shares in A, NCOB holds shares in B, and CCO holds equal stakes in both firms.

Let n_A equal the fraction of A's shares held by NCOA, n_B equal the fraction of B's shares held by NCOB, and c equal the fraction of shares in both firms held by CCO, with $1 > n_A, n_B, c > 0$.

At $t = 0$, an initial ownership structure is exogenously determined. At $t = 1$, NCOA, NCOB, and CCO can sequentially buy shares from (or sell shares to) the atomistic owners of A and B at a price equal to the value of a share to the atomistic owner.[14] This process continues until NCOA, NCOB and CCO no longer want to buy shares from (or sell shares to) the atomistic owners. At the end of $t = 1$, a final ownership structure is determined. At $t = 2$, firms produce q_A and q_B generating profits of π_A and π_B with

$$\pi_A = pq_A = (1 - q_A - q_B)q_A$$

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[13] *See* Katharina Lewellen & Michelle Lowry, *Does Common Ownership Really Increase Firm Coordination?,* 141 J. FIN. ECON. 322 (2021).

[14] Our results are robust to assuming instead that NCOA, NCOB, and CCO can buy shares from (or sell shares to) the atomistic owners of A and B at a price equal to the value of A or B, respectively, that will result after the sale or at any price between such value and the value of a share to the atomistic owner. Moreover, our results also hold for tender offers by NCOA, NCOB, and CCO directed at atomistic owners.

Since firm A and B are identical in relevant respects, we present this and other results only for firm A.

B. Equilibrium Outcomes

Following Salop and O'Brien, a firm with common owners maximizes a weighted average of its own and its competitor's profits.[15] Let w_i represent the weight that firm i attaches to its own profits; $1 - w_i$ is the weight that firm i places on its competitor's profits. Firm A's objective function o_A is given by

$$o_A = w_A\pi_A + (1 - w_A)\pi_B$$
$$= w_A q_A(1 - q_A - q_B) + (1 - w_A)q_B(1 - q_A - q_B)$$

and likewise for Firm B. In equilibrium, $o_A'(q_A) = 0$ and $o_A''(q_A) < 0$ with $o_A'(q_A) = w_A - 2q_A w_A - q_B$. Hence

$$o_A'(q_A) = 0 \;\Leftrightarrow\; q_A = (w_A - q_B)/2w_A$$

Substituting the respective condition for q_B into this equation yields the following Cournot/Nash equilibrium condition:

$$q_A{}^* = w_B(2w_A - 1)/(4w_A w_B - 1)$$

yielding equilibrium firm profits

$$\pi_A{}^* = w_B(2w_A{}^2 + 2w_A w_B - 3w_A - w_B + 1)/(4w_A w_B - 1)^2$$

and industry profits

$$\pi_I{}^* = \pi_A{}^* + \pi_B{}^* = (w_A + w_B - 1)(4w_A w_B - w_A - w_B)/(4w_A w_B - 1)^2$$

and price

$$p^* = 1 - q_A{}^* - q_B{}^* = (w_A + w_B - 1)/(4w_A w_B - 1)$$

C. Profit Weights

We adopt the standard assumption in the common ownership literature (including Salop and O'Brien) that control weights are proportional to ownership stakes.[16] Following Salop and O'Brien, Firm A maximizes $\pi_A + \pi_B c^2/(c^2 + n_A{}^2)$ which means that

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[15] *See* Salop & O'Brien, *supra* note 2.

[16] *See id.* at 610.

$$w_A = (c^2 + {n_A}^2)/(2c^2 + {n_A}^2)$$

As $1 > n_A$ and $c > 0$, it follows that $0.5 < w_A < 1$.

Differentiating w_A yields:

$${w_A}'(n_A) = 2c^2 n_A/(2c^2 + {n_A}^2)^2 > 0$$

Intuition: An increase in n_A raises w_A both because it gives NCOA greater control, relative to CCO, over A's policies (the control effect), and because it increases NCOA's interest in A (the ownership effect).

$${w_A}'(n_B) = 0$$

Intuition: An increase in n_B has no effect on w_A because NCOB neither has control over A's policies nor any direct interest in A's profits.

$${w_A}'(c) = -2cn^2/(2c^2 + {n_A}^2)^2 < 0$$

Intuition: An increase in c affects w_A in several ways. First, due to its increase in A ownership, CCO cares more about A's profits (the A ownership effect). Second, due to its increase in control over A relative to NCOA, CCO has a greater ability to induce A to reduce its output for the benefit of B (the A control effect). Third, due to an increase in B ownership, it increases CCO's incentives to use its existing control over A's policies for the benefit of B (the B ownership effect). There is no B control effect on w_A.

