FEDERAL RESERVE BANK *of* ATLANTA **WORKING PAPER SERIES**

A Critical Review of the Common Ownership Literature

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Working Paper 2023-17
November 2023

Abstract: The rapid growth in index funds and significant consolidation in the asset-management industry over the past few decades has led to higher levels of common ownership and increased attention on the topic by academic researchers. A consensus has yet to emerge from the literature regarding the consequences of increased common ownership on firm behavior and market outcomes. Given the potential implications for firms and investors alike, it is perhaps not surprising that policymakers, legal scholars, finance and accounting academics, and practitioners have all taken a keen interest in the subject. This paper provides an overview of the theoretical underpinnings of common ownership and critically reviews the empirical literature. Measurement issues and identification challenges are detailed, and a discussion of plausible causal mechanisms is provided. Across the newest papers employing the most credible identification techniques, there is relatively little evidence that common ownership causes lower competition. However, further research is necessary before broad conclusions can be reached.

JEL classification: G23, G32, G34, L22

Key words: common ownership, institutional investors, corporate governance

https://doi.org/10.29338/wp2023-17

Carola Schenone acknowledges financial support from McIntire's summer research grants. The views expressed here are those of the authors and not necessarily those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. Any remaining errors are the authors' responsibility.

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1 Introduction

Common ownership refers to situations in which investors own shares in multiple firms that compete in the same product market. Over the past few decades, substantial growth in index funds and consolidation in the asset-management industry has contributed to a substantial rise in common ownership. An established theoretical literature suggests that under certain conditions, common owners can exert anti-competitive effects. Inspired by both these factors, a rapidly growing academic literature has attempted to estimate the effects of common ownership on market outcomes.

The seminal papers by Azar et al. (2018) and He and Huang (2017) were the first to present empirical evidence documenting that increased common ownership is associated with greater coordination and softer competition among commonly held product market rivals. The findings attracted the attention of legal scholars and policymakers, and swiftly generated calls for anti-trust authorities to open formal investigations into the potentially anti-competitive effects of common ownership. Proposals have ranged from strict enforcement of the Clayton Act (specifically §7) to challenges of any stock acquisition that results in a common set of investors owning significant shares in corporations that are horizontal competitors, to limits on institutional holdings in an industry (i.e., no more than 1% of the total size of the industry).[1] Legislation restricting asset managers' ability to construct diversified portfolios would have severe consequences for the industry, individual investors, and potentially, the economy as a whole. Regulators and funds would likely incur heavy monitoring costs to ensure that funds stay within the investment limits. Fund families could be forced to split up so that they would not surpass proposed ownership limits; as a result, individual investors could find it difficult to construct diversified portfolios at low fees. Firms could also face more severe principal-agent problems as funds are forced into governance "passivity."

The Azar et al. (2018) and He and Huang (2017) findings and the increased attention on

[1] See Elhauge et al. (2021), Elhauge (2020), Posner (2021), Posner et al. (2016), Elhauge (2015). These proposals have been the subject of discussion at the U.S. Department of Justice, the U.S. Federal Trade Commission, and the European Central Bank, among others.

the topic from policymakers and from industry spurred additional empirical research that tested for common ownership's effects on a bevy of economic outcomes across a broad set of industries. These seminal studies also initiated an intense debate in the literature about whether the empirical evidence should be interpreted in a causal manner, and thus, whether there is any scope for a policy response. This debate continues to rage, with new empirical evidence supporting both sides.

In this paper we critically review the common ownership literature. We begin with the theoretical literature, tracing the concept of common ownership back to the models of Rubinstein and Yaari (1983), Rotemberg (1984) and Bresnahan and Salop (1986). We focus on the conditions that are necessary for common ownership to result in anti-competitive effects in product markets. We note that these conditions are at odds with the typical assumptions imposed in mainstream corporate finance theory regarding the objectives of firm managers.[2]

We then turn to how the literature has measured common ownership, focusing on the Modified Herfindahl-Hirschman Index (MHHI) that was first developed by Bresnahan and Salop (1986) and later extended by O'Brien and Salop (2000). While the MHHI is one of the most common measures employed in the empirical literature, there are numerous challenges involved in its construction. We also provide a brief discussion of some of the alternative measures that have been developed to avoid the shortcomings of the MHHI.

Next, we discuss the various ways in which the literature has attempted to overcome endogeneity concerns and thereby identify the causal effects of common ownership on economic outcomes. Since investment decisions are endogenous, it is very hard to separately identify the effects of ownership on firm performance from the effects of expected performance on investment. The literature has focused mainly on mergers between financial institutions as well as reconstitutions of the Russell 1000/2000 Index and/or additions to the S&P 500 Index to generate pseudo-random variation in common ownership. We critically assess these

[2] Jensen and Meckling (1976), Hart and Holmstrom (1987), Holmstrom and Milgrom (1987), Hart (1997)).

methods borrowing heavily from the arguments of Lewellen and Lowry (2021).

We continue by summarizing the different mechanisms posited in the literature for how common ownership can exert causal effects on market competition. We divide the mechanisms into two broad types, which we label direct and indirect channels. Direct channels refer to explicit communication between investors and firm managers. Examples include board meetings and shareholder elections. In contrast, indirect channels do not involve explicit collusion. The indirect channel that has received the most attention in the literature involves institutional investors providing managers with weak incentives to compete, for example via the design of compensation schemes (Anton et al. (2023)).

Finally, we survey the current state of the empirical literature. We provide a listing in Table 1 of all empirical papers, and summarize for each paper the principal outcomes analyzed, whether the results show a significant effect of common ownership on that outcome, and the paper's approach toward addressing endogeneity.[3] We additionally provide a figure, which facilitates a comparison across papers, of the effects of common ownership on different outcome variables. After reviewing this literature, we conclude that there is only weak evidence supporting the hypothesis that increased common ownership exerts a negative causal effect on product market competition among the studies that convincingly address endogeneity concerns.

This paper is not the first to review the common ownership literature. Schmalz (2018) reviewed the theoretical, legal, and early empirical literature related to common ownership. In the five years or so since that paper was published in the pages of this journal, the empirical literature has grown tremendously, and importantly, evidence has emerged refuting the idea that common ownership exerts anti-competitive effects. We provide an update of the empirical literature and assess the available evidence with a critical eye toward measurement and identification issues.

The balance of the paper is organized as follows. In section 2 we review the theoretical

[3]This survey overviews papers publicly distributed as of the time of this writing.

studies that motivated the empirical literature on common ownership. Section 3 summarizes the most frequently employed common ownership measures and presents the numerous issues associated with taking those measures to the data. In section 4 we critically discuss the primary identification strategies used to measure causal effects of common ownership on firm and market outcomes. Section 5 presents the causal mechanisms that the literature has highlighted, focusing on both direct and indirect communication channels. In section 6 we survey the current state of the empirical literature, focusing on the identification debate that has emerged in recent years and briefly discussing results across different settings, for example private versus public firms. Finally, we provide concluding remarks in section 7.

2 Foundations

In this section we review the relevant theoretical literature that motivated concerns about adverse competitive effects of common ownership. This literature spans the fields of finance and industrial organization. Our goal is not to produce an exhaustive list of studies, but rather to discuss the most influential papers. We start by documenting the theoretical origins of the common ownership concept and then trace the evolution of the theoretical literature to the present day. We explain some of the key assumptions shared by all of the relevant models, provide a critical discussion of whether these assumptions are justified, and discuss their implications for applied research.

2.1 Underlying Theory

We trace the theoretical literature on common ownership back to two early studies, Rubinstein and Yaari (1983) and Rotemberg (1984). Both papers develop models that assume a perfectly competitive stock market, where investors trade shares in firms that are product market rivals. Rubinstein and Yaari (1983) begins with the assumption that product

markets are competitive.[4] In the model, shareholders' trades are strategically targeted at redistributing firm payoffs across shareholders and maximizing the joint overall payoffs. The Nash equilibrium outcome from these strategic trades results in collusion in the product market. In contrast, Rotemberg (1984) develops a model where capital market investors' motivation to trade shares is to achieve a well diversified portfolio. In doing so, they invest in firms that are product market rivals. Taking this as given, firm managers choose output levels that maximize the return of their shareholders' portfolios, in proportion to each investor's ownership.[5]

While both models predict lower equilibrium output, compared to the level that would result if firm managers competed against other firms to maximize firm value, there is an important distinction. In Rubinstein and Yaari (1983), cooperation is the result of shareholders trading in a perfectly competitive stock market with the explicit objective of creating a collusive product market. In contrast, in Rotemberg (1984), cooperation represents managers' optimal response given shareholders' diversified portfolios.[6]

A related literature emerged in the industrial organization field with the early work by Bresnahan and Salop (1986). The model developed in the paper focuses on the competitive effects of partial (or cross) ownership, which refers to the case when a firm purchases some fraction of equity in a product market rival, or when two or more competing firms jointly invest in a venture that operates in the same market.[7] The paper shows that in such cases, each firm's value maximizing objective function includes its own firm's profits, as well as the value of its holdings in the competing firm or joint venture (in which it owns a share). For

[4]This assumption is motivated by the existence of effective anti-trust measures or, more generally, because collusive contracts are unenforceable.

