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Common Ownership, Competition, and Top Management Incentives

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Abstract

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Keywords: Common ownership, competition, CEO pay, management incentives, governance

JEL Classifications: G30, G32, D21, J31, J41

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Abstract

When one firm's strategy affects other firms' value, optimal executive incentives depend on whether shareholders have interests in only one or in multiple firms. Performance-sensitive contracts induce managerial effort to reduce costs, and lower costs induce higher output. Hence, greater managerial effort can lead to lower product prices and industry profits. Therefore, steep managerial incentives can be optimal for a single firm and at the same time violate the interests of common owners of several firms in the same industry. Empirically, managerial wealth is more sensitive to performance when a firm's largest shareholders do not own large stakes in competitors.

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I Introduction

Competition is at the core of capitalism. Smith (1776) is credited with the insight that competitive markets have the ability to channel individual self-interest to increase aggregate welfare. But what ensures that firms act in a self-interested way and thus compete with each other? The theoretical literature on incentive design has long recognized that shareholders can and do structure compensation contracts to incentivize managers to compete more or less aggressively in the product market (Hart, 1983; Vickers, 1985; Fershtman and Judd, 1987; Sklivas, 1987; Fumas, 1992; Alexander and Zhou, 1995; Schmidt, 1997; Kedia, 1998; Joh, 1999; Spagnolo, 2000; Raith, 2003), and that CEO compensation contracts affect real investment (Edmans et al., 2017). However, all of this literature assumes shareholders seek to maximize the value of a single firm in isolation, as opposed to the value of their portfolio. This in turn conflicts with the fundamental tenet of financial economics that shareholders should hold diversified portfolios in equilibrium and with the fact that the growth and consolidation of intermediated asset management has led to secular changes in beneficial ownership of firms. These changes have led to a situation in which the largest owners of firms tend to hold interests in other firms as well. The failure of the assumption that each shareholder cares only about the value of a single firm becomes relevant when firms strategically interact because in that case shareholders no longer agree that the firm should maximize its own value (Hart, 1979; DeAngelo, 1981). In particular, if shareholders also have holdings in competitors, they may wish the firm to take these interests into account when designing optimal compensation contracts.

These considerations raise the question of whether the assumption that firms' most influential shareholders want the firm to maximize only its own value continues to be a correct and useful description of empirical realities. Does this assumption obscure our understanding of first-order drivers of corporate governance in general and managerial incentives in particular? To address this question, the present paper documents the extent to which significant variation in shareholder

preferences for firm value maximization (as opposed to portfolio value maximization) exists in U.S. publicly traded firms, and shows how such variation helps explain variation in managerial incentive structures. We thus offer an answer to the central questions about optimal incentives posed by Hart and Holmstrom (1987), who ask, "to which extent the conduct of firms will be different from the assumed profit maximization behavior in classical theory [(Fisher, 1930)]; and if it differs, what ramifications [...] that ha[s] for market outcomes."

This paper shows that viewing managerial compensation through the lens of shareholders' portfolio incentives is useful in understanding variation in top management incentives in the data. Specifically, the theoretical model illustrates that providing weaker incentives to managers can have the effect of raising profits in industry equilibrium. This is because weaker incentives lead to lower managerial effort, and lower effort by several managers in the industry can lead to higher industry profits. Hence, common owners can implement their desired incentives simply by failing to offer managerial compensation that is as performance-sensitive as the compensation provided by undiversified owners. Empirically, we show that top managers tend to have stronger financial incentives to maximize firm value, as measured by wealth-performance sensitivities (Edmans et al., 2009), when an industry's firms are controlled by shareholders with lower (or no) financial stakes in competitors. Managers of firms in industries with more common ownership, by contrast, have flatter incentives that can have the effect of reducing output and competition.

Our model is similar to Raith (2003) and analyzes the role of common ownership in shaping managerial incentives. A manager maximizes the utility of her compensation net of her private cost of effort. Managerial effort reduces the firm's costs and thereby increases its profits. However, the decrease in the firm's costs also increases equilibrium quantities and decreases equilibrium prices when firms interact in the product market (i.e., it leads to more competition between firms). Thus, performance-sensitive compensation serves a dual role. It induces managerial effort to cut costs (or discourages the manager from diverting funds to himself), but also influences the competitive interaction between firms. Compared to the benchmark case of separately owned firms, a common owner benefits in the same way from cost improvements, but suffers more from the resulting

increase in output because this reduces the profits of the other firms he owns. As a result, a common owner has relatively weaker economic incentives to provide her manager with highly performance-sensitive compensation. Thus, managerial incentives are predicted to be flatter in industries where common ownership is more prevalent.[1]

On the empirical side, the first contribution of our paper is to document the extent to which the same set of diversified investors own natural competitors in U.S. industries. We show how many firms and what fraction of firms have a particular common investor among the top shareholders. For example, today both BlackRock and Vanguard are among the top five shareholders of almost 70 percent of the largest 2,000 publicly traded firms in the US; twenty years ago that number was zero percent for both firms. As a result of this increase in common ownership, ownership-adjusted levels of industry concentration are frequently twice as large as those suggested by traditional concentration indexes that counterfactually assume completely separate ownership.

We then test the model's qualitative predictions. Our primary outcome variable of interest is the sensitivity of managers' wealth (including accumulated stock and options) to their firm's performance. The reason for this choice is that managerial wealth dwarfs annual "flow" pay, and therefore more accurately reflects managers' economic incentives. Consistent with the main model prediction, we find a strong negative association between the wealth-performance sensitivity (WPS) and common ownership in a comprehensive panel of US stocks controlling for industry structure (HHI), firm- and manager-level characteristics (e.g., size, book-to-market, volatility, tenure) as well as industry-, time-, and manager-firm-fixed effects. In addition, our results remain qualitatively unchanged when we control for industry-time-fixed effects. Whereas the baseline results use Edmans et al. (2009)'s measure of WPS, we find similar results using the measures by Hall and Liebman (1998) and Jensen and Murphy (1990). Moreover, the results are qualitatively similar whether we employ the often-used MHHI delta measure of common ownership concentra-

[1]In line with previous literature, our model focuses on product market competition as one particular channel through which firms' interaction can affect the steepness of incentives. However, our results about common ownership reducing the performance-sensitivity of managerial incentives hold more generally. Specifically, they hold in any setting in which performance-sensitive compensation encourages managers to make strategic choices that have negative repercussions for the profits of other firms (partly) owned by the same shareholders.

tion, a model-free measure of top-5-shareholder-overlap, or the measure of connected stocks by Antón and Polk (2014). Our results are also robust to various alternative industry definitions.

To strengthen a causal interpretation of the link between common ownership concentration and top management incentives, we use plausibly exogenous variation in ownership caused by BlackRock's acquisition of Barclays Global Investors (BGI)—the largest such event in history—in a difference-in-differences design. The results corroborate the findings from the panel regressions: wealth-performance sensitivities decline when an industry becomes more commonly owned as a result of that consolidation event, compared to other industries that experienced a lesser increase in common ownership as a result of the acquisition.

Identifying a single mechanism driving these findings is beyond the scope of the present paper. However, it is important to document that plausible mechanisms exist. The simplest mechanism is that the absence of a large active blockholder (with a strong interest in the target firm and without interests in competitors) is associated with reduced efforts to design high-powered managerial incentives. In other words, common owners need not actively design flat incentives; they may merely fail to design steep ones the way a non-common owner would. This interpretation is also consistent with the recent evidence of shareholder rights activists challenging the large 'lazy' (Economist, 2015) asset managers to do more to curb excessive and performance-insensitive executive compensation (Melby, 2016; Melby and Ritcey, 2016; Morgenson, 2016). Under this view, managers of firms predominantly owned by "quasi-indexing" large mutual fund families live a relatively "quiet life" with flat incentives, few price wars, and high profits.

That said, our results also allow for an active channel of influence. Asset managers claim to discuss executive compensation in almost half of the hundreds of engagement meetings they conduct every year with portfolio firms.[2] Some observers thus compare the role of asset managers

[2]Of course, large institutional investors' influence reaches far beyond pay structure. For example, BLK's CEO and Chairman Larry Fink says "We can tell a company to fire 5,000 employees tomorrow" (Rolnik, 2016). Reuters headlines tell a similar story, e.g., "When BlackRock calls, CEOs listen and do deals" (Hunnicutt, 2016). Engagement meetings not only feature discussions about executive pay, but also about product market competition. For example, Chen (2016) reports that a group of seven major funds recently called a private meeting with top biotech and pharma executives in which "representatives, including those from Fidelity Investments, T. Rowe Price Group Inc. and Wellington Management Co., exhorted drug industry executives and lobbyists to do a better job

to those of activist investors (Flaherty and Kerber, 2016). So-called "passive investors" can also vote against activist investors who propose changes to top management incentives.[3]

The paper proceeds as follows. Section II discusses the related literature, and Section III presents the model. Section IV details the data set and presents the summary statistics on common ownership. The empirical results are presented in Section V. Section VI concludes.

II Related Literature

Previous contributions have analyzed the interplay between (i) product market competition and (ii) incentive contracts, as well as between (iii) common ownership and (i) product market competition. This paper completes the triangle between the three concepts by establishing a link between (ii) incentive contracts and (iii) common ownership. We review the related literatures in that order.