We can examine these effects more closely if we separate the c in the formula for w_A into the A ownership component c_{Ao}, the A control component c_{Ac}, and the B ownership component c_B, such that $w_A = (c_{Ao}c_{Ac} + {n_A}^2)/(c_{Ao}c_{Ac} + {n_A}^2 + c_{Ac}c_B)$. Taking separate derivatives of c_{Ao}, c_{Ac} and c_B yields:

A ownership component:

$${w_A}'(c_{Ao}) = c_B {c_{Ac}}^2/(c_{Ao}c_{Ac} + {n_A}^2 + c_{Ac}c_B)^2 > 0$$

A control component:

$${w_A}'(c_{Ac}) = -c_B {n_A}^2/(c_{Ao}c_{Ac} + {n_A}^2 + c_{Ac}c_B)^2 > 0$$

B ownership component:

$${w_A}'(c_B) = -c_{Ac}(c_{Ao}c_{Ac} + {n_A}^2)/(c_{Ao}c_{Ac} + {n_A}^2 + c_{Ac}c_B)^2 < 0$$

Thus, the A ownership component is positive, while the A control component and the B ownership component are negative. Moreover, for $c_A = c_B$ the size of the (negative) effect of an increase in c_B exceeds the size of the (positive) ownership effect of an increase in c_A. Hence, an increase in c reduces w_A.

D. The Effect of Profit Weight on Firm Decisions

Proposition 1: The equilibrium quantity produced by firm A increases as the weight firm A places on its own profits increases and as the weight firm B places on its own profits decreases.

Proof: Differentiating ${q_A}^*$ yields:

$$ {q_A}^{*\prime}(w_A) = 2w_B(2w_B - 1)/(4w_Aw_B - 1)^2 > 0 \text{ (since } w_A, w_B > 0.5) $$
$$ {q_A}^{*\prime}(w_B) = (1 - 2w_A)/(4w_Aw_B - 1)^2 < 0 \text{ (since } w_A, w_B > 0.5) $$

Intuition: An increase in w_A increases ${q_A}^*$ because it reduces the degree to which firm A restrains its own production for the benefit of firm B. An increase in w_B reduces ${q_A}^*$ because an increase in w_B increases ${q_B}^*$ which in equilibrium leads firm A to reduce its own production.

Proposition 2: The equilibrium price decreases as the weight firm A places on its own profits increases and as the weight firm B places on its profits increases.

Proof: Differentiating p^* yields:

$$ p^{*\prime}(w_A) = -(2w_B - 1)^2/(4w_Aw_B - 1)^2 < 0 \text{ (since } w_B > 0.5), $$

and likewise for $p^{*\prime}(w_B)$.

Intuition: An increase in w_A increases overall production because its direct effect on q_A exceeds its indirect effect on q_B. As the overall quantity produced increases, price declines.

Proposition 3: The equilibrium profits of firm A increase as the weight firm A places on its own profits increases and as the weight firm B places on its own profits decreases.

Proof: Differentiating π_A^* yields:

$$\pi_A^{*\prime}(w_A) = w_B(2w_B - 1)(4w_A + 4w_B - 4w_Aw_B - 3)/(4w_Aw_B - 1)^3$$

The denominator and $w_B(2w_B - 1)$ are positive for $w_B > 0.5$. The expression $(4w_A + 4w_B - 4w_Aw_B - 3)$ is positive for $w_A, w_B \in (0.5, 1)$ as it is 0 at $w_A = w_B = 0.5$ and it is increasing in both w_A and w_B. Hence $\pi_A^{*\prime}(w_A) > 0$. Since $q_A^{*\prime}(w_B) < 0$ and $p^{*\prime}(w_B) < 0$, it follows that $\pi_A^{*\prime}(w_B) < 0$.

Intuition: Firm A giving more weight to its own profits implies an increase in A's profits. Firm B giving more weight to its own profits reduces both the equilibrium quantity for firm A and the price and hence must reduce A's profits.

E. The Effect of Ownership on Firm Decisions

Proposition 4: The equilibrium quantity produced by firm A increases as the ownership in firm A by NCOA increases and as the ownership in firm B by NCOB decreases.

Proof: An increase in ownership in firm A by NCOA increases w_A which in turn increases q_A^*. A decrease in ownership in Firm B by NCOB decreases w_B which in turn increases q_A^*.

Intuition: An increase in NCOA ownership in firm A raises the profit weight firm A places on its own profits. This induces firm A to increase its quantity produced. A decrease in NCOB ownership in firm B decreases the profit weight firm B places on its own profits. This induces firm B to decrease its quantity produced, which induces A to increase its quantity produced.

Proposition 5: The equilibrium total industry quantity increases as NCOA ownership increases, as NCOB ownership increases, and as CCO ownership decreases.