[5]One result from this theory is that as the number of firms increase, shareholders own stock in this larger number of firms, motivating managers to cooperate with a larger pool of competing firms. Thus, as the number of firms grows, the markets become increasingly collusive. Also, as transaction costs drop (e.g. with mutual funds) it becomes less expensive for investors to own a broader set of firms, thus inducing more product market collusion.

[6]Note, in both of these models, there is no need to use (the threat of) punishment for a manager who deviates from collusive behavior. Collusion represents managers' optimal strategy, and no player has an incentive to deviate.

[7]O'Brien and Salop (2000) extended the framework developed by Bresnahan and Salop (1986) to cases of full mergers, total control, one way control, and Coasian joint control among others.

various levels of financial interests and control arrangements, (i.e., different forms of cross-ownership / partial mergers), Bresnahan and Salop (1986) develops a measure that quantifies the extent of cross ownership in a market, referred to as the modified Herfindahl-Hirschman Index (MHHI). The paper uses this measure to study anti-competitive effects arising from cross-ownership/joint ventures/horizontal mergers. The recent empirical literature adopts this measure to gauge the anti-competitive effects of common ownership. We discuss the potential challenges with this approach in the next section.

The more recent theoretical work of Azar (2012) revived interest in the effects of common ownership. The paper develops a model of oligopolistic competition with risk-neutral investors, where shareholders vote on every firm action and managers make decisions based on majority votes. Thus, instead of managers having an objective of maximizing firm value, shareholders (who may own multiple competitor firms in their portfolios) effectively dictate decisions that managers implement. This leads to an equilibrium where managers maximize a weighted average of shareholder portfolio returns, resulting in higher markups and less efficient outcomes in the product market. This theory suggests that the degree of competition should be measured by a modified Herfindahl index (MHHI), in which managers internalize diversified shareholders' objective functions; this MHHI is similar to the one developed in Bresnahan and Salop (1986). An important result from Azar (2012) is the *Common Ownership Trilemma*, stating that complete portfolio diversification by investors, perfect alignment of interest between managers and owners, and perfect competition, are not jointly attainable. It is possible to achieve at most two of the three. In sum, this trilemma implies that it is not possible to separate financial policy from competition policy.[8]

The common ownership trilemma highlights a key characteristic shared by all theoretical models predicting that common ownership will cause anti-competitive behavior: these models depart from the standard assumption in the economics and finance literature that

[8] Azar and Vives (2021) further develops the framework of Azar (2012) and analyzes common ownership in a general equilibrium model where firm managers coordinate against labor, which contributes to higher markups.

managers' actions are geared toward maximizing their firm's value, given the competitive environment they face in the product market. Instead, the models assume that managers maximize the portfolio returns of their firms' shareholders, which results in managers colluding with product market rivals. Critically, this assumption directly violates the Fisher Separation Theorem, which states that a firm's investment choices are separate from shareholders' investment preferences (see, e.g., Romano (2021)). In the next subsection we discuss some of the potential problems associated with these key modeling assumptions.

2.2 Key Assumptions

There are key disconnects between the assumptions in the models developed in Rubinstein and Yaari (1983), Rotemberg (1984), Bresnahan and Salop (1986), and Azar (2012), and what we observe in reality.

The first disconnect relates to principal-agent conflicts. In the models discussed above, the benevolent manager knows each shareholder's preferences and acts upon them.[9] This assumes away both asymmetric information and agency problems between managers and shareholders.[10] Yet, these issues are so palpable in the real world that an entire field of study has evolved around the design of governance mechanisms and managerial contracts geared at aligning managerial incentives with those of firm owners. We observe these contracts and mechanisms implemented across firms around the world.[11]

Second, even if firm managers could figure out how to overcome asymmetric information and agency problems, there is still the question of whether it is optimal for institutional investors to foster collusion among product market rivals within an industry, given that they

[9] For example, Azar (2012) explicitly states: "By modeling shareholders as directly voting on the actions of the firms, and having managers care only about expected vote share, I abstract in this paper from the conflict of interest between owners and managers."

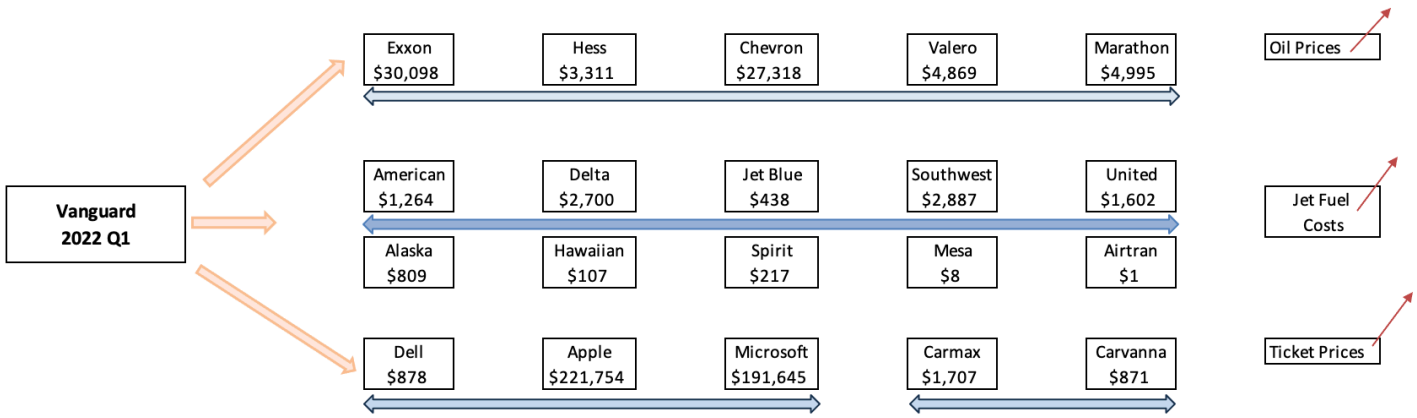
[10] Adler and Mitkov (2023) drops the assumption of no principal-agent conflicts. Using a simple dynamic model of common ownership, the paper shows that when agency costs are high, common owners cannot incentivize managers to collude, because managers obtain greater benefits by diverting resources for their own benefit. The paper finds that common ownership leads to *weaker* profit margins when corporate governance is poor.

[11] Examples include paying managers with stock options in their firms, boards of directors who monitor and advise executives, etc.

hold diversified portfolios that include stocks across a wide range of industries. Inducing collusion in one industry, resulting in higher markups within that industry, would lower the investor's returns on firms that purchase inputs from that industry, generating an ambiguous effect on overall portfolio returns.

We present a simple example in Figure 1 to highlight the issue. Consider a subset of firms in Vanguard's portfolio during the first quarter of 2022. Vanguard invested in product market rivals within the oil and gas industry (e.g., Exxon: \$30.1B, Hess: \$3.3B, Chevron: \$27.3B), product market rivals within the airline industry (e.g., Delta: \$2.7B, Southwest: \$2.9B, United, \$1.6B), and various firms across other industries (e.g., Microsoft \$191.6B, Apple: \$221.8B). If Vanguard induces collusion between Exxon, Hess, Chevron, and other oil and gas industry firms in its portfolio, the higher average markups in the industry would negatively affect the operating costs and profits of any firm that uses oil and gas as an input, such as an airline. If Vanguard also induces collusion among the ten airlines it holds in its portfolio, the higher airline ticket prices could adversely impact the operating costs and profits of any firm in Vanguard's portfolio that purchases airline services, such as Exxon, Chevron; Carmax and Carvana; Microsoft and Apple, for example.