A large theoretical literature beginning with Vickers (1985) and Fershtman and Judd (1987) examines the relationship between (i) product market competition and (ii) managerial incentives while Aggarwal and Samwick (1999) and Cunat and Guadalupe (2005, 2009) provide empirical evidence.[4] These papers analyze both how the competitiveness of the product market influences the strength of managerial incentives as well as the reverse link of how managerial incentive contracts can be used to strengthen or soften product market interactions.[5]

Our paper is also related to a recent empirical literature that investigates the causes and consequences of (iii) common ownership of firms and its effects on (i) product market competition.

defending their pricing" amid political and public pressure to do the opposite, and "encouraged them to investigate innovative pricing models." Schlangenstein (2016) reports that a common owner of six US airlines explicitly demanded that Southwest Airlines (SWA) "boost their fares but also cut capacity" – a move against what SWA's managers believe to be in SWA's best interest; see also Levine (2016). The Wall Street Journal reports on twelve oil investors' coordinated governance intervention to reduce output and thus increase profit of their portfolio firms, https://www.wsj.com/articles/wall-streets-fracking-frenzy-runs-dry-as-profits-fail-to-materialize-1512577420

[3]See Schmalz (2015) for a case study.

[4]Other notable theoretical contributions include Scharfstein (1988), Hermalin (1992), Meyer and Vickers (1997), Vives (2008), and Baggs and de Bettignies (2007).

[5]The vast theoretical and empirical literature on managerial incentives is reviewed by Murphy (1999) and Edmans and Gabaix (2016).

For example, Azar et al. (2018, 2016) provide evidence that common ownership causes higher product prices in the airline and banking industries, respectively, Philippon and Gutierrez (2017) show that firms owned by quasi-indexers tend to underinvest relative to investment opportunities in a broad panel of US firms, and Xie and Gerakos (2018) document that pharmaceutical brands pay commonly owned generic manufacturers for delayed entry. Our paper contributes to this literature by providing one potential answer to the question about the mechanism which translates diversified shareholder incentives into firm behavior. Our analysis shows that managerial incentives to compete are, at least to some extent, aligned with the interests of shareholders in a subtle way: weaker incentives to maximize the value of the own firm can lead to lower output, and therefore higher industry profits.[6] This insight supports the view that the product market effects caused by common ownership can obtain without direct or indirect coordination between firms, but can be driven by subtle changes in unilateral incentives.

Whereas common ownership of competitors can have the effect of reducing competition, common ownership can also increase incentives to innovate (López and Vives, 2018; Antón et al., 2018). Either effect requires that firms' managers have incentives to internalize the externalities of their strategic decisions on other firms.

Related to the same literature, our paper's summary statistics on common ownership concentration (MHHID) are a significant contribution to the burgeoning literature on common ownership and increased concentration in the United States. Previous papers have provided measures of ownership for various markets within an industry, but none have calculated common ownership concentration across several industries and across time. Our analysis complements and refines analyses by Azar (2012), He and Huang (2014), and Azar (2016) who report the change over time in the likelihood that two randomly selected S&P 1500 firms in the same industry have an overlapping shareholder of a given size.

The final piece of related literature concerns previous papers investigating the effect of own-

[6] See Ikeda et al. (2017) for evidence for this mechanism from Japan, showing that weaker monitoring is related to lower output.

ership on managerial incentives. The theoretical idea that shareholder diversification (and the resulting common ownership) requires rethinking the role of managerial incentive contracts dates back to at least Arrow (1962). In particular, he argued that "any individual stockholder can reduce his risk by buying only a small part of the stock and diversifying his portfolio to achieve his own preferred risk level. But then again the actual managers no longer receive the full reward of their decisions; the shifting of risks is again accompanied by a weakening of incentives to efficiency. Substitute motivations [...] such as executive compensation and profit sharing [...] may be found." To our knowledge the earliest formal investigations of this question is by Gordon (1990) who analyzes linear relative performance evaluation (RPE) contracts when the firm's owners also care about the profits of other firms. He theoretically shows that RPE should be less prevalent when firms benefit more from their competitors' performance.[7] Hartzell and Starks (2003) study how managerial incentives vary with institutional ownership in general. We specifically investigate how cross-sectional variation in the institutions' interests in competitors relates to incentive provision.

Finally, Liang (2016) empirically shows that common ownership concentration causes less relative performance evaluation which is a conclusion consistent with the main argument of our paper and the above-mentioned theoretical literature. Kwon (2016) also empirically studies the relationship between common ownership concentration and relative performance evaluation using flow pay as the primary outcome variable, but uses different industry definitions, measures of common ownership, empirical specifications, and identification strategies, and finds results that are qualitatively opposite to those of Liang (2016) and in contradiction to the literature's theoretical predictions. Bennett et al. (2017) show that equity-based compensation declines with product market fluidity. In contrast to all these papers, we study how the economically more meaningful wealth-performance sensitivities (Edmans et al., 2009) vary with common ownership.

[7]Similar arguments have since been discussed in variations by Macho-Stadler and Verdier (1991), Hansen and Lott (1996), Rubin (2006), and Kraus and Rubin (2006).

III Model and Hypothesis Development

A Setup

The following stylized model of product market competition and managerial contracts analyzes the role of common ownership.

A1 Product Market Competition

There are 2 firms producing differentiated products. Each firm i is owned by a majority owner and a set of minority owners and it is run by a single (risk-averse) manager.[8] The model has two stages. At stage 1, the majority owner (she) of each firm proposes an incentive contract to the manager (he) of that firm. At stage 2, the managers simultaneously improve efficiency through costly private effort and engage in differentiated Cournot (Bertrand) competition in a way that is consistent with the managerial incentives shareholders designed at stage 1. We assume that a manager's action choices at stage 2 are noncontractible while profits are contractible.

We derive demand from the behavior of a representative consumer with the following quadratic utility function:

$$U(q) = A\sum_{i=1}^{2} q_i - \frac{1}{2}\left(b\sum_{i=1}^{2} q_i^2 + 2a\sum_{i\neq j} q_i q_j\right) \tag{1}$$

where q_i is the quantity of product i, $A > 0$ represents overall product quality, $b > 0$ measures the concavity of the utility function, and a represents the degree of substitutability between products i and j. $b > a > 0$ ensures that the products are (imperfect) substitutes. The higher the a, the more alike are the products. The resulting consumer maximization problem yields linear inverse demand for each product i such that the firms face symmetric inverse demand functions given by

$$P_i(q_i, q_j) = A - bq_i - aq_j, \tag{2}$$

[8] Risk aversion of the manager is not crucial to our model. The same qualitative predictions would hold for a risk-neutral manager.

where $i \in 1, 2$. Thus, the manager's action choice has a greater impact on the demand for his own product than do his competitive rivals' actions.[9]

Each firm i has a constant marginal cost given by $c_i = \bar{c} - e_i$, where $\bar{c}$ is a constant and e_i is the effort exerted by firm i's manager.

The profits of firm i are therefore given by

$$\pi_i = q_i(A - bq_i - aq_j - c_i) + \varepsilon_i. \tag{3}$$

We assume that ε_i is normally distributed with zero mean and variance σ^2, and is independent of the other firms' profit shocks.

A2 Managers

All managers simultaneously choose effort levels and quantities (prices) in accordance with the incentives given by their contracts. The manager of firm i is offered the following total compensation in the form of a linear contract

$$w_i = s_i + \alpha_i \pi_i \tag{4}$$

where s_i is a salary and α_i is the incentive slope on firm i's profits π_i. This compensation contract mirrors real-world compensation practices as top managers' compensation is usually tied to their firm's equity value which reflects the discounted value of firm profits. We assume a linear compensation contract for expositional clarity and tractability. The manager's base salary s_i is used to satisfy the individual rationality constraint which is pinned down by the manager's outside option $w_i^{'}$. Each manager's utility is given by $-\exp[-r(w_i - kq_i e_i^2/2)]$, where r is the agent's degree of (constant absolute) risk aversion and $kq_i e_i^2/2$ is his disutility of exerting effort. This functional form assumes that as the firm's output increases it becomes more costly for the manager to further

[9] Although we assume linear demands and the presence of only 2 firms, the results of our model generalize to nonlinear demand functions and $n > 2$ firms.

reduce cost. The manager's wage has expected value of $s_i + \alpha_i \pi_i$ and variance of $\alpha_i^2 \sigma^2$. Given the normal distribution of ε_i, maximizing utility is therefore equivalent to maximizing

$$s_i + \alpha_i \pi_i - \frac{r}{2} \alpha_i^2 \sigma^2 - \frac{k}{2} e_i^2. \tag{5}$$

Thus, each manager i chooses effort and sets quantity (price) to maximize his expected compensation net of risk and effort costs:

$$\max_{e_i, q_i} s_i + \alpha_i [A - b q_i - a q_j - (\bar{c} - e_i)] q_i - \frac{r}{2} \alpha_i^2 \sigma^2 - \frac{k}{2} q_i e_i^2. \tag{6}$$

Finally, note that this model is a static model. As a result, the model does not distinguish between the stock (e.g., accumulated wealth) and the flow (e.g., yearly wage) of managerial compensation and provides exactly the same predictions in both cases. However, the empirically relevant measure of α_i has been shown to be wealth-performance sensitivity (Edmans et al., 2009). We therefore interpret it as such.

A3 Owners

There are 2 owners. To simplify the exposition, we assume that these owners are symmetric such that owner i owns a majority stake in firm i and a residual share in the other firm. López and Vives (2018) show that, when the ownership stakes are symmetric, firm i's maximization problem can be restated in the following way

$$\phi_i = (\pi_i - w_i) + \lambda (\pi_j - w_j) \tag{7}$$

where the value of λ depends on the type of ownership and corresponds to what Edgeworth (1881) termed the "coefficient of effective sympathy among firms".[10]

[10] Note that by maximizing equation (7) the firm essentially maximizes a weighted average of its own as well as all other firm's profits. The particular objective function given in equation (7) is a normalization. Firms do not maximize a sum that is larger than the entire economy.