Proof: An increase in ownership in firm A by NCOA increases w_A and has no effect on w_B. Differentiating equilibrium industry quantity q_I^* on w_A yields:

$$q_I^{*\prime}(w_A) = q_A^{*\prime}(w_A) + q_B^{*\prime}(w_A) = (2w_B - 1)^2/(4w_Aw_B - 1)^2$$

which is positive. Likewise, for an increase in ownership in firm B by NCOB.

A change in CCO ownership affects both w_A and w_B. To obtain the effect of a change in CCO ownership on ${q_A}^*$ and ${q_B}^*$, we differentiate:

$$ {q_A}^{*\prime} = [-(2{w_A}'w_B + 2w_A{w_B}' - {w_B}') + w_B(4{w_A}'w_B)]/(4w_Aw_B - 1)^2 $$

$$ {q_B}^{*\prime} = [-(2{w_A}'w_B + 2w_A{w_B}' - {w_A}') + w_A(4{w_B}'w_A)]/(4w_Aw_B - 1)^2 $$

Adding ${q_A}^{*\prime}$ and ${q_B}^{*\prime}$ yields

$$ {q_I}^{*\prime} = {q_A}^{*\prime} + {q_B}^{*\prime} $$
$$ = [{w_A}'(4{w_B}^2 - 4w_B + 1) + {w_B}'(4{w_A}^2 - 4w_A + 1)]/(4w_Aw_B - 1)^2 $$

which is negative since the numerator is negative (as ${w_A}'$ and ${w_B}'$ are both negative and $(4{w_B}^2 - 4w_B + 1)$ and $(4{w_A}^2 - 4w_A + 1)$ are positive when $w_A, w_B > 0.5$) and the denominator is positive.

Intuition: An increase in NCOA ownership in firm A raises the profit weight firm A places on its own profits. This induces firm A to increase its quantity produced. While the increase in the quantity produced by firm A, in turn, induces firm B to lower its quantity produced, the increase in firm A's quantity exceeds the reduction in firm B's quantity.

A decrease in c leads each firm to give relatively greater weight to its own profits and relatively less weight to the other firm's profits. The combined effect of this dual increase in profit weights is to increase industry quantity produced.

Proposition 6: The equilibrium price increases as the ownership in firm A by NCOA decreases, as the ownership in firm B by NCOB decreases, and as CCO ownership increases.

Proof: If equilibrium industry quantity increases, price decreases, and vice versa.

F. Equilibrium Ownership Structure

Proposition 7: NCOA will always want to buy shares of A from atomistic owners as long as atomistic owners own such shares. NCOB will always want to buy shares of B from atomistic owners as long as atomistic owners own

such shares. CCO will always want to buy shares of both firms from atomistic owners as long as atomistic owners own such shares.

Any marginal share of A will have a greater value to NCOA than it does to atomistic owners of A. The reason is as follows. An acquisition of a marginal share of A by NCOA has two effects. First, NCOA acquires the value of the marginal share itself (which, conditional on sale, is the same for NCOA as it is for an atomistic owner). Second, increasing n_A changes the value of the stake NCOA owned in A *before* NCOA acquires a marginal share. Specifically, increasing n_A increases w_A and thus π_A (since $\pi_A'(w_A) > 0$)—and hence the value of the pre-acquisition stake held by NCOA. This effect is present for any $n_A > 0$ and any w_B. Hence, NCOA will have an incentive to acquire shares of A held by atomistic owners.

If $c_A = c_B$, then any marginal share of A will have a greater value to CCO than it does to atomistic owners of A. If $c_A = c_B$, then an increase in c_A will reduce overall quantity and hence increase industry profits.[17] Since $c_A = c_B$, the value of the combined stake in A and B owned by CCO before it acquires a marginal share increases if industry profits increase. In addition to obtaining the value of the marginal share itself (which, conditional on sale, is the same for CCO as it is for an atomistic owner), CCO benefits from this increase.

The result that an NCO attributes a greater value to a marginal share than an atomistic owner follows directly from two of the premises underlying the theoretical literature on common ownership and will hold generally. The first premise is that common owners are interested in having a firm take actions that maximizes the value of their common ownership stakes rather than the value of that firm. The second premise is that increased ownership confers upon the owner some degree of increased control over firm decisions. Both of these premises are necessary to generate the predictions of the common ownership literature. But, by the same token, if an NCO increases its ownership, it will obtain some marginal degree of increased control over firm decisions which it will use to induce the firm to take marginally more actions that maximize firm value, thus increasing firm value. Since an NCO—unlike an atomistic owner—has a pre-existing stake in

[17] Quantity will change by $(4{w_A}^2 - 4w_A + 1)({w_B}' + {w_A}')/(4{w_A}^2 - 1)^2$ which is negative since $({w_B}' + {w_A}') = -2cn^2/(2c^2 + n^2)^2 < 0$.

the firm that rises as firm value increases, an NCO will inevitably attribute a greater value to a marginal share than an atomistic owner.