Figure 1: A subset of firms in Vanguard's 2022 (Q1) portfolio.



Note: Vanguard's dollar holdings (in millions) in selected firms, as of the end of the first quarter, 2022.

In sum, it is unclear whether a shareholder with a diversified portfolio across industries would benefit from inducing softer competition in a single industry. Higher markups in that industry could be offset by increased costs of firms in downstream sectors, with the net effect depending on the investor's portfolio composition.[12]

The third disconnect between the assumptions underlying the theory and reality relates to a manager's (in)ability to implement multiple objective functions. Each shareholder holds a portfolio of stocks, with a composition uniquely tailored to the investor's risk tolerance and objectives. For a firm manager, maximizing the returns of one shareholder's portfolio is likely to conflict with maximizing those of another shareholder's portfolio. The manager must find a mechanism to satisfy the heterogeneous preferences of all shareholders, or at least a mechanism to aggregate shareholder preferences under majority rule. However, this is a task economists consider impossible, as demonstrated by the Arrow Impossibility Theorem and the Condorcet Paradox.[13] Jensen (2000), focusing on a shareholder value perspective, reaches similar conclusions: "It is logically impossible to maximize in more than one dimension at the same time unless the dimensions are monotone transformations of one another."

One potential solution to the multiple objective function conundrum emerges if one investor is sufficiently powerful to elevate her preferences over those of other shareholders. But then, if the manager capitulates to this investor, the resulting collusive outcome would no longer represent the manager's optimal response to the objectives of *all* shareholders. As a result, this one investor would need a way to keep managerial behavior in line with her objectives. It is unclear whether institutional investors have credible and enforceable punishments to prevent managers from deviating.[14] If instead, managers follow the traditional objective of maximizing firm value through competition with other firms, then this multiple objective

[12]See Romano (2021) and Rock and Rubinfeld (2017) for further discussions of this issue.

[13]The Arrow Impossibility Theorem states that when voters have three or more options, there is no procedure to order these options in a socially optimal way, that is, a way that reflects the preferences of all voters. The Condorcet Paradox shows that it is impossible to aggregate individual transitive preferences under majority rule.

[14]Simply selling their ownership stake in the offending manager's firm is unlikely to qualify as a credible form of punishment, since it would likely disrupt the fund's objective and could adversely affect the fund's diversification strategy, index tracking objectives, etc.

problem is avoided. As Jensen (2000) states, "Maximizing the total value of the firm... is one objective function that will resolve the tradeoff problem among multiple constituencies." As such, the manager can fulfill her fiduciary duties to *all* shareholders.

3 Measuring Common Ownership

We turn now to a discussion of the measures of common ownership that have been employed in the literature. We begin in section 3.1 with the definition of MHHI, as this represents the theoretical foundation of this literature. This measure was first derived by Bresnahan and Salop (1986), and later generalized by O'Brien and Salop (2000). In section 3.2 we discuss some of the difficulties in empirically constructing the common ownership component of MHHI. Finally, in section 3.3, we overview several alternative measures of common ownership that have been used in the literature.

3.1 The Modified Herfindahl-Hirschman Index (MHHI)

As reviewed in section 2, MHHI is derived from the first order conditions of the manager's optimization problem, which is to maximize the weighted value of the portfolio of each one of the firm's shareholders. These portfolios comprise shares in the manager's firm, as well as shares in other firms, including the manager's product market rivals.

Formally, owner i's total profit is given by the weighted average of the profits of all firms k in i's portfolio, $\sum_k \beta_{ik} \cdot \pi_k(x_k)$, where β_{ik} is owner i's equity stake (cash flow rights) in firm k and $\pi_k(x_k)$ is firm k's profit, which is a function of k's output x_k. The manager of firm k chooses output to maximize the weighted sum of the profits accruing to owners of firm k from their holdings in firm k as well as their holdings in firms $j \neq k$, where the weights are the control rights that owner i has over firm k, γ_{ik}. Thus, the optimization problem faced by k's manager is,

$$\underset{x_k}{Max} = \sum_i \gamma_{ik} \cdot \left(\beta_{ik} \cdot \pi_k(x_k, x_j) + \sum_{j \neq k} \beta_{ij} \cdot \pi_j(x_k, x_j) \right) \tag{1}$$

$$\underset{x_k}{Max} = \sum_i \gamma_{ik} \cdot \sum_j \beta_{ij} \pi_j(x_j, x_k) \tag{2}$$

This can be rearranged as,[15]

$$\underset{x_k}{Max} = \pi_k(x_j, x_k) + \sum_{j \neq k} \overbrace{\left(\frac{\sum_i \gamma_{ik} \cdot \beta_{ij}}{\sum_i \gamma_{ik} \cdot \beta_{ik}} \right)}^{\omega_{jk}} \cdot \pi_j(x_j, x_k) \tag{3}$$

The weight that firm k's manager places on profits from firms $j \neq k$ is $\omega_{jk} \equiv \frac{\sum_i \gamma_{ik} \cdot \beta_{i,j}}{\sum_i \gamma_{ik} \cdot \beta_{i,k}}$, the value to firm k of a one dollar profit generated by firm j.

The MHHI is derived from the first order conditions of this optimization problem. As shown in equation (4), the MHHI is the sum of the traditional Herfindahl-Hirschman Index (HHI) and an additional common ownership term, which we refer to as MHHIΔ,

$$MHHI = \overbrace{\sum_{j,k \neq j} \underbrace{s_j \cdot s_k}_{\substack{\text{Market Shares,} \\ \text{firms } j,k}}}^{HHI} + \overbrace{\sum_j, \sum_{k \neq j} \underbrace{\left(\frac{\sum_i \gamma_{ij} \cdot \beta_{ik}}{\sum_i \gamma_{ij} \cdot \beta_{ij}} \right)}_{\substack{\text{Investor } i\text{'s} \\ \text{Ownership } (\beta) \\ \text{Control } (\gamma)}} \underbrace{s_j \cdot s_k}_{\text{Market Shares}}}^{\text{Common Ownership: } MHHI\Delta} \tag{4}$$

The traditional HHI term measures the extent of product concentration in an industry and MHHIΔ measures the additional concentration due to common ownership.

3.2 Taking MHHIΔ to the Data

Taking MHHIΔ in equation (4) to the data requires identifying three critical inputs. First, information on each investor i's equity holdings (cash flow rights) across all firms j in i's portfolio, β_{ij}. Second, information on the weights that the firm places on each investor i's

[15] Backus et al. (2019) and Kennedy et al. (2017).

total profits, γ_{ij}. This entails identifying the amount of control that investor i has in firm j and all other firms $k \neq j$.[16] Finally, information on each firm j's market shares, s_j. We discuss how the literature has measured each of these inputs.

3.2.1 Ownership Stakes: Investor i's equity holding in firm j, $\beta_{i,j}$.

Obtaining information on an investor's equity holdings in a particular firm is not as straightforward as it might seem. First, holdings are generally unavailable for most retail minority investors and thus, are excluded from most studies. A rationalization for excluding retail investors in the construction of MHHI is that they hold negligible amounts of equity and control in any given firm, and therefore their contribution to common ownership is essentially zero ($\beta_{ik} \cdot \gamma_{ik} \approx 0$). However, as Backus et al. (2019) shows, ignoring retail investors can lead to unrealistic outcomes, such as a firm weighting a competitor's profits by an amount that is multiple times larger than the firm places on its own profits.[17]

Holdings by company insiders (e.g., officers, directors, and anyone owning 10% or more of a firm's shares) are available through other SEC filings, however these holdings are ignored in most studies.

Finally, holdings for large institutional investors can be readily compiled since the SEC mandates that all institutional investment managers with at least $100 million in assets under management disclose equity holdings in Form 13F. However, holdings are measured imprecisely as reported by Ben-David et al. (2021) and Backus et al. (2019).

[16] That γ_{ij} measures how much firm j's manager weighs investor i's portfolio returns is clearly seen in the manager's optimization problem in equation (2).

[17] Backus et al. (2019) also shows that because retail investors have effectively no control in any given firm, common ownership is positively related to the level of retail ownership. These issues become even greater when insider holdings are also ignored.