In stage 1, each majority owner publicly proposes an incentive contract (s_i, α_i) for her manager i such that the contract maximizes her profit shares in all the firms.[11] The optimal incentive contract for manager i therefore internalizes the effect on profits of the remaining firm to the extent that the majority owner of firm i also owns shares of that other firm. Hence, the relevant maximization problem for the majority owner of firm i is

$$\max_{s_i,\alpha_i}(\pi_i - w_i) + \lambda(\pi_j - w_j) \tag{8}$$

$$\text{subject to} \quad w_i \geq w_i^{'} \quad \text{and} \quad (e_i^*, q_i^*) \in \arg\max_{e_i,q_i} \mathbb{E}[-\exp(-r(w_i - kq_i e_i^2/2))]. \tag{9}$$

B Analysis

We solve for a symmetric equilibrium by backward induction. At stage 2 of the game, when the managers simultaneously choose effort and quantities, each manager knows his own incentive contract (s_i, α_i) as well as those of all of his competitors.

For a given contract (s_i, α_i) the manager's best response functions in stage 2 are

$$e_i = \frac{\alpha_i}{k} \tag{10}$$

$$q_i = \frac{A - \bar{c} - aq_j}{2b} - \frac{\alpha_i}{2bk}(1 - \frac{\alpha_i}{2}). \tag{11}$$

First, note that the stronger the incentives α_i given to the manager the larger will be the efficiency improvements e_i that he undertakes as can be seen in equation (10). This is because a larger share of the firm's profits encourages the manager to exert more effort to cut costs. Second, stronger incentives also lead to higher quantities (lower prices) because the efficiency improvements induced by stronger incentives increase the firm's per-unit profit margin, thereby encouraging the manager to set a higher quantity. This is apparent by looking at equation (11). Stronger incentives

[11] The assumption that the majority owner sets the terms of the incentive contract is made for expositional simplicity. However, even with "one share, one vote" majority voting the majority owner would be able to implement the same contract. In settings without a majority owner, the largest investor usually has the greatest chance of being pivotal. Our empirical measure of common ownership accounts for this situation.

therefore lead to more competitive product market behavior. Finally, the base salary s_i does not affect the managers' decisions.

We solve this system of best response functions $e_i(\alpha_1, \alpha_2), q_i(\alpha_1, \alpha_2)$ of the 2 firms for the managerial effort and quantity choices as a function of the vector of incentive slopes α_1, α_2 in stage 2 to obtain the equilibrium effort and quantity choices

$$e_i(\alpha_1, \alpha_2) = \frac{\alpha_i}{k} \tag{12}$$

$$q_i(\alpha_1, \alpha_2) = \frac{A - \bar{c}}{2b + a} + \frac{2b\alpha_i - a\alpha_j}{2k(4b^2 - a^2)}. \tag{13}$$

In stage 1, the majority owner of firm i uses the salary s_i to satisfy the manager's individual rationality constraint and uses the incentive slope α_i to maximize her profit shares both in firm i as well as in the other firm in the industry. We substitute the expressions for stage 2 effort and quantity from equations (12) and (13) in the objective function of owner i given by (7). We then differentiate with respect to α_i and solve for the symmetric equilibrium incentive slope $\alpha_i^* = \alpha^*$ which is given by

$$\alpha^* = \frac{2k(A - \bar{c})(8b^2 - a^2 - 2\lambda ab)}{\lambda a(4b + a) + a^2 - 2ab - 12b^2 + 4(4b^2 - a^2)(2b + a)(1 + kr\sigma^2)k}. \tag{14}$$

The following proposition establishes our central theoretical result.

Proposition 1. *The equilibrium incentives α^* given to managers decrease with the degree of common ownership λ, that is $\frac{\partial \alpha^*}{\partial \lambda} < 0$.*

Differentiating the equilibrium incentive slope α^* given in equation (14) with respect to common ownership λ immediately yields the result contained in the Proposition 1. The intuition for this result is also relatively straightforward. As common ownership λ increases, each owner cares relatively more about the profits of the other firm in the industry. Thus, each owner would prefer softer competition between the 2 firms that she partially owns. As a result, she sets incentives for the manager of her majority-owned firm to induce less competitive strategic behavior. She does

so by decreasing α_i in stage 1 because lower incentives lead to lower managerial effort to reduce costs and thus less aggressive product market behavior in stage 2.

In contrast to other moral hazard models of managerial effort in this model it is neither necessary to assume that the manager is risk-averse nor that profits include a random shock. As can be seen from equation (14) setting risk aversion r or the variance σ^2 equal to zero only eliminates another term in the denominator, but does not lead to the principal "selling the firm" to the agent and does not alter our predictions. In other models of moral hazard, the main problem of underprovision of managerial effort derives from the fact that the principal is unwilling to provide strong incentives because this would impose too much risk on the agent and would be excessively costly. In our model, however, a common-owner principal does not want to provide strong incentives because—from her point of view—this would lead to excessive effort provision and undesirably intense product market competition.[12]

Our results also hold in a different type of model in which the manager can divert corporate funds to himself, but thereby raises costs. In such a model, increasing the incentive slope α gives the manager a stronger incentive to maximize profits and thus he will divert fewer funds. Because such personal enrichment leads to lower firm profits any owner has a strong incentive to deter such behavior by designing performance-sensitive compensation plans. However, the incentive to design performance-sensitive pay is weaker for a common owner because flatter compensation leads to less aggressive product market behavior and therefore higher profits of other firms that are commonly owned by the same investor.

Although our model focuses on product market competition as one particular channel through which firms' interaction can affect the steepness of incentives, our conclusions about common ownership reducing the performance-sensitivity of managerial incentives hold more generally. Any setting in which performance-sensitive compensation encourages managers to make strategic choices

[12]Note that the degree of common ownership λ has no impact on the product market shares in our model. This is because the firms' cost structures and the market demand remain unchanged when λ changes and thus the firms' remain constant. As a result, measures of product market concentration based on market shares such as the Hirschman-Herfindal Index (HHI) are also unchanged.

that have negative repercussions for the profits of other firms will yield the same prediction.

IV Data

The model yields testable implications for the relationship between common ownership and the structure and level of top management pay. To test these predictions, we need data on executive compensation, performance, ownership, and a robust industry definition. In what follows, we first describe how common ownership is measured and then detail the data sources used to construct our variables.

A Measuring Common Ownership Concentration

To identify the extent to which common ownership concentration in an industry affects managerial incentives we need a measure of common ownership concentration. This endeavor is substantially more complicated in the empirical analysis than in theory, because there are typically more than two firms per industry and because different types of shareholders hold different portfolios. Fortunately, the existing literature provides several candidate measures of common ownership concentration that address these challenges.[13] In our baseline tests we use the "modified Herfindahl-Hirschman index" (MHHI) as a measure of market concentration. This measure, originally developed by Bresnahan and Salop (1986) and O'Brien and Salop (2000), is used by regulators worldwide to assess competitive risks from holdings of a firm's stock by direct competitors, and has previously been implemented empirically by Azar et al. (2018).

One attractive property of the measure is that it allows us to decompose total market concentration (MHHI) in two parts, industry concentration as measured by the Herfindahl-Hirschman Index (HHI), $\sum_j s_j^2$, where s_j is the market share of firm j and common ownership concentration, called MHHI delta (or MHHID). HHI captures the number and relative size of competitors; MHHID captures to which extent these competitors are connected by common ownership and ciontrol

[13] See Schmalz (2018) for a discussion of the costs and benefits or alternative measures.

links. Formally,

$$\underbrace{\sum_j \sum_k s_j s_k \frac{\sum_i \mu_{ij}\nu_{ik}}{\sum_i \mu_{ij}\nu_{ij}}}_{\text{MHHI}} = \underbrace{\sum_j s_j^2}_{\text{HHI}} + \underbrace{\sum_j \sum_{k \neq j} s_j s_k \frac{\sum_i \mu_{ij}\nu_{ik}}{\sum_i \mu_{ij}\nu_{ij}}}_{\text{MHHID}} \tag{15}$$

where ν_{ij} is the ownership share of firm j accruing to shareholder i, μ_{ij} the control share of firm j exercised by shareholder i, and k indexes firm j's competitors.

In the special case of completely separate ownership MHHI is equal to HHI because MHHID is equal to 0. An attractive feature is that the measure can be micro-founded with a voting model (Azar, 2016; Brito et al., 2018). In addition, MHHI can be interpreted in the context of a Cournot model of competition. However, we do not estimate this particular model of product market competition, but instead use MHHID as a reduced-form measure of reduced incentives to compete due to common ownership.

Given that some components of MHHID, such as market shares, are potentially endogenous, and given that MHHID only varies at the industry-time level, it is important to verify that our baseline results are robust to using alternative measures of the extent to which a firm's most powerful shareholders care about competitor profits. The first such measure we employ is the average fraction of competitor shares held by the firm's top 5 shareholders which we call the Top 5 shareholder measure. In particular, this firm-specific measure for firm j is

$$Top5_j = \frac{1}{n-1} \sum_i^5 \sum_{j \neq k} \nu_{ik} \tag{16}$$

where ν_{ik} is the ownership share of firm k accruing to shareholder i who is one of the 5 largest owners of firm j, and k indexes all of firm j's competitors (of which there are $n-1$ for a given industry). The advantage of this measure over an industry-level measure of common ownership concentration such as MHHID is that the latter may absorb relevant cross-sectional variation across firms within industry of shareholder overlap between the different companies. By looking at a firm-level measure of "effective sympathy" one firm's shareholders should have towards connected firms based on their portfolios, we may capture more precisely the intensity of the influence of common

ownership links between firms. For example, one firm in an industry of five competitors may be controlled by a single investor without stakes in competitors, whereas the other four firms are commonly owned. Although our model only makes industry-level predictions, its underlying logic also suggests that, at the firm level, executive incentives are less performance sensitive in commonly owned firms compared to firms with undiversified owners.