The result that CCO attributes a greater value to marginal shares of A and B than atomistic owners, as well, follows from the basic premises underlying the common ownership literature. A common owner who holds equal stakes in all competing firms wants to maximize industry profits. Holding a greater stake in all firms will give that common owner more control and induce firms to take marginally more actions that increase industry profits. This will raise the value of the common owner's pre-existing stake, with the result that the common owner will attribute a greater value to marginal shares than the atomistic owners.

Since the NCOs and the CCO all want to acquire shares from atomistic owners, the equilibrium ownership structure in the model entails no shareholdings by atomistic owners. This result of the model will hold in a more general setting as long as concentrated owners face no constraints in increasing ownership stakes. In reality, of course, concentrated holders face several constraints: among others, they may have limited access to capital, they may want to reduce risk by holding diversified portfolios, or they may want to preserve liquidity. While one would thus not expect that NCOs and CCOs will completely crowd out atomistic owners, the model predicts a higher level of ownership concentration in industries dominated by publicly traded companies where firm decisions affect the value of competing firms ("noncompetitive industries") than in industries dominated by publicly traded companies where such effects are largely absent ("competitive industries").

G. Portfolio Structures

The results of our model also yield predictions for the portfolio structure of institutional investors. Institutional investors can invest in noncompetitive industries (where ownership affects profit weights) and in competitive industries (where ownership does not affect profit weights) and, in each set of industries, can take concentrated positions in one or several competitors in a single industry (or a few industries) or diversified positions in a larger number of companies in an industry. The model has no implications for portfolio allocations within competitive industries and, to the extent that institutional investors are interested in diversified portfolios, one would expect any investor to take diversified positions in the set of competitive industries.

However, our model yields a prediction for portfolio allocations within noncompetitive industries.[18] Given the amount of investments in the set of noncompetitive industries, it is more profitable to concentrate investments in a single or a small number of such industries (either as a concentrated position in one company in the industry or as concentrated positions in multiple competing firms in the same industry) than to spread the investments over a larger number of noncompetitive industries (with less invested in each industry). In addition, our model yields a prediction for portfolio allocations across types of industries. Starting with an equal allocation of investments in firms in competitive and noncompetitive industries, an institutional investor would benefit by shifting investments from firms in competitive industries to firms in noncompetitive industries.

As a result, looking at the portfolio of an institutional investor, one would expect the portfolio to be overweight in the set of noncompetitive industries relative to the set of competitive industries and, within the set of noncompetitive industries, less diversified across industries than within the set of competitive industries.

III. CONCLUSION

In this paper, we have presented a simple model of ownership structure in a setting where concentrated ownership—both common ownership and noncommon ownership—affects the objective function of a firm. Specifically, concentrated common ownership induces a firm to place less weight on its own profits, while concentrated noncommon ownership induces a firm to place more weight on its own profits. These effects on profit weights form the basis for both the main theoretical models of and the bulk of the empirical literature on the anticompetitive effects of common ownership.

In our model, both NCOs and CCOs have incentives to raise their respective ownership stakes. If an NCO increases its ownership stake, the firm's objective function changes such that the prior stake held by the NCO increases in value. The same is true for a CCO who holds equal stakes in competing firms. Our formal model addresses only a duopoly with identical firms and simple production and industry demand functions. But the intuition for why both concentrated noncommon owners and concentrated

[18] These predictions obviously do not apply to indexed investors as indexed investors are constrained in their investment allocations by the indexing strategies they follow.

common owners have incentives to raise their respective ownership stakes carries forward to a more general setting.

The incentives of concentrated owners to increase their stakes in firms in oligopolistic industries yield empirical predictions both for the ownership structure of such firms and for the portfolio structure of institutional investors. As to ownership structure, our model predicts that ownership in firms in noncompetitive industries (where ownership structure affects profit weights) will be more concentrated than ownership in firms in competitive industries (where ownership structure does not affect profit weights). As to portfolio structure, our model predicts that institutional investors will invest more in noncompetitive industries than in competitive industries and that stakes in firms in noncompetitive industries will be more concentrated than stakes in firms in competitive industries.

These predictions, in turn, can be used to test whether concentrated common ownership has anticompetitive effects. In particular, it is disputed to what extent concentrated owners can effectively induce a company to take actions that lower the value of the company but raise the value of their portfolio holdings. In previous work, we identified several reasons why doing so may be difficult, especially if it entails legal or reputational risks.[19] But we have also identified several strategies for achieving this result that seem feasible. The empirical literature to date, however, has not been able to establish whether investors in fact pursue such strategies. Part of the reason for this failure is the difficulty of structuring econometric tests that causally link certain outcomes (such as a change in prices) to ownership structure. The predictions we have developed in this paper point to a different, and perhaps more fruitful, strategy to determine the effect of concentrated ownership.

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[19] *See* Hemphill & Kahan, *supra* note 3.