3.2.2 Shareholder Control: Investor i's control over firm j, $\gamma_{i,j}$.

The key issue is how to measure and quantify the extent of control.[18] The theoretical literature has identified two channels through which shareholders can exert control. The first is "exit" or the threat thereof (see, e.g., Edmans (2009), Admati and Pfleiderer (2009), and Edmans and Manso (2011)). Critically, the "exit" channel is not a feasible method of control for the many large common owners who are index funds.

The second channel is "voice" (Hirschman (1970)), which includes shareholders' votes and shareholders' communications with management. However, proposals up for vote do not relate to firm operations. Thus, it is unclear how voting could lead to anti-competitive behavior.[19] Furthermore, due to the risk of anti-trust litigation it seems unlikely that common owners would explicitly instruct management to compete less aggressively. As suggested by Anton et al. (2023), the voice channel may play a greater role through a lack of action: common owners may facilitate anti-competitive behavior by *failing* to pressure firms to compete aggressively, for example by agreeing to compensation contracts that lack strong incentive structures.

The empirical common ownership literature has focused on voting as a measure of shareholder control. Azar et al. (2018) use voting rights designations recorded in 13F filings, where shareholder i reports "sole," "none," or "shared" voting rights. The paper sets institution i's control of firm j equal to the number of shares over which i declares it has sole or shared voting rights divided by the total number of firm j's outstanding shares. Kennedy et al. (2017) and Koch et al. (2021) follow a similar approach. However, Dennis et al. (2022a) shows that these voting designations are classified inconsistently both across institutions and within institutions over time, likely due to the vague definitions and unclear reporting in-

[18] Several models assume control and ownership are the same, $\gamma_{i,j} = \beta_{i,j}$. For example, Rubinstein and Yaari (1983), Rotemberg (1984), Azar (2012), and Azar and Vives (2021) assume no separation of ownership and control. Backus et al. (2019) also sets control equal to ownership, $\gamma_{i,j} = \beta_{i,j}$, but acknowledges that this is an arbitrary assumption.

[19] Items up for vote include: director nominees, compensation proposals, governance proposals, environmental proposals, and social proposals.

structions provided by the SEC. Moreover, the paper shows that Azar et al. (2018)'s results are sensitive to which voting designations are used to measure shareholder control.

There are also questions regarding the extent to which voting rights, even if perfectly measured, capture actual control rights. First, as noted above, items up for vote are generally unrelated to a firm's competitive decisions. Second, control rights may be a nonlinear function of voting rights. For example a doubling of voting rights may reflect more than a doubling of control rights, as discussed by Backus et al. (2021b). Third, Edmans et al. (2019) shows theoretically that voting rights (and also threat of exit) vary as a function of common ownership, with both being more influential when shares are owned by a common owner.[20]

3.2.3 Market shares: s_j's.

In the construction of the MHHI, the third key component is the market shares of firms j and k, s_j and s_k. Empirically, market shares are relatively straightforward to calculate. However, using market shares in the measure of common ownership can be problematic. This is especially severe in studies that run regressions of firm performance (e.g., prices, profits, etc.) on MHHI. The reason is that the outcome variable in these studies and the market share component of MHHI are endogeneous, and therefore the estimate of MHHI cannot be interpreted in a causal manner. We discuss this issue in more detail in section 4.2 below.

3.3 Alternative Measures

We now discuss alternative measures of common ownership, which potentially overcome some of the challenges discussed above. To avoid the endogeneity issues associated with market shares, Kennedy et al. (2017) employs a measure that is independent of market shares. While

[20]Intuitively, when an investor owns stakes in multiple firms, if faced with a liquidity shock she can choose which firm to sell and thus the price impact is greater. The higher price impact makes governance through voice (since an investor who sells rather than monitors receives a lower price) and exit (since a manager who shirks experiences a lower stock price) more influential. Different from most common ownership studies, these effects are greatest when the investors' common ownership is across unrelated as opposed to rival firms.

MHHIΔ represents one term that captures investors' weighted ownership and control in rival firms multiplied by a second term that captures the market shares of these firms, Kennedy et al. (2017)'s measure is based only on the first term.

More recent work has developed additional measures that similarly omit market shares. For example, Freeman (2023) uses *Overlap Value*, which corresponds to the proportion of firm market value that is held by overlapping owners. Park et al. (2019) employs *Market Value Common Firms*, which is the sum of the market values of common owners' ownership in same-industry firms that share a common owner with the focal firm. Backus et al. (2021b) develops a profit weight measure, which represents the weight that a firm places on another firm's profits relative to the weight it places on its own profits, given the ownership structure of each firm. In addition to being independent of market shares, this measure also avoids the necessity of defining product markets. Koch et al. (2021) focus on industry-level dynamics and thus employ industry-level measures of common ownership, which by definition are not dependent on market shares. Many of the measures that avoid using market shares require a measure of control, for example voting rights.[21] As noted above in section 3.2.2, measuring control presents its own set of challenges.

To address the criticism that voting rights do not necessarily equate to control rights, Gilje et al. (2020) develops a measure that explicitly allows for investors to devote varying levels of attention to the firm. For example, prior literature suggests that active funds, larger funds, larger fund families, and funds that hold a greater fraction of their portfolio in the firm are more diligent monitors (see, e.g., Iliev et al. (2021)); the Gilje et al. (2020) measure enables the researcher to incorporate such factors.

He and Huang (2017) constructs five alternative measures, which do not depend on firm market shares or control rights. Each of these measures, or close variants thereof, have been used in many subsequent papers in the literature.[22] The five measures, each of which is

[21] See, for example, Backus et al. (2021b) and Kennedy et al. (2017).

[22] See, e.g., Chen et al. (2023), Freeman (2023), He et al. (2020), Kini et al. (2023), Park et al. (2019), and Ramalingegowda et al. (2021).

defined at the firm-year level, include: (1) *Cross Dummy*, an indicator variable equal to one if at least one of a firm's blockholders simultaneously blockholds at least one other firm in the same industry; (2) *Number of Investors*, the number of unique institutional blockholders that blockhold another firm in the same industry; (3) *Number of Firms*, the number of firms within the same industry that have a blockholder who is also a blockholder in the focal firm; (4) *Avg Number of Firms*, the number of same-industry peers that are block-held by the average cross-holding institution; and, (5) *TotalCrossOwn*, the sum of all cross-holding institutions' percentage holdings in the focal firm. Each of these measures generally captures the extent to which one (or more) investor(s) simultaneously own competing firms, in ways that potentially lead a manager to compete against these other firms less aggressively.

Finally, an increasing number of papers in the common ownership literature focus on pairs of firms that are potentially more directly related to each other. For example, Newham et al. (2022), Gerakos and Xie (2020), and Schmalz and Xie (2022) focus on brand-name and generic drug companies. In such cases, the papers develop measures of common ownership, which are applicable to their particular setting.

4 Identification

Any empirical analysis that tries to estimate the causal effect of common ownership on firm behavior and competitive dynamics must confront the fact that investment decisions by institutional investors are endogenous. There are likely to be unobserved factors driving investment decisions that lead to both increases in common ownership and higher firm prices and profits. In section 4.1 below, we provide a critical discussion of the various ways that researchers have attempted to address and overcome this issue.

In addition to the issue of endogenous investment, a second identification challenge arises when using MHHIΔ to measure common ownership and to estimate its impact on prices or firm profits. MHHIΔ is a function of firm market shares, and regressions of prices on market

shares suffer from well-known endogeneity biases. We discuss this issue in section 4.2.