Another established and often used measure of connectivity of firms comes from Antón and Polk (2014). It constructs a measure of common owners i that held both stocks j and k in their portfolios and measures common ownership as the total value of stock held by all the common shareholders i of the two stocks, scaled by the total market capitalization of the two stocks j and k. Specifically, the measure is

$$FCAP_{jk} = \frac{\sum_i (S_j^i P_j + S_k^i P_k)}{S_j P_j + S_k P_k} \tag{17}$$

where S_j^i is the number of shares held by owner i of firm j trading at price P_j with total shares outstanding of S_j, and similarly for stock k. Following Antón and Polk (2014) we calculate the normalized (to have zero mean and unit standard deviation) rank-transformed $FCAP_{jk}$ to create a variable that is comparable across cross sections.[14] We refer to this measure as the Anton and Polk measure of common ownership.

B Data Description

Executive Compensation. We employ three measures of managerial incentives that have been widely used in the literature. Such a comprehensive measure of incentives should incorporate all possible links between firm performance and executive wealth. Jensen and Murphy (1990) measure CEO incentives by the change in CEO wealth for a \$1,000 increase in firm value (i.e., a dollar-dollar measure) and we denote this measure by WPS JM. In contrast, Hall and Liebman (1998) measure incentives as the dollar change in wealth for a percentage change in firm value.

[14] We also show that our results are robust to not rank-transforming this variable.

This measure is the executives' effective dollar ownership (i.e., their "equity-at-stake") and we denote it by WPS HL. Finally, Edmans et al. (2009) measure incentives as the dollar change in wealth for a percentage change in firm value divided by annual pay (WPS EGL). This measure is independent of firm size and, therefore, it is our preferred measure.[15] Summary statistics about the mean, standard deviation, and distribution of our three leading wealth-performance sensitivity measures as well as CEO tenure are given in Table 1.

Ownership. To construct the ownership variables, we use Thompson Reuters 13Fs, which are taken from regulatory filings of institutional owners. We describe the precise construction of the common ownership variables in the following section. A limitation implied by this data source is that we do not observe holdings of individual owners. We assume that these stakes are relatively small and in most cases do not directly exert a significant influence on firm management. Inspection of proxy statements of all firms in particular industries such as airlines and banking suggests that the stakes individual shareholders own in large publicly traded firms are rarely significant enough to substantially alter the measure of common ownership concentration we use *at the industry level*, even in the more prominent cases.[16] For example, even Bill Gates's ownership of about 5% of Microsoft's stock is small compared to the top five diversified institutional owners' holdings, which amount to more than 23%. As a result, including or discarding the information on Bill Gates' holdings does not have a large effect on the measure of common ownership used. We thus expect that the arising inaccuracies introduce measurement noise and an attenuation bias toward zero in our regressions.

Because common ownership summary statistics are a contribution in their own right, we discuss them in a separate subsection below. However, given that common ownership is the main explanatory variable of our study, some considerations on what drives the variable's variation are in order. Variation over time within and across industries in common ownership comes from any variation in the structure of the ownership network, i.e., from any change in top shareholder positions. These

[15] We thank Alex Edmans for providing the code to compute these wealth-performance sensitivity measures.

[16] The missing variation is likely to be more important when common ownership concentration is calculated at the market level, as can be done in industry studies.

changes include transactions in which an actively managed fund increases or offloads a position in an individual stock, as well as transactions in which an index fund increases its holdings across a broad set of firms because of inflows the fund needs to invest. It also includes variation from combinations of asset managers. Some of this variation could be thought of being endogenous to executive incentives. For example, an undiversified investor might accumulate a position in a single firm that has an inefficiently structured compensation policy in place, thus decreasing common ownership density, which would be followed by a change in compensation structure. Or, an investor might buy shares from undiversified investors and accumulate positions in competing firms, thus increasing common ownership density, with the aim of decreasing competition between them.[17] In the penultimate section of this paper we address how the exogenous and potentially endogenous parts of the variation can be decomposed and separately used in the analysis.

Table 1 reports summary statistics for our three common ownership measures.

Industry Definitions. Regarding the definition of markets and industries, we again start with the benchmark provided by the existing corporate finance literature, and then offer several refinements. Our baseline specifications define industries by four-digit SIC codes from CRSP. We construct the industry-year level HHI indices based on sales from Compustat North America. For robustness, we also use the coarser three-digit SIC codes. The advantage of doing so is that broader industry definitions may be more appropriate for multi-segment firms. Two significant disadvantages are that the market definition necessarily becomes less detailed and thus less accurate for focused firms, and that the variation used decreases. We then check robustness to using Compustat SIC-four-digit industry definitions instead of CRSP. Finally, we provide alternative tests checks using the 10K-text-based industry classifications of Hoberg and Phillips (2010, 2016) (henceforth HP).

Despite our efforts to use robust industry definitions, we acknowledge that no single one of them is perfect. In general, the assumption that an industry corresponds to a market in a way that

[17] See Flaherty and Kerber (2016) for a recent example of such conduct and a brief discussion of potential legal consequences.

precisely maps to theory will deviate from reality, no matter whether SIC or HP classifications are used. Moreover, using Compustat to extract sales and compute market shares implies we miss private firms in our sample. Studies that focus on one industry alone and benefit from specialized data sets for that purpose can avoid or mitigate these shortcomings. However, for firm-level cross-industry studies, the imperfection implied by coarser industry definitions is unavoidable: available data sets on ownership and industries also limit existing studies in the literature to public firms. We do not have a concrete reason in mind why these limitations should lead to qualitatively misleading results, but it is advisable to keep these constraints in mind when attempting a quantitative interpretation of the results.

C Common Ownership Across Industries and Over Time

Our sample contains yearly data from 1993 to 2014.[18] Table 1 provides summary statistics for HHI and MHHID at the four-digit SIC code industry level over these years. In the average and median industry, common ownership concentration is about a quarter as large as product market concentration. However, these economy-wide summary statistics obscure the variation in both product market and ownership concentration across different sectors of the economy and over time. Panel B reports the same measures of HHI and MHHID, but separately for each two-digit SIC code sector. More precisely, the concentration measures are computed for each four-digit industry and then averaged across these industries, for each two-digit code. In our regressions, we use the variation from four-digit industries and control for two-digit industry times time fixed effects.

Figure I shows that there has been a significant increase in MHHID for the average four-digit SIC code industry in various sectors over the past two decades. In particular, in construction, manufacturing, finance, and services, the average industry MHHID has increased by more 600 HHI points. While this number is a lower bound due to the coarse industry definitions we use, it is three

[18] We end our sample in 2014 because the data quality deteriorates significantly thereafter. The data providers' promised fixes are incomplete at this time.

times larger than the 200-point threshold the DoJ/FTC horizontal merger guidelines find "likely to enhance market power." This increase in ownership concentration is largely decoupled from a relatively constant product market concentration. To illustrate, Figure II shows the average HHI and MHHID time series for the manufacturing sector where the average is taken across four-digit SIC code industry definitions.

Figure II also shows that common ownership concentration MHHID can add a quantitatively large amount of concentration to standard measures of industry concentration HHI. Towards the end of our sample, in 2013, $MHHI$ is more than 1,500 points higher than HHI. Again, these magnitudes are likely underestimates of the true extent of increased market concentration, among others because antitrust enforcement typically considers market-level concentration measures as a proxy for competitive threats.[19]

What kind of investors drive the increase in common ownership concentration? Table 3 shows that large mutual fund families play an important role. Panel A reports the number and fraction of firms for which a particular investor is the largest shareholder of the firm, by two-digit industry. Panel B repeats the exercise, but instead reports the proportion of firms for which a particular investor is among the top ten shareholders of the firm. Although the two panels reveal a significant amount of sectoral variation in ownership concentration, even the average magnitude of common ownership is quite large across the entire sample of firms. For example, BlackRock is now among the largest ten shareholders of almost 70% of all the firms in our sample (roughly the 2,000 largest publicly traded firms in the U.S.). Vanguard follows very close behind.

Panel C shows that the role of these investors has become more important over the last two decades. Whereas a very small proportion of firms had one of the investors listed in the panel as one of their top ten shareholders at the beginning of our sample, a very large proportion did so at the end. For example, whereas both BlackRock and Vanguard were among the top ten shareholders in almost no firms in 1994, both were among the top ten in almost 70% of the sample

[19]Indeed, larger magnitudes have been reported with market-level concentration measures in the airlines and banking industry by Azar et al. (2018, 2016).

firms in the final years of our sample. To put that number in perspective, recall that our sample includes quite small corporations outside the S&P1,500 as well. It is less typical for large asset managers to hold large blocks of shares in that universe.

V Panel Regressions

A Empirical methodology

This section details how we translate the model's predictions into empirically testable hypotheses. Our main interest is whether the strength of top management incentives varies across industries by their level of common ownership concentration. We measure the strength of incentives with various measures of wealth-performance sensitivities (WPS) from Edmans et al. (2009) and common ownership concentration with MHHID as detailed above. Our baseline analysis regresses

$$WPS_{ijzt} = \beta \cdot F(MHHID_{z_4t}) + \gamma \cdot X_{ijzt} + \eta_{z_2t} + \mu_{ij} + \varepsilon_{ijzt}, \tag{18}$$

where i indexes managers, j firms, z_4 denotes industries at the four-digit level whereas z_2 labels industries at the two-digit level, X is a vector of controls, η and μ are the respective fixed effects, and $F(MHHID_{z_4t})$ is the rank-transformed measure of common ownership. Given the fixed effects, the main source of identifying variation are differences across industries in changes over time in common ownership concentration. In addition, we show robustness to the introduction of manager-firm and industry-year fixed effects, which becomes particularly important when we use firm-level measures of common ownership. Furthermore, to make sure that our results are not driven by outliers we winsorize our measures of compensation, sales, book to market, and institutional ownership at the 1% level. All regressions are clustered two-ways by firm and year.

B WPS Panel Regression Results

Table 4 presents the baseline results. Column (1) regresses the log wealth-performance sensitivity (WPS) which we calculate as in Table 2 of Edmans et al. (2009), on the rank-transformed common ownership concentration as measured by $F(MHHID)$, industry-fixed effects and year-fixed effects. The coefficient is negative, -0.205, and highly statistically significant. That is, wealth-performance sensitivities tend to decrease when industries become relatively more commonly-owned.

Column (2) adds the rank-transformed $F(HHI)$, size, the logarithm of book-to-market, volatility, leverage, and the logarithm of the executive's tenure with the firm as controls. Introducing these controls increases the magnitude of the common ownership coefficient to -0.537 and increases its statistical significance, as evidenced by a t-statistic of -6.731 compared to -2.875 in the first specification. The identifying variation driving these results is differences across industries in time-series changes of common ownership. The next specification addresses the concern that omitted industry-level time trends may obscure inference.

Column (3) differences out unobserved firm-level determinants of wealth-performance sensitivity by introducing firm-fixed effects. It also differences out time trends at the two-digit industry level. The remaining variation is therefore within-two-digit-industry variation across four-digit industries in time-series changes of common ownership. The relation between common ownership concentration and WPS remains robust with a 1% level of statistical significance and similar magnitude as in column (1), at -0.275. In terms of economic significance, moving from the least concentrated industry in terms of common ownership to the most concentrated industry decreases wealth-performance sensitivity by almost one-third.

B1 Robustness to alternative industry definitions

Specifications (4) and (5) present evidence of the robustness of the results shown in the previous two columns to the data source used to compute industries. Columns (2) and (3) use CRSP

definitions of SIC-4 codes to compute market shares whereas columns (4) and (5) use Compustat. The results are qualitatively similar, although quantitatively attenuated by about forty percent. Also, the level of statistical significance in column (5) drops to five percent.

Furthermore, specifications (6) and (7) are similar to the previous two sets of results. The only difference is that we use the Hoberg-Phillips four-digit industry definition. The coefficient on common ownership in both columns is highly statistically significant, and quantitatively ranks between the CRSP and Compustat specifications.

We conclude that the baseline result is robust to alternative industry definitions.

B2 Robustness to alternative WPS measures

One basic question regarding the evidence presented in Table 4 is to which extent the insights are robust to the way that managerial wealth-performance sensitivities are calculated. To investigate that question, Table 5 offers the fully saturated specifications presented in Table 4, but with various alternative outcome variables. Columns (1) through (3) use Jensen and Murphy (1990)'s sensitivity of executive pay to performance; columns (4) through (6) use Hall and Liebman (1998)'s version of the wealth-performance sensitivity. The results are qualitatively similar to those presented in Table 4, and statistically significant at least at 5% levels.

B3 Robustness to alternative measures of common ownership and "effective sympathy"

Our baseline results may also suffer from a concern about the particular measure of common ownership concentration (MHHID) we use. Although this particular measure has several attractive properties both from an empirical and theoretical perspective, we want to ensure that our results are robust to using alternative measures of the degree to which competitors are commonly owned.

We offer two alternatives. First, we calculate to which extent the top five shareholders in a firm own competitor stock as well. This variable is meant to capture to which extent firms should display "effective sympathy" to other commonly owned firms. In addition, we also use the Antón

and Polk (2014) measure of common ownership.

We present the results in Table 6. The results are consistent with and in some ways stronger than the baseline results. Both the Top 5 shareholder measure and the Anton and Polk measure of common ownership are negatively related to WPS. This is true for the SIC-4 industry definitions both in Compustat and CRSP, as well as for the HP400 industry definition. The correlations are statistically significant at 1% levels across all specifications.

Finally, Table 7 shows that when common ownership is higher the wealth-performance sensitivity of top management compensation is lower not just for CEOs, but also for all top executives. In particular, the negative association between common ownership and wealth-performance sensitivity remains significant for all industry definitions no matter whether MHHID or the Top 5 shareholder measure is used. However, the latter results are slightly stronger.

B4 Other robustness tests

We provide further robustness tests in the appendix. Although the standard approach in the literature (Edmans et al., 2009) is to take logs of the WPS measures as we do in our main analysis, Table II shows that the baseline results are robust to measuring the main outcome variable WPS EGL in levels rather than logs. Table III shows the same for the results using the alternative WPS JM and WPS HL measures. The only specification that loses its statistical significance is in specification (5), but the point estimate remains negative.

Table IV shows robustness to the non-use of logs in the outcome variable of the robustness tests with alternative common ownership measures. All results remain statistically significant at least at 10% levels. These results indicate that the main results are unlikely to be driven by outliers. To the contrary, when outliers are allowed to have a greater effect on the estimation (by using levels rather than logs), statistical significance if anything declines.

Finally, Table V shows that the results, for all of the various measures of common ownership, are robust to not rank-transforming the explanatory variables.[20]

[20] Rank-transforming is standard in the literature given the difficulty of comparing concentration measures quan-

C Discussion

Whereas the baseline results do not seem to be driven by the particular measure of WPS or common ownership or the particular industry definition used, some audiences have voiced the concern that sorting of executives with particular characteristics and preferences could be driving the results. For example, less aggressive CEOs might sort into firms that are held by common owners who, for an unexplained reason other than their economic incentives, also systematically offer "flatter" compensation packages. Our interpretation is not challenged by this plausible explanation: the purpose of the paper is to show that in firms whose largest owners are widely diversified, managers receive less performance-sensitive pay packages. This is because there are no powerful undiversified shareholders in whose interest and power it is to change these incentive schemes and to encourage more effort to maximize the value of a single firm in isolation. Given that this sorting hypothesis is part of the narrative we propose, we do not intend to challenge this interpretation.

That said, it is interesting to know to which extent the correlations reported so far have a causal interpretation, among others because ownership decisions could reasonably be related to expected changes in firms' product market strategies, which may be reflected in or driven by managerial incentives as measured by WPS. Similar to the strategy used in Azar et al. (2018)'s study of airline ticket prices and Liang (2016)'s study of relative performance evaluation, we explore this question by using variation in ownership caused by BlackRock's acquisition of Barclays Global Investors in a difference-in-differences design – the largest such event in history.

D Difference-in-differences Design

Using variation in ownership implied by the pre-acquisition equity portfolios of BlackRock and Barclays Global Investors (BGI) can yield more internally valid and quantitatively accurate estimates of the effect of common ownership on WPS under the identifying assumption that there

titatively across industries.

is no systematic unobserved variation conditional on controls that correlates both with ownership changes implied by the BLK-BGI acquisition and with future variation in WPS. A violation of that assumption could be that BlackRock's decision to acquire control over the particular portfolio under management of the BGI family of funds was driven by anticipated changes in managerial incentive contracts in such a way that thus-implied increases in common ownership across firms and four-digit industries within two-digit industries happen to align with the anticipated changes in incentives, also across firms and four-digit industries within two-digit industries. Given the history and stated purpose of the acquisition (detailed in Azar et al. (2018)), this hypothesis seems implausible, but we want to be clear that the following results only have a causal interpretation under the above assumption.

As the acquisition was announced in the second quarter of 2009 and consummated (including the harmonization of corporate governance strategies, according to insiders) by the end of the same year, we want to use the pre-merger portfolios as a source of variation. We thus seek to avoid the use of potentially endogenous variation in ownership that was triggered by the acquisition itself.

The estimated specification is:

$$WPS_{ijzt} = \alpha \cdot Treat_{ijz_4} + \beta \cdot Treat_{ijz_4} \cdot Post_t + \gamma \cdot X_{ijz08} + \eta_{z_2} + \mu_t + \varepsilon_{ijzt}, \tag{19}$$

where i indexes managers, j firms, z_4 denotes industries at the four-digit level whereas z_2 labels industries at the two-digit level, X_{ijz08} is a vector of controls measured in 2008 (to avoid using potentially endogenous post-treatment variation), η and μ are two-digit-industry and time-fixed effects. The estimation is run on a sample with three pre- and three post-years in addition to the treatment year; $Post_t$ is a dummy variable equal to 1 for years 2010, 2011, and 2012, and zero for years 2006 to 2009.

As in Azar et al. (2018), $Treat_{ijz}$ takes the value of 1 if firms are in the top tercile of the implied change in common ownership from the hypothetical merger of BLK and BGI in 2008, and 0 if firms are in the bottom tercile of the implied change in common ownership distribution. To

compute "implied change" we first calculate the common ownership variable in December 2008, the year before the acquisition was announced (Q2 of 2009). We then calculate the same common ownership measure for the same period, with the only difference being that we treat the holdings of BlackRock and Barclays as if they had already been held by a single entity. The difference between the hypothetical common ownership in 2008 and the true common ownership yields the implied change in common ownership, which serves to assign firms into treated and control groups.

Different from Azar et al. (2018), we not only measure increases in common ownership at the market (here: industry) level using MHHID as a measure of common ownership, but alternatively also at the firm level within industry by using the Top 5 shareholder measure.

Table 8 presents the results. In particular, for all combinations of various WPS measures (EGL, JM, and HL) and common ownership measures (MHHID and the firm-level Top 5 shareholder measure), we show how changes in WPS relate to the implied changes in common ownership. The first row shows consistently insignificant coefficients, indicating that WPS trends across industries before 2009 are unrelated to the implied change in common ownership from the BLK-BGI merger, conditional on controls.