4.1 Endogenous Investment Decisions

Investors' ownership choices are endogenous, and it is difficult to separate the effects of expected performance on ownership from the effects of ownership on performance. Moreover, the increase in common ownership has coincided with increased consolidation in nearly every industry, and either could influence firm input costs and markups. Researchers have employed several approaches to identify the causal effects of common ownership. We discuss the primary methods of identification, along with the papers that developed each approach in the common ownership setting.[23]

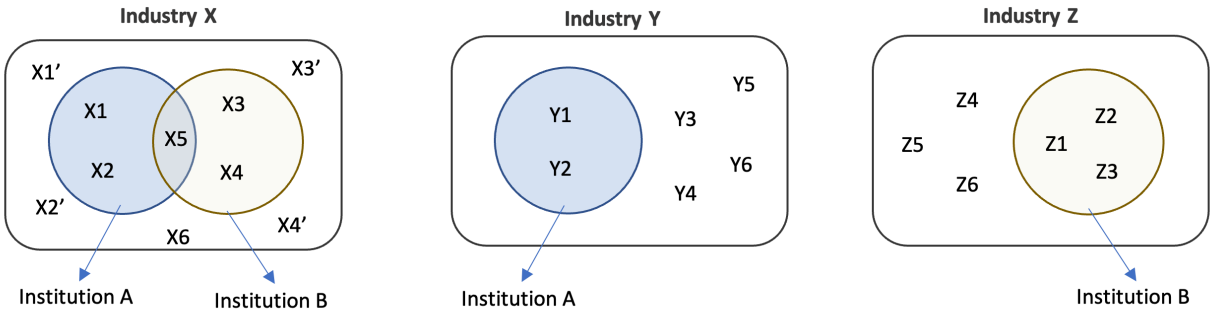
One approach is to employ the Blackrock-BGI merger, which occurred in 2009, as a source of identification. There are several requirements that must be satisfied for this to be a valid instrument. First, the merger must not be motivated by 'the policies or performance of portfolio firms'. The plausibility of this exclusion condition is discussed in depth by He and Huang (2017) and Azar et al. (2018) and appears to be satisfied. Second, the Blackrock-BGI merger must significantly affect common ownership. This relevance condition also appears to hold, as shown by Azar et al. (2018). The merger of Blackrock and BGI's investment portfolios led to one much larger investment portfolio, and this larger portfolio was more likely to hold equity in additional competitor firms and to hold larger positions in the competitor firms.

As highlighted by Lewellen and Lowry (2021), the challenge associated with using the Blackrock-BGI merger as a source of identification lies in the selection of an appropriate control sample. This is best illustrated with a figure.[24] Looking at Figure 2, within industry X, the treatment firms represent firms X1, X2, X3, and X4. Prior to the merger, suppose X1 and X2 were owned by Blackrock, and X3 and X4 were owned by BGI. Following the merger, all four competitor firms are owned by Blackrock-BGI (i.e., common ownership has

[23] Table 1 provides a more complete list of papers that have employed each identification approach.
[24] This figure is replicated from Lewellen and Lowry (2021).

increased). There are two possible samples of control firms: firms that belong to a different industry in which only Blackrock or BGI owned any firms prior to the merger (firms in industry Y or Z, which can be labeled Control^{DI}), and firms that belong to the same industry but were owned by neither Blackrock or BGI prior to the merger (firms within industry X other than X1, X2, X3, and X4, which can be labeled Control^{SI}).

Figure 2: Sample construction example for the financial institution-merger analysis



FOR FIRM-LEVEL ANALYSES:

Treatment Firms: firms that are block-held by one of the merger partners with some industry rivals being block-held by the other partner (firms block-held by both partners are excluded).
X1, X2, X3, X4

Control Firms^{DI}: firms block-held by one merger partner with no industry rivals block-held by the other partner.
Y1, Y2, Z1, Z2, Z3

Control Firms^{SI}: firms matched to Treatment Firms based on industry and size and not block-held by the merging institutions:
X1', X2', X3', X4'

Notes: In this example, the universe consists of three industries (X, Y, and Z) and two merging institutions (A and B). Firms are numbered X1, X2, ..., Y1, Y2, ..., etc. Treatment Firms are firms that are block-held by one of the merger partners with some industry rivals being block-held by the other partner (firms block-held by both partners are excluded). Control Firms^{DI} are firms block-held by one merger partner with no industry rivals block-held by the other partner. Control Firms^{SI} are firms matched to Treatment Firms based on industry and size (a matched firm to firm X1 is denoted as X1', etc.).

The first set of control firms, Control^{DI}, can generate biased inferences if different industries behaved differently in the years following the 2009 Blackrock-BGI merger. Lewellen and Lowry (2021) shows that this is the case. On average, the treatment firms represent higher growth firms, and these firms performed better in the years following the 2008–2009 Global Financial Crisis (GFC). One way to overcome this problem is to create a matched

sample of control firms, where the controls are matched to treatment firms based on size and book-to-market (Control^{DIMatched}). Alternatively, the researcher can use control firms from the same industry (as the treatment firms), Control^{SI}. In sum, although Control^{DI} has been commonly used in the literature, more recent evidence suggests that Control^{SI} and Control^{DIMatched} are more likely to provide unbiased inferences.

The second approach toward identification builds upon the Blackrock-BGI merger approach, but it employs a broader set of financial institution mergers, which are spread through calendar time. Following the criteria outlined in He and Huang (2017), Lewellen and Lowry (2021) provides a list of 64 financial institution mergers, during the 1980–2015 period. Similar to the Blackrock-BGI merger case, the relevance and exclusion conditions are likely satisfied. Moreover, the fact that the mergers do not all occur at the same point in time potentially represents an advantage over just using the Blackrock-BGI merger. However, Lewellen and Lowry (2021) shows that although the mergers are spread through calendar time, the largest financial institution mergers occurred around the time of the GFC. As a result, affected firms are disproportionately concentrated during this period, and inferences can be biased by the effects of the crisis. To lessen potential biases, the researcher can either use one of the recommended control samples described above (Control^{SI} or Control^{DIMatched}), or the researcher can omit financial institution mergers that occur around the GFC.

A third approach toward identification is to use the Russell 1000/2000 Index reconstitution or S&P 500 Index additions. Both of these approaches suffer from several problems. First and foremost, entry into an index is not random. In addition, a fundamental problem with Russell reconstitutions is that they do not affect firm-level common ownership. In other words, this approach does not satisfy the relevance condition. The reason is that Russell index reconstitutions only affect ownership by mutual funds, not ownership at the institution level, a point made by both Schmidt and Fahlenbrach (2017) and Lewellen and Lowry (2021). In contrast to Russell Index reconstitutions, S&P 500 index additions do cause an increase in common ownership. However, additions to the S&P 500 also cause increases in

institutional ownership and decreases in block ownership, and either of these could plausibly affect firms along multiple dimensions.

Finally, a fourth approach to identification, as proposed by Boller and Morton (2020) and used by Anton et al. (2023), is to use entry of competitor firms into the S&P 500 Index. A treatment firm is defined as a firm that belongs to the S&P 500 Index and that had a firm in the same industry join the S&P 500 Index. Control firms represent firms that also belong to the S&P 500 Index, but for which no firm in the same industry joined the S&P 500. This approach causes an increase in common ownership of the treatment firms, and it potentially overcomes many of the problems associated with the above-described approach of using entry into the S&P 500 as the treatment. However, one potential cause for concern is that control firms are drawn from different industries than treatment firms. As highlighted by Lewellen and Lowry (2021), this can cause biased inferences, particularly when firms are not matched, for example on size and growth.

In sum, prior literature suggests multiple candidate sources of identification. However, many of the approaches that have been used do not satisfy all necessary criteria to be valid instruments. It is critical that the researcher be aware of the potential biases that can arise from approaches in which treatment events are clustered in calendar time and approaches in which control firms are drawn from different industries than treatment firms.

4.2 MHHIΔ, Market Shares, and Endogeneity Bias

Empirical papers that employ MHHIΔ as a measure of common ownership face another basic identification problem. We discuss this in the context of Azar et al. (2018)'s main specification, though the issue is not unique to their paper. The paper regresses the logarithm of the average airfare charged by carrier j on route r during year-quarter t, on the measure of common ownership, MHHIΔ_{rt}, the traditional Herfindahl Index, HHI_{rt}, a set of control

variables, year-quarter fixed effects, and market-carrier fixed effects:

$$\log(p_{rjt}) = \alpha \cdot MHHI\Delta_{rt} + \eta \cdot HHI_{rt} + \theta \cdot X_{rjt} + \alpha_t + \nu_{rj} + \varepsilon_{rjt}, \tag{5}$$

where p_{rjt} is the average ticket price for airline j, in market r, in year-quarter t; HHI_{rt} captures industry concentration in route r at time t; and MHHIΔ_{rt} captures the additional effect on concentration arising from common ownership.

Substituting the formula for MHHIΔ from equation (4), we obtain:

$$\begin{aligned}\log(p_{rjt}) \quad = \quad & \alpha \cdot \overbrace{\sum_j \sum_{k \neq j} \underbrace{\left(\frac{\sum_i \gamma_{ijt} \cdot \beta_{ikt}}{\sum_i \gamma_{ijt} \cdot \beta_{ijt}} \right)}_{\text{Ownership \& Control}} \underbrace{s_{rjt} \cdot s_{rkt}}_{\text{Market Shares}}}^{MHHI\Delta} + \eta \cdot \overbrace{\sum_j \underbrace{s_{rjt}^2}_{\text{Market Shares}}}^{HHI} \\ & + \theta \cdot X_{rjt} + \alpha_t + \nu_{rj} + \varepsilon_{rjt}. \end{aligned} \tag{6}$$

From this expression it is clear that the Azar et al. (2018) specification represents a regression of average prices on two functions of market shares, namely, the traditional Herfindahl Index and MHHIΔ. There are serious identification concerns with such a specification.