The key result is presented in the second row: the negative coefficient on the interaction between treatment and the post-merger dummy indicates that post-merger variation across four-digit industries (or firms) within two-digit industries in common ownership correlates negatively with the change in WPS in the firms in the respective industries. This result is statistically significant at the 1% level in the EGL-MHHID specification presented in column (1), significant at 5% levels in the EGL-Top 5 specification (2), both the JM-MHHID and JM-Top 5 specifications (3) and (4), as well as the HL-Top 5 specification (6). The HL-MHHID specification has the lowest level of statistical significance at 10% levels.

In sum, the difference-in-difference specifications are estimated on a smaller sample and using much less variation in common ownership and WPS than the panel results presented earlier. The advantage is that they may be more internally valid, i.e., strengthen a causal interpretation of the results presented in this paper. On the downside, the estimates may enjoy less external validity.

To obtain a full picture of the evidence, a combination of panel and difference-in-difference results may be most informative.

VI Conclusion

This paper examines theoretically how shareholder incentives may affect optimal managerial incentive contracts in the context of a model of competitive strategies. The model predicts that the sensitivity of top managers' wealth to their firm's performance is weaker when the firm's largest shareholders are also large shareholders of competitors. By contrast, the wealth-performance relation for managers is steeper when firms are owned by shareholders without significant stakes in competitors. Although our model focuses on product market competition as one particular channel through which firms' interaction can affect the steepness of incentives, our theoretical conclusions about common ownership reducing the performance-sensitivity of managerial incentives hold more generally. Any setting in which performance-sensitive compensation encourages managers to make strategic choices that have negative repercussions for the profits of other firms will yield the same prediction.

Our empirical analysis documents robust support for these predictions. The present paper thereby provides an answer to the applied question about which mechanism could potentially induce the less competitive product market behavior of firms that arises from higher concentrations of common ownership. The answer we propose here is that shareholder pressure to maximize firm value (e.g., through high-powered managerial incentive contracts that spur competitive behavior) is more valuable in firms and industries that feature more concentrated and less common ownership. We thereby provide an explanation for why large institutional investors, such as largely passive mutual fund families, have reduced incentives to engage in corporate governance activities that promote firm-value maximization. This complements previous contributions in this literature which emphasize the motive of saving on governance costs and the presence of agency problems within mutual fund families that may limit their incentives to engage in the same way that a large

concentrated investor (such as an entrepreneur-founder or activist investor) would.

This step forward naturally raises additional "mechanism" questions: do shareholders (or rather board members) explicitly think about the effect of competition when they set managerial incentives contracts? Are board members proposed (and elected) who tend to support more optimal incentive contracts if elected to the compensation committee? Do the contracts themselves make explicit mention of these considerations, or are the incentives only implicit in the payoff structure, as documented in the present paper? These questions are challenging to answer: theories of shareholder or board members' thought processes pose challenges for gathering evidence for an empirical evaluation, and looking at the language and features of contracts is not necessarily informative even about the *sign* of competitive incentives these features imply. For example, relative performance evaluation can give pro-competitive incentives if performance is measured in terms of firm value creation, but can have anti-competitive effects if performance is measured in terms of margins. Merely checking for the presence of relative performance provisions in contracts is therefore not informative about the question of competitive incentives, but requires new methods of analyzing contracts. We therefore leave addressing these questions to future research.

At a more general level, our results challenge the validity of a ubiquitous and fundamental assumption in financial economics that has rarely been examined: the fact that firms' ownership structures and shareholders' competitive preferences affect the structure of managerial incentives suggests that a firm's behavior and objectives depend on who owns the firm. Our findings may therefore motivate future studies that re-examine other questions in corporate finance and corporate governance by testing hypotheses derived from alternative objective functions of the firm against each other.

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Figures

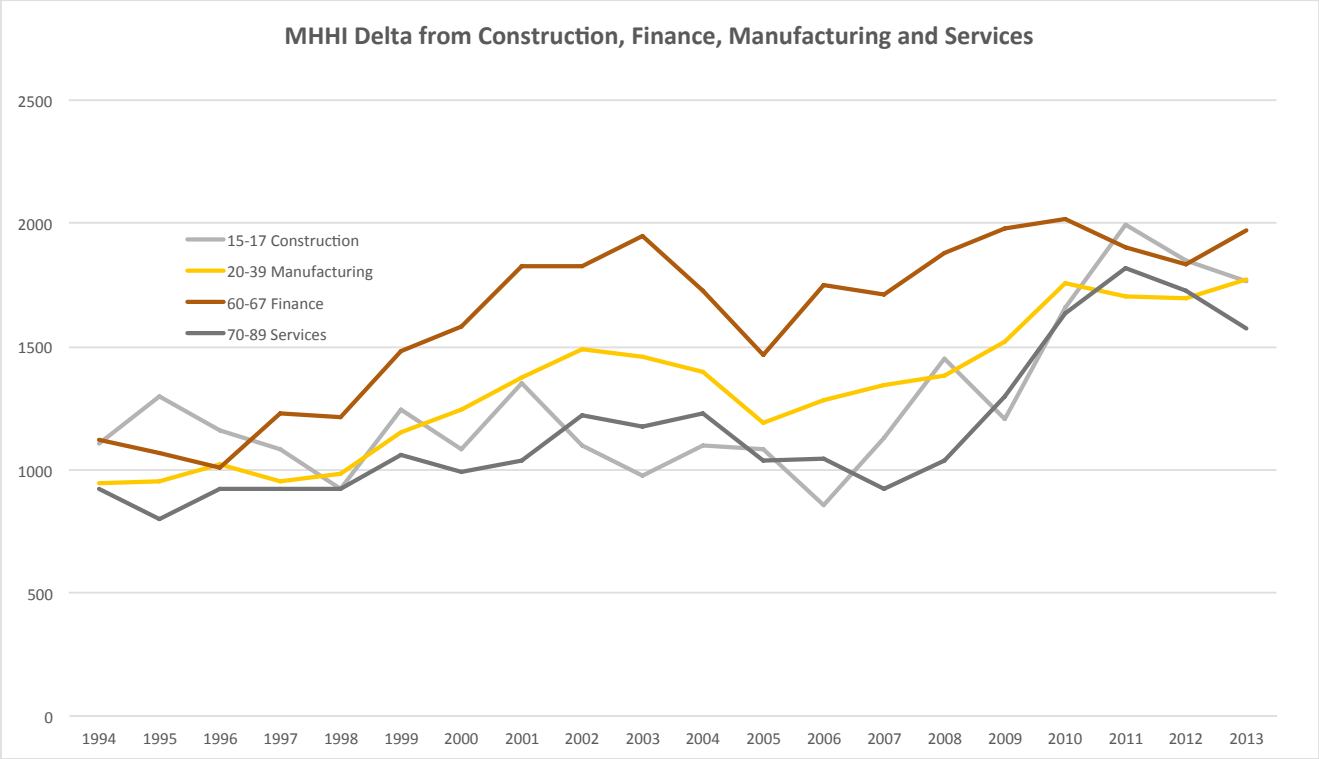

Figure I. Common ownership concentration (MHHI Delta) in various sectors over time.
This figure plots the ownership concentration as measured by MHHI Delta averaged across four-digit SIC code industries for various sectors (construction, manufacturing, finance, and services) for the years 1994 to 2013.

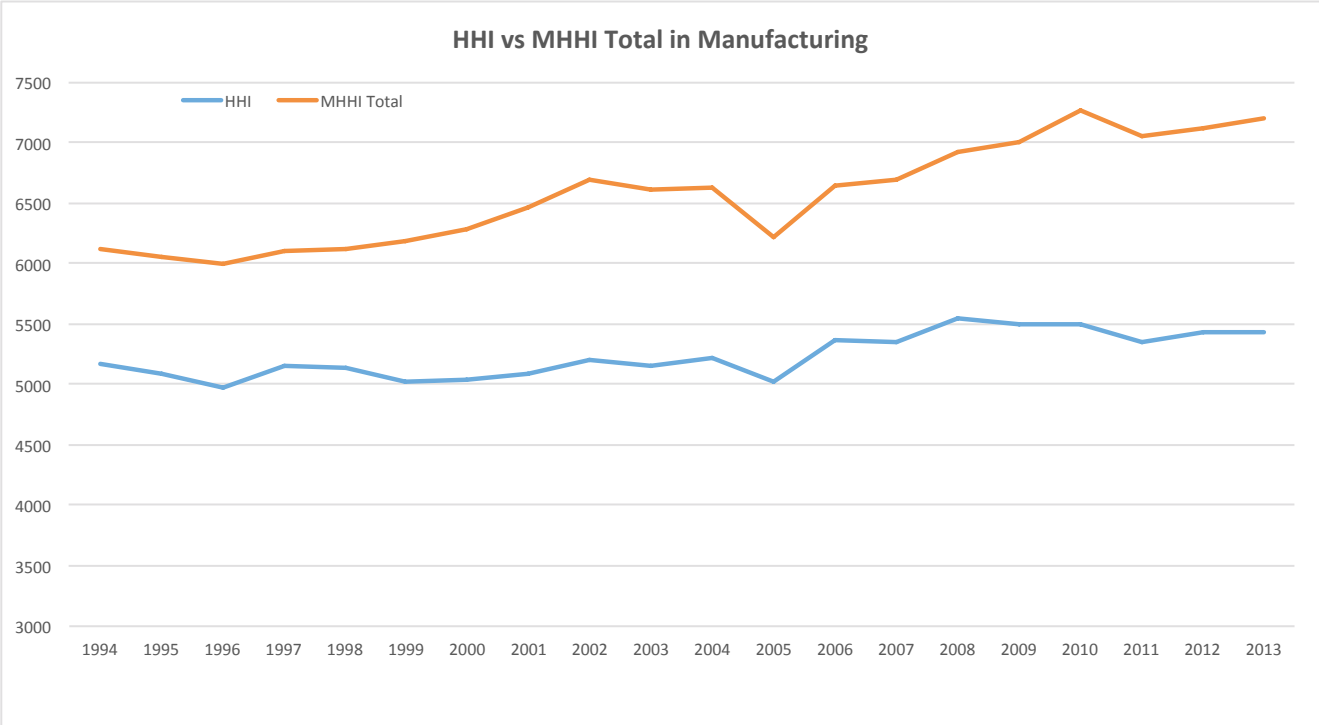

Figure II. Four-digit SIC HHI versus MHHI Delta over time in manufacturing.
This figure plots the product market and ownership concentration in manufacturing industries as measured by HHI and MHHI Delta averaged across four-digit SIC code industries in manufacturing for the years 1994 to 2013.

Tables

Table 1. Summary statistics for key variables.

This table reports summary statistics for the variables at the manager level (wealth-performance sensitivities and tenure), at the firm level (performance, size, and volatility), and at the industry level (HHI and MHHI Delta).

Variables	N	Mean	Median	Std	10%	90%
At the CEO level						
WPS EGL	40,347	25.90	6.21	69.35	1.22	47.14
WPS JM	40,347	18.30	6.30	30.51	0.59	51.00
WPS HL	40,347	61.46	19.27	119.87	2.31	149.17
Tenure (years)	42772	7.22	6.00	4.72	2.00	14.00
At the firm level						
Log(Market Equity)	42,186	7.640	7.531	1.582	5.721	9.776
Volatility	42,044	0.104	0.091	0.053	0.050	0.176
Leverage	42,025	0.235	0.212	0.208	0.000	0.485
At the industry level (SIC4)						
HHI	12514	0.587	0.537	0.313	0.174	1.000
MHHI Delta	9610	0.150	0.120	0.134	0.011	0.327
Firm level Common ownership (SIC4)						
Common Ownership Top 5 Equal Weighted	8,862	0.061	0.047	0.049	0.008	0.139
Anton and Polk FCAP measure	9,592	0.191	0.174	0.117	0.047	0.366

Table 2. Panel A: Cross-sectional variation of product market (HHI) and common ownership (MHHID) concentration, across and within industries.

This table reports summary statistics for product market and ownership concentration for the average two-digit SIC industry, whereas average are taken across four-digit SIC industries.

			HHI			MHHI Delta	
Main SIC group and Description	# of 4-digit SIC in 2013	# of 4-digit SIC-Years	Mean	10%	90%	Mean	10%	90%
01-09 Agriculture, Forestry, Fishing	4	214	6882	5314	9955	448	4	1260
10-14 Mining	77	1684	4510	1174	8806	1609	24	3504
15-17 Construction	24	981	4761	1542	8168	1204	60	2719
20-39 Manufacturing	707	23761	5247	2230	8949	1253	53	2932
40-49 Transportation & Public Utilities	152	4184	3826	1028	7211	1797	133	3831
50-51 Wholesale Trade	107	3222	5034	2346	8660	1272	60	2839
52-59 Retail Trade	120	3903	4552	1669	7887	1452	141	3157
60-67 Finance, Insurance, Real Estate	168	5241	3817	1017	7908	1520	82	3618
70-89 Services	246	7409	4722	1681	8576	1113	62	2518

Table 2. Panel B: Time-series variation of Production Market (HHI) and Common Ownership (MHHID) Concentration, by Industry.

This table reports the variation over time in the conventional HHI measure of product market concentration and the additional piece to concentration stemming from common ownership, MHHI Delta, in various industries. The concentration numbers are averages across four-digit SIC industries, for each two-digit SIC industry group.

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
01-09 Agriculture, Forestry, Fishing	HHI	6945	6858	6370	6198	6842	6543	6134	5802	5808	5620	8048	7991	8462	9972	9491	8011	7747	9961	9987	9991
	MHHID	393	818	417	139	94	358	1016	926	361	675	47	305	90	0	2	231	604	8	2	0
10-14 Mining	HHI	4746	4203	4481	4816	4579	4814	4796	4156	4375	4096	4509	3761	4837	4563	4965	4585	4173	4230	4081	4487
	MHHID	1227	1920	1706	1418	1307	1241	1764	1502	1703	1933	1533	1066	1460	1404	1700	1578	2224	2047	1981	1899
15-17 Construction	HHI	4359	4223	4922	4149	4071	3517	4044	4634	4808	4839	4773	5039	4799	5699	5929	4998	5611	4234	3959	4040
	MHHID	1103	1299	1158	1080	923	1242	1080	1351	1101	980	1099	1085	856	1131	1449	1206	1655	1998	1847	1763
20-39 Manufacturing	HHI	5173	5095	4973	5152	5139	5028	5044	5094	5206	5155	5222	5030	5362	5355	5542	5490	5503	5349	5426	5428
	MHHID	942	953	1025	953	985	1151	1246	1377	1492	1460	1398	1188	1280	1345	1379	1516	1761	1705	1700	1771
40-49 Transportation & Public Ut.	HHI	4298	4503	4152	3803	3643	3557	3399	3246	3388	3482	3795	3754	3470	3881	3802	3760	3714	3893	3967	3868
	MHHID	1557	1447	1363	1434	1318	1563	1726	1845	2400	2374	1999	1335	1781	1942	1884	2228	2239	2398	2111	2322
50-51 Wholesale Trade	HHI	5223	4884	4689	4876	4459	4323	4752	4549	4292	4366	4751	5079	5428	5442	5373	5809	5590	5702	5465	5469
	MHHID	882	864	951	765	944	1036	1287	1358	1947	1811	1584	1706	1642	1395	1674	1449	1790	1587	1405	1540
52-59 Retail Trade	HHI	3960	4052	4204	4404	4221	4459	4590	4454	4507	4178	4298	4443	4772	4862	4724	5051	4714	4379	4623	4577
	MHHID	1102	1224	1372	1211	1330	1293	1423	1438	1645	1957	1949	1578	1596	1282	1449	1542	1902	1908	1770	2243
60-67 Finance, Insurance, Real Estate	HHI	3736	3708	3724	3545	3534	3693	3462	3220	3629	3603	3867	3886	4455	4393	4253	3971	3866	3909	3722	3693
	MHHID	1121	1068	1009	1226	1216	1485	1579	1826	1829	1948	1725	1468	1753	1712	1880	1981	2016	1903	1837	1968
70-89 Services	HHI	4766	4827	4601	4378	4202	4354	4507	4489	4627	4344	4502	4716	4629	4984	4983	5162	4929	4813	4667	4952
	MHHID	926	799	919	926	924	1060	989	1039	1225	1173	1231	1038	1043	925	1039	1296	1639	1817	1728	1572

Table 3. Panel A: Fraction of firms in which investor X is the largest shareholder, by industry.
This table reports the average proportion of firms in two-digit SIC industries for which a given investor is the largest shareholder as of June 2013.

		2-digit SIC Industries								
	Firms with top shareholder	**01-09** Agriculture, Forestry, Fishing	**10-14** Mining	**15-17** Construction	**20-39** Manufact	**40-49** Transport Public Utilit	**50-51** Wholesale Trade	**52-59** Retail Trade	**60-67** Finance, Insurance, Real Estate	**70-89** Services
BlackRock	655	7.7%	12.9%	26.0%	16.6%	20.7%	12.5%	11.4%	16.9%	10.4%
Vanguard	222	0.0%	2.7%	0.0%	3.9%	4.8%	1.8%	5.2%	10.9%	2.4%
State Str	25	0.0%	0.0%	0.0%	1.1%	1.0%	0.0%	0.5%	0.3%	0.2%
Dimensional Fund Advisors	193	0.0%	2.7%	4.0%	5.4%	2.7%	5.4%	5.7%	5.8%	2.7%
The Northern Trust Co.	4	0.0%	0.7%	0.0%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%
Fidelity	347	7.7%	3.7%	10.0%	8.9%	4.1%	14.3%	18.0%	5.7%	10.9%
Mellon Asset Management	10	0.0%	0.3%	0.0%	0.4%	0.0%	0.0%	0.0%	0.2%	0.2%
Wellington	146	0.0%	2.7%	4.0%	2.4%	2.4%	1.8%	0.9%	7.3%	2.1%
T. Rowe Price	175	0.0%	3.4%	6.0%	4.0%	3.1%	2.7%	10.9%	2.5%	6.0%
JP Morgan	30	0.0%	1.0%	2.0%	0.7%	1.0%	1.8%	0.9%	0.2%	0.9%
Royce & Associates	97	15.4%	1.4%	2.0%	3.8%	1.0%	5.4%	3.8%	0.9%	1.2%
Renaissance Tech. Corp	67	0.0%	0.0%	2.0%	2.3%	2.2%	3.6%	0.5%	0.0%	2.7%
Invesco	20	0.0%	1.4%	2.0%	0.6%	0.2%	0.9%	0.5%	0.1%	0.5%
Capital Group	116	0.0%	4.4%	2.0%	3.6%	4.1%	0.0%	2.8%	1.5%	1.7%
Goldman Sachs	19	0.0%	1.0%	0.0%	0.3%	0.5%	0.9%	0.0%	0.5%	0.5%

Table 3. Panel B: Fraction of firms in which investor X is among the largest 10 shareholders, by industry.
This table reports the average proportion of firms in two-digit SIC industries for which a given investor is among the largest 10 shareholders as of June 2013.