As has been recognized for over 40 years in the industrial organization literature, regressions of firm performance (e.g., prices, profits, etc.) on measures of concentration (market shares, HHI, etc) are merely descriptive; they yield no causal evidence on the factors driving this relationship. In fact, since Weiss (1989), Bresnahan (1989), Schmalensee (1989), and Evans et al. (1993), the literature has recognized that market shares and prices are jointly determined in equilibrium, and therefore regressions of prices on market shares are unidentified.

A further issue arises from the fact that MHHIΔ is a non-linear function of market shares (s_{rjt}, s_{rkt}) and the ownership/control parameters $(\beta_{ijt}, \gamma_{ijt})$. A positive coefficient on MHHIΔ could indicate one of two things: (1) increased common ownership increases product market prices, or (2) increased market shares lead to increased product market prices. If the positive

correlation between MHHIΔ and prices is driven mainly by variation in market shares, then changes in prices cannot be attributed to common ownership.

In fact, Dennis et al. (2022a) shows that the positive relationship between $MHHI\Delta$ and ticket prices documented in Azar et al. (2018) appears to be identified by variation in the market share component rather than variation in the ownership/control parameters. This evidence casts further doubt on whether common ownership truly exerts a causal effect on airline pricing.

5 Channels

Thus far, we have summarized the theoretical foundations of common ownership, discussed the main assumptions underlying the theory, described both the most commonly used measures of common ownership and alternative proposed measures, and reviewed identification concerns. In this section, we set aside these conceptual and empirical issues, and turn our attention to the fundamental question of how common owners can exert causal effects on market competition. Specifically, how do institutional investors in a given firm achieve an equilibrium in which rival firms coordinate to soften competition? Furthermore, how does the channel allow common owners to sustain coordination between firms that are natural competitors and prevent any one firm from deviating and destroying the equilibrium?

We organize our discussion of the potential causal mechanisms into two parts below. In section 5.1 we discuss channels that involve direct, explicit communication between investors and firm managers. In section 5.2 we consider more indirect mechanisms that have been proposed in the common ownership literature.

Before delving into the discussion, it is helpful to note that the mechanism through which coordination among rivals is achieved must satisfy two criteria. First, the mechanism cannot (overtly) violate antitrust laws, and second, the terms of the agreement must be enforceable and self-regulating, in the sense that a firm manager would not have an incentive to deviate

from the cooperative equilibrium and, if they did, they would face credible and enforceable punishment.

5.1 Direct Channels

Direct channels represent explicit communications between owners and managers, regarding the level of competition between rival firms. Such channels seem closest in spirit to the early common ownership models of Rotemberg (1984) and Azar (2012), which are based on the assumption that managers know (and are incentivized to act upon) the preferences of owners, where these owners potentially also own shares in rival firms.

There are multiple direct channels of communication between investors and managers. Large investors may sit on firm boards, as is commonly observed among venture capitalists, private equity investors, and activists. Large investors and activist investors may also speak directly with management as a way to achieve changes in firm policies (see, e.g., Becht et al. (2022) and Brav et al. (2022). Finally, investors also interact with firms through voting, though in these cases the interactions are limited to items on the ballot.

There are two key issues. The first issue is whether common owners use any of these channels to pressure firms into anti-competitive behavior. It is important to note that such actions would likely violate one of the necessary criteria listed above: abiding by antitrust laws. Furthermore, we are not aware of any evidence of such communications. In fact, there seems to be some evidence that common owners steer clear of direct communications with rival firms, as Geng et al. (2022) finds that among cases where one shareholder owns a block in two rival firms, this common owner rarely sits on the boards of both firms.

The second key issue is whether investors are attentive toward all portfolio firms. Iliev et al. (2021), Ben-Rephael et al. (2017) and Schmidt (2019) show that investor attention varies widely, and Gilje et al. (2020) shows how the presence of less attentive investors mitigates effects arising from common ownership. Additionally, a growing portion of market capitalization is held by passive mutual funds, and there is some evidence that such funds

engage less intensely, for example Bebchuk and Hirst (2019) and Heath et al. (2022).[25] In aggregate, it is fair to say that prior literature highlights the importance of considering common owners' incentives to engage, particularly given the substantial heterogeneity across investors.

5.2 Indirect Channels

Rather than owners communicating their preferences directly to managers, it is possible that a *lack* of communication leads to softer competition. If common owners benefit by rival firms competing less aggressively against each other, then they have incentives to *not* pressure firms to compete aggressively. Managers would benefit from such decreased pressure, because they could enjoy the "quiet life" (Bertrand and Mullainathan (2003)).

Anton et al. (2023) develops a theoretical model that lays out a specific channel through which common owners can incentivize managers to compete less aggressively. The paper posits that compared to other shareholders, common owners put less pressure on firms to adopt incentive-based contracts. The lower incentive structure causes managers to be less efficient, which results in a higher cost structure. Prices are higher and quantity sold is lower.

Unlike the direct channels listed above, this indirect channel does not violate the criteria related to antitrust laws. However, it may violate the incentive compatibility criteria. Firms with greater agency costs are more likely to attract activist investor attention, and they are also more likely to become takeover targets. Thus, even if current shareholders incentivize a manager to enjoy the quiet life, it still may not be in the manager's best interest to do so. Incremental to this concern, Walker (2019) highlights several additional challenges with the Anton et al. (2023) framework. First, the Anton et al. (2023) model and associated empirical analysis focuses on the executive's wealth to own-firm performance sensitivity (WPS), but Walker (2019) notes that compensation committees have little short-term in-

[25] In contrast, Appel et al. (2016) concludes that passive funds represent more active monitors, and Lewellen and Lewellen (2022) concludes that passive common ownership has a particularly large affect on indexers' incentives to engage.

fluence over WPS. Second, compensation committees have much more direct influence over relative performance evaluation (RPE, the extent to which pay packages consider firm performance relative to peers) - but RPE has *increased* over time, rather than decreased as one would expect if common owners sought to weaken competitive incentives. Third, compensation contracts with lower incentive structures would discourage many other firm actions, for example firm lobbying; yet there is no evidence of changes in these types of behavior.

6 Empirical Evidence

In this section we provide an overview of the applied common ownership literature. We begin with a brief discussion of what we consider to be two of the seminal papers in the applied literature, He and Huang (2017) and Azar et al. (2018). We then summarize a few notable critiques of this evidence. Finally, we summarize the numerous papers that have been written since those seminal papers, which have explored the consequences of common ownership for a large number of economic outcomes across a broad set of industries.

6.1 Seminal Studies and Prominent Critiques

He and Huang (2017) and Azar et al. (2018) were the first published studies to present causal evidence that common ownership leads to greater coordination and softer competition among product market rivals.[26] The papers, which were written contemporaneously, use different measures of common ownership, analyze different economic outcomes, and differ in the scope of the micro-data that they employ to test their hypotheses.

He and Huang (2017) focuses on a broad set of industries and shows that increased common ownership causes higher growth in firm-level market shares and facilitates greater collaboration among product market rivals, including more joint ventures, strategic alliances,

[26] Azar (2012), which preceded both of these papers, computed measures of common ownership of U.S. stocks over time and documented a positive correlation between common ownership and profit margins in cross-industry panel regressions.

and within-sector acquisitions. The paper uses several different measures of common ownership and addresses identification concerns by using mergers of financial institutions over the 1983–2011 sample period.

In contrast, Azar et al. (2018) focuses exclusively on the airline industry and provides empirical evidence that increased common ownership among carriers operating in a market results in higher average ticket prices. The paper estimates fixed effects models using the MHHIΔ measure of common ownership and also uses the 2009 merger between BlackRock and Barclays Global Investors (BGI) to isolate plausibly exogenous variation in common ownership.

While both of these studies have received a significant amount of attention among both academic researchers and policymakers, the Azar et al. (2018) study, in particular, has been the focus of a heated debate in the literature. Subsequent empirical studies, including Kennedy et al. (2017) and Dennis et al. (2022a), have called into question the robustness of the paper's results due to both measurement and identification concerns.

The Dennis et al. (2022a) critique focuses on the measure of common ownership used in the Azar et al. (2018) analysis, MHHIΔ. The paper implements a placebo analysis, which shows that the positive correlation between MHHIΔ and airline ticket prices is driven by the market share component of the MHHIΔ measure rather than the ownership and control components. This finding suggests that endogeneity bias rather than a truly causal relationship is driving the positive correlation between the measure of common ownership and airline prices.[27] Dennis et al. (2022a) also show that the relationship between common ownership and ticket prices is not robust to alternative measures of investor control and to assumptions about the extent of investor control during bankruptcky periods.

The Kennedy et al. (2017) critique focuses on the differences between common ownership theory and Azar et al. (2018)'s empirical specifications. In particular, theory suggests that both price and the MHHIΔ are equilibrium effects that depend on the structure of ownership

[27] In subsequent work, Azar et al. (2022b) presents a critique of the Dennis et al. (2022a) placebo analysis and Dennis et al. (2022b) responds to that critique.

and control and also on cost and demand factors. However, Azar et al. (2018)'s main empirical analysis consists of regressions of price on MHHI, which are likely to suffer from endogeneity bias. As an alternative approach, Kennedy et al. (2017) estimates a structural model in which the measure of common ownership is directly derived from theory and shows that the Azar et al. (2018) results do not hold.

The He and Huang (2017) and Azar et al. (2018) analyses (and many subsequent papers) have also come under scrutiny in work by Lewellen and Lowry (2021). First, the authors critique the identification strategy employed in these papers (discussed in depth in section 4.1). Second, Lewellen and Lowry (2021) cast doubt on He and Huang (2017)'s conclusion that common ownership causes increases in mergers and joint ventures, as the rate of such explicit coordination between any two firms is very rare (less than 0.1% of all potential firm pairs).

6.2 Current State of the Literature

Since the seminal He and Huang (2017) and Azar et al. (2018) papers were published, the common ownership literature has rapidly expanded in numerous directions. Table 1 provides an up-to-date list of papers, in alphabetical order by first author, which have empirically tested for common ownership effects. The table lists the principal outcome variables that each paper focuses on, whether a common ownership effect is found, the method(s) used to address endogeneity concerns, and the particular industry and time period covered by each paper.

The literature has considered a wide variety of economic outcomes from prices, markups and other measures of firm profitability to M&A activity, R&D expenditures, patent citations, corporate governance, and even the strength and durability of supply-chain relationships. Like the seminal He and Huang (2017) study, many papers focus on more than one outcome. To capture this fact, Figure 3 displays all of the papers listed in Table 1, sorted by subject matter with arrows connecting papers that cover more than one topic. The fig-

ure also includes the publication status of each paper and a bit more detail regarding each paper's findings.

Table 1 clearly shows that most studies have found statistically significant common ownership effects. However, many of those papers use identification strategies that are subject to the critiques leveled by Lewellen and Lowry (2021) and discussed above in section 4.1. At the time of this draft, there are only two published papers that have used the alternative approaches to identification discussed in Lewellen and Lowry (2021).[28] Chen et al. (2023) estimates a difference-in-differences (DiD) model using mergers of financial institutions and finds that higher common ownership reduces profits from insider trading, consistent with common owners contributing to better governance. The paper carefully matches treatment firms with control firms of a similar size that are in the same industry and shows that the results are robust to excluding mergers around the time of the GFC. Kini et al. (2023) uses a similar DiD framework, and they find that higher common ownership leads to *greater* competition, more product development, and higher investments. The paper also shows that the results are robust to excluding mergers from the crisis period. We think that it is notable that the papers that address recent identification critiques find that common ownership leads to improved market outcomes across broad samples. Interestingly, recent theoretical work also predicts improved market outcomes arising from common ownership in certain cases. For example, López and Vives (2019) shows that when knowledge spillovers are sufficiently high, increases in common ownership can lead to higher R&D investment.

There is also a stream of papers focusing on common owners of private firms, in particular the portfolios of venture capitalists (VCs). This setting is critically different than the broader sample of public firms that represents the focus of both the theoretical and empirical literature.[29] Nonetheless, this setting is informative because many of the "key assumptions",

[28] As discussed in section 5.2, Anton et al. (2023) find anti-competitive effects of common ownership, in a specification that employs a means of identification different from all of the above papers. The strength of their identification is sensitive to the fact that treatment firms and control firms come from different industries. See section 4.1 for a more in-depth discussion of concerns with such specifications.

[29] For this reason, and for brevity, we do not include these papers in Table 1.

highlighted in section 2.2 as questionable in the setting of public firms, are almost by definition satisfied in the VC setting. In particular, VCs typically have more control rights and do not own broad sets of firms. Lindsey (2008), González-Uribe (2020), Li et al. (2023), and Eldar et al. (2023) all find evidence of information sharing among VCs' portfolio firms, in ways that influence these firms' behaviors, for example their innovation, alliances, patent citations, and capital raising. In sum, among more recent empirical papers that carefully consider identification and that have undergone the peer review process, evidence that common ownership causes anticompetitive behavior is concentrated within very specific samples, for example samples of private firms where ownership tends to be more concentrated.

7 Conclusion and paths for future research

This review of the common ownership literature highlights several key issues. First, the theoretical foundations sustaining the literature rest on several questionable assumptions. One of these is that a firm's manager knows each shareholder's preferences and acts to satisfy these (diverse) preferences. This dismisses asymmetric information and principal-agent problems between managers and shareholders. These assumptions are unlikely to hold among publicly traded firms. A further assumption common ownership models make is that managers maximize the value of their shareholders' portfolios (as opposed to maximizing firm value). Based on these assumptions, the common ownership models deliver an equilibrium whereby managers of common owned rival firms do not compete aggressively with each other. However, this predicted behavior could actually *hurt* common owners, as these owners hold shares in various industries, and weak competition and higher markups in one industry can lead to decreased profits in related industries also owned by the common owner. We encourage future research to focus on scenarios where these assumptions are less questionable, for example among private firms with concentrated owners (see Li et al. (2023)).

Second, endogeneity issues are paramount, and insufficient identification can lead to er-

roneous conclusions. Since investment decisions are endogenous, it is difficult to separately identify the effects of ownership on firm performance from the effects of expected performance on investment. While the literature has adopted several approaches to address this concern, Lewellen and Lowry (2021) shows that they are significantly flawed and suggests alternative empirical approaches to achieve cleaner identification. Recent papers employing these suggested techniques show little evidence that common ownership causes lower competition. We advise researchers to carefully address identification concerns.

Third, there are numerous issues associated with measuring common ownership. We show that the most common measure used in the literature, MHHI, has significant drawbacks. Most importantly, MHHI is a function of firm market shares, which introduces an endogeneity bias within regressions of firm performance on this common ownership measure. This is an important concern as Dennis et al. (2022a) shows that the positive correlation between this measure of common ownership and ticket prices in Azar et al. (2018) is driven by the market share component of MHHI, rather than the ownership and control parameters. An additional concern is that there is no clear way to measure the extent of investor control over firm decision-making. Most papers identify control with votes, but the literature has shown that votes are imprecisely defined and inconsistent across time and across institutions. While alternative measures have been developed to deal with some of these issues, the literature has yet to come to a consensus about the best way to measure common ownership.

A survey of the current literature, in particular those papers that have successfully gone through peer review and are now published in top tier academic journals, provides relatively little evidence that common ownership causes anti-competitive behavior among publicly traded firms. Nevertheless, it remains possible that common ownership has anti-competitive effects in other settings.

Table 1: Empirical studies

Study	Principal Outcome(s)	Find Effect?	Addressing endogeneity	Industry/ Sector	Sample Period
Adler and Mitkov (2023)	Profits, as a function of firm corporate governance and industry competition	Yes (-), when gov't is weak and competition is soft.		Public firms	1989 - 2012
Azar et al. (2018)	Airline ticket prices	Yes (+)	Fixed Effects; Blackrock-BGI merger	Airline	2001 - 2014
Azar et al. (2022a)	Depository interest rates	Yes (+)	Index fund ownership	Banking	2003 - 2013
Backus et al. (2021a)	Prices, markups	No	Structural/GMM	Cereal	2007 - 2016
Bindal and Nordlund (2022)	Gross margin, Profitability	Yes (+), among firms with more similar products	Financial institution mergers[1]	Public firms	1988 - 2019
Boller and Morton (2020)	Abnormal returns of product market rivals, when common ownership increases	Yes (+)	S&P500 Index Additions	Public firms	2000 - 2017
Brooks et al. (2018)	M&A activity	Yes (+)	Russell Index reconstitution	Public firms	1984 - 2014
Chen et al. (2023)	Insider trading profits	Yes (-)	Financial institution mergers[1]	Public firms	1997 - 2015
Dennis et al. (2022a)	Airline ticket prices	No	Fixed Effects; Placebo tests	Airline	2001 - 2014
Freeman (2023)	Duration, strength, and value of supply-chain relationships	Yes (+)	Financial institution mergers[1]	Public firms	1976 - 2010
Gao et al. (2022)	Opportunistic earnings management by supplier firms	Yes (-)	2003 mutual fund scandal	Public firms that represent suppliers	1980 - 2016
Geng et al. (2023)	Patent citation counts, Patent litigation	Yes: citations (+), Litigation (-)	Fixed effects	Public firms with 1+ patents	1991 - 2017
Gerakos and Xie (2020)	Settlements of patent lawsuits to delay generic drug entry	Yes (+)	Blackrock-BGI merger	Pharmaceutical	2003 - 2017
Gutiérrez and Philippon (2017)	Investment	Yes (-)		Public firms	1970 - 2016
He and Huang (2017)	MSH growth; M&A activity	Yes (+)	Financial institution mergers	Public firms	1980 - 2014
He et al. (2020)	Accrual-based earnings management	Yes (-)	Financial institution mergers	Public firms	1980 - 2014

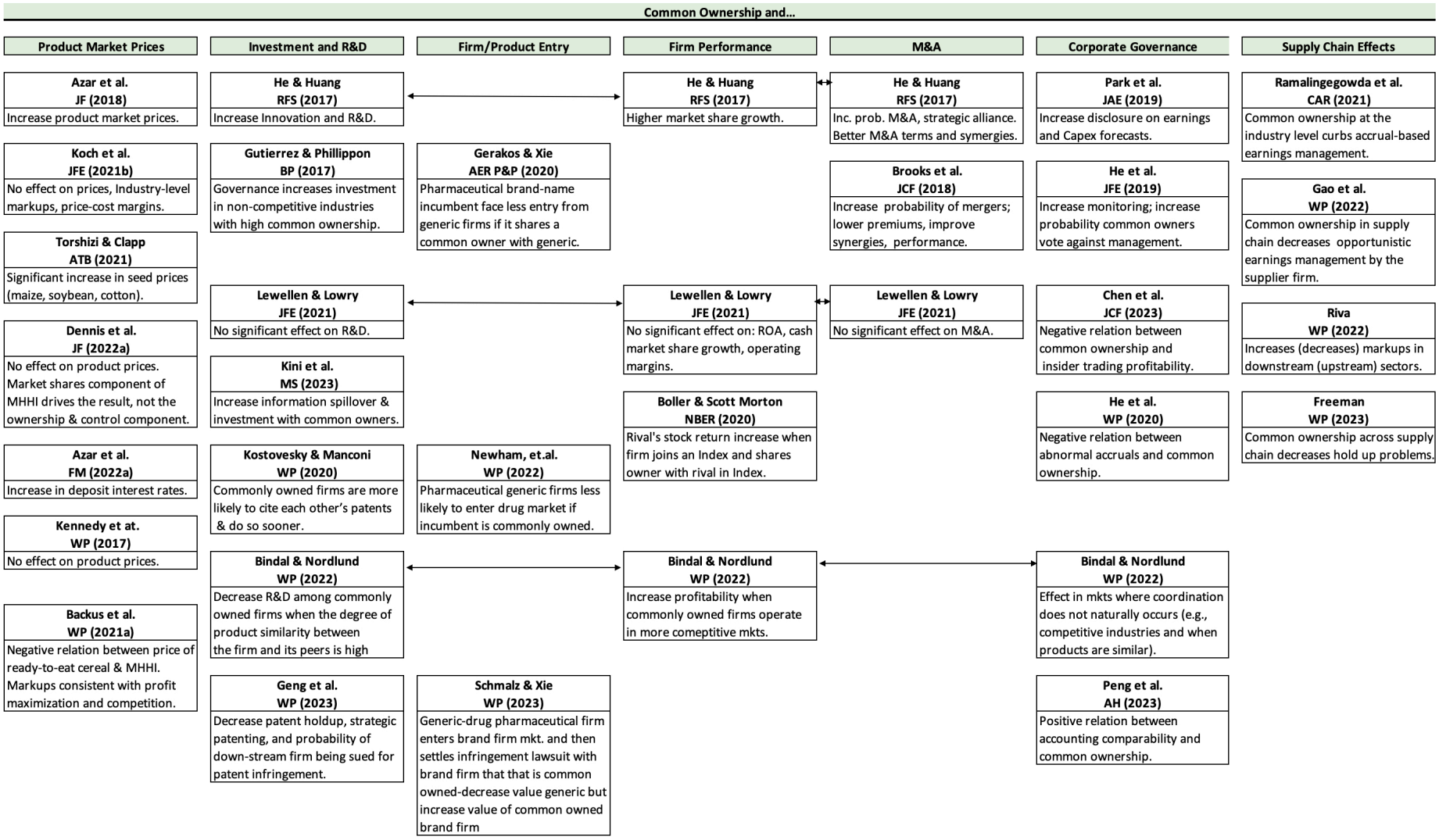
Continued on next page

Table 1 – *Continued from previous page*

Study	Principal Outcome(s)	Find Effect?	Addressing endogeneity	Industry/	Sample
He et al. (2019)	Votes against management on shareholder proposals	Yes (-)	Financial institution mergers	Public firms	2003 - 2012
Kennedy et al. (2017)	Airline ticket prices	No	Blackrock-BGI merger; Russell Index 1000 membership; Structural/GMM estimation	Airline	2001 - 2014
Kini et al. (2023)	Product market fluidity, investment	Yes (+), among sectors with high propensity for knowledge spillovers	Financial institution mergers[1]	Public firms	1997 - 2017
Koch et al. (2021)	Industry-level markups, prices, and margins	No	Financial institution mergers	Public firms	1995 - 2012
Lewellen and Lowry (2021)	ROA, R&D, Mergers	No	Financial institution mergers[1]	Public firms	1980 - 2013
Kostovetsky and Manconi (2020)	Patent citations	Yes (+)	Financial institution mergers;[1] Russell index reconstitutions	Public firms with 1+ patents	1980 - 2010
Newham et al. (2022)	Generic drug entry	Yes (-)	Membership in Dow Jones Pharma Index	Pharmaceutical	2004 - 2014
Park et al. (2019)	Voluntary disclosure	Yes (+)	Financial institution mergers	Public firms	1999 - 2015
Peng et al. (2023)	Accounting comparability	Yes (+)	Financial institution mergers	Public firms	1988 – 2017
Ramalingegowda et al. (2021)	Accrual-based earnings management	Yes (-)	Financial institution mergers	Public firms	1989 - 2015
Riva (2022)	Markups in upstream vs downstream industries	Yes (- in upstream industries; + in downstream industries)	Financial institution mergers	Public firms	1985 – 2017
Schmalz and Xie (2022)	Entry by generic drug manufacturers and settlements of patent lawsuits to delay generic drug entry	Yes (+)	Blackrock-BGI merger	Pharmaceutical	2003 - 2017
Torshizi and Clapp (2021)	Seed prices	Yes (+)	Blackrock's investments in BASF (a major agrochemical producer); Structural break analysis	Seed	1997 - 2017

[1] When using financial institution mergers as a source of identification, the paper employs the alternative approach(es) suggested by Lewellen and Lowry (2021).

Figure 3: Applied Common Ownership Papers by Topic



Journal Key: AH: Accounting Horizons; ATB: Anti-Trust Bulletin; AEJM: American Economic Journal: Microeconomics; BP: Brooking Papers; CAR: Contemporary Accounting Research; FM: Financial Management; JCF: Journal of Corporate Finance JF: Journal of Finance; JFE: Journal of Financial Economics; MS: Management Science; RFS: Review of Financial Studies; WP: Working Paper.

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