		2-digit SIC Industries								
	Firms with top 10 shareholder (Universe of 4676 firms)	**01-09** Agriculture, Forestry, Fishing	**10-14** Mining	**15-17** Construction	**20-39** Manufact	**40-49** Transport Public Utilit	**50-51** Wholesale Trade	**52-59** Retail Trade	**60-67** Finance, Insurance, Real Estate	**70-89** Services
BlackRock	3025	54%	53%	80%	76%	68%	70%	86%	69%	72%
Vanguard	3038	46%	51%	74%	77%	61%	72%	85%	72%	74%
State Str	1625	38%	33%	34%	39%	39%	30%	58%	42%	30%
Dimensional Fund Advisors	1531	38%	24%	42%	38%	29%	43%	42%	41%	33%
The Northern Trust Co.	904	23%	17%	12%	22%	25%	26%	18%	27%	14%
Fidelity	1292	23%	26%	38%	31%	25%	37%	41%	27%	35%
Mellon Asset Management	655	8%	8%	14%	18%	19%	15%	22%	15%	10%
Wellington	787	8%	16%	26%	18%	13%	17%	20%	24%	17%
T. Rowe Price	753	0%	15%	22%	20%	17%	13%	25%	14%	19%
JP Morgan	539	8%	14%	12%	11%	17%	17%	19%	13%	11%
Royce & Associates	533	31%	7%	16%	20%	6%	22%	13%	6%	11%
Renaissance Tech. Corp	680	31%	11%	10%	20%	16%	16%	18%	10%	20%
Invesco	478	15%	8%	18%	11%	13%	5%	11%	12%	12%
Capital Group	451	8%	12%	10%	12%	14%	4%	12%	8%	11%
Goldman Sachs	371	0%	10%	10%	7%	13%	10%	4%	12%	6%

Table 3. Panel C: Fraction of firms in which investor X is among the Largest 10 Shareholders, over time.

This table reports the average proportion of US Corporations for which a given investor is among the largest 10 shareholders.

TOP 10 BLOCKHOLDERS	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
BlackRock	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	1%	3%	3%	8%	9%	9%	69%	72%	71%	69%
Vanguard	0%	0%	0%	10%	12%	17%	25%	30%	35%	32%	36%	37%	41%	45%	54%	65%	65%	66%	69%	68%
State Str	13%	8%	7%	8%	10%	10%	15%	19%	23%	32%	31%	20%	22%	23%	26%	33%	37%	37%	37%	36%
Dimensional Fund Advisors	29%	31%	32%	34%	34%	36%	36%	35%	38%	37%	31%	32%	33%	34%	39%	42%	39%	37%	36%	33%
The Northern Trust Co.	2%	2%	1%	1%	2%	10%	11%	14%	18%	22%	18%	13%	10%	8%	8%	16%	20%	17%	20%	20%
Fidelity	25%	26%	24%	23%	23%	21%	21%	23%	25%	28%	29%	26%	29%	28%	29%	30%	31%	30%	29%	30%
Mellon Asset Management	25%	24%	23%	24%	24%	21%	23%	22%	19%	17%	16%	15%	15%	12%	13%	16%	15%	15%	15%	14%
Wellington	10%	11%	11%	11%	12%	12%	12%	14%	16%	16%	17%	17%	20%	19%	19%	17%	19%	20%	19%	18%
T. Rowe Price	5%	5%	6%	7%	8%	8%	8%	9%	10%	10%	11%	11%	13%	14%	14%	16%	15%	17%	18%	17%
JP Morgan	7%	6%	6%	6%	7%	0%	5%	10%	8%	6%	5%	8%	8%	9%	8%	8%	9%	10%	12%	12%
Royce & Associates	6%	5%	4%	3%	3%	4%	4%	7%	10%	10%	11%	11%	11%	12%	12%	13%	13%	13%	13%	12%
Renaissance Tech. Corp	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	6%	17%	22%	21%	15%	13%	15%	15%
Invesco	5%	4%	4%	10%	13%	4%	9%	9%	9%	9%	8%	7%	6%	5%	9%	10%	12%	12%	11%	11%
Capital Group	8%	8%	9%	10%	11%	11%	13%	13%	13%	11%	12%	10%	12%	12%	12%	11%	11%	12%	11%	10%
Goldman Sachs	0%	0%	0%	2%	0%	6%	6%	6%	6%	7%	8%	11%	11%	14%	13%	12%	9%	9%	9%	8%

Table 4. Wealth-performance sensitivities as a function of common ownership.

This table presents the association between common ownership (MHHID) and the Edmans, Gabaix and Landier (2009) measure of wealth-performance sensitivity (EGL), after controlling for industry- and year-fixed effects. The universe covers all CEOs from 1993 to 2014. We use industry definitions based on 4-digit SIC codes as well as the Hoberg & Phillips 400 definition. Column 1 presents the correlation between the measure of common ownership (MHHID) and WPS. Column 2 adds the measure of product market differentiation (HHI) and a full set of controls. Column 3 adds firm-fixed effects. Columns 4 and 5 use the Hoberg & Phillips industry definition at the 400 level. Note that the Hoberg & Phillips are available starting in 1996. *** p<0.01, ** p<0.05, * p<0.1.

	Log(Wealth-Performance Sensitivity EGL)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Common Ownership (MHHID)	-0.205***	-0.537***	-0.275***	-0.266***	-0.158**	-0.375***	-0.230***
	(-2.875)	(-6.731)	(-4.555)	(-3.601)	(-2.798)	(-4.134)	(-3.030)
HHI		-0.307***	-0.220***	-0.124	-0.0547	-0.169**	-0.0997
		(-3.822)	(-2.834)	(-1.533)	(-0.856)	(-2.143)	(-1.378)
Size		0.180***	0.519***	0.172***	0.516***	0.181***	0.545***
		(13.47)	(12.10)	(12.81)	(12.26)	(13.27)	(12.68)
Volatility		0.857**	1.565**	0.952**	1.723***	0.598	1.716***
		(2.280)	(2.467)	(2.566)	(2.891)	(1.593)	(2.874)
Leverage		-0.818***	-0.123	-0.927***	-0.121	-0.909***	-0.0934
		(-7.950)	(-1.175)	(-8.720)	(-1.302)	(-8.188)	(-0.970)
Log (Tenure)		0.466***	0.529***	0.475***	0.532***	0.457***	0.528***
		(18.70)	(13.50)	(19.05)	(14.49)	(18.44)	(13.65)
Observations	36,680	36,478	36,478	38,547	38,291	33,920	33,594
R-squared	0.097	0.182	0.253	0.180	0.651	0.186	0.656
Industry Definition	SIC4 CRSP	SIC4 CRSP	SIC4 CRSP	SIC4 COMP	SIC4 COMP	HP-400	HP-400
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	No	No	Yes	No	Yes	No	Yes
Firm FE	No	No	Yes	No	Yes	No	Yes
Number of Firms			3,239		3,285		3,067

Table 5. Wealth-performance sensitivities as a function of common ownership: alternative WPS measures.
This table presents coefficients from regressions of wealth-performance sensitivities on common ownership (MHHID). The difference to Table 4 is that we use alternative measures of wealth-performance sensitivity. The universe covers all CEOs from 1993 to 2014. We use industry definitions based on 4-digit SIC codes as well as the Hoberg & Phillips 400 definition. In columns 1 to 4 the dependent variable is the Jensen and Murphy (1990) measure while columns 5 to 8 use the Hall and Liebman (1998) measure (both in logs). *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable	Log(WPS JM)			Log(WPS HL)		
	(1)	(2)	(3)	(4)	(5)	(6)
Common Ownership (MHHID)	-0.211***	-0.106**	-0.180***	-0.212***	-0.106**	-0.154***
	(-3.454)	(-2.218)	(-3.518)	(-3.952)	(-2.117)	(-2.934)
HHI	-0.217***	-0.0955	-0.123*	-0.241***	-0.0742	-0.128*
	(-3.329)	(-1.316)	(-1.832)	(-3.798)	(-1.285)	(-2.010)
Size	0.174***	0.173***	0.218***	0.879***	0.878***	0.906***
	(2.914)	(2.976)	(3.551)	(24.31)	(25.07)	(25.23)
Volatility	1.682**	1.845***	1.882**	2.132***	2.247***	2.245***
	(2.387)	(2.818)	(2.812)	(3.588)	(4.008)	(3.910)
Leverage	-0.821***	-0.817***	-0.775***	-0.0867	-0.0843	-0.0527
	(-6.691)	(-7.466)	(-6.930)	(-1.087)	(-1.222)	(-0.755)
Log(Tenure)	0.455***	0.459***	0.456***	0.478***	0.483***	0.483***
	(12.11)	(13.01)	(12.25)	(12.40)	(13.38)	(12.56)
Observations	36,216	38,291	33,594	36,216	38,291	33,594
R-squared	0.780	0.776	0.773	0.789	0.785	0.793
Industry Definition	SIC4 CRSP	SIC4 COMP	HP-400	SIC4 CRSP	SIC4 COMP	HP-400
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	3,239	3,285	3,067	3,239	3,285	3,067

Table 6. Wealth-performance sensitivities as a function of common ownership: alternative common ownership measures.

This table presents regressions similar to those in Table 4, but instead of MHHID uses two alternative common ownership measures. The first measure captures for each firm's top 5 shareholders the amount of overlap among peers. The second measure is based on Anton and Polk (2014) and captures for each firm the average total value of stock held by the common funds of any two stock pair, scaled by the total market capitalization of the two stocks. The universe covers all CEOs from 1999 to 2014. We use industry definitions based on 4-digit SIC codes as well as the Hoberg & Phillips 400 definition. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable	Log(Wealth-Performance Sensitivity EGL)					
	(1)	(2)	(3)	(4)	(5)	(6)
CO (Top 5 Sh Overlap)	-0.150***		-0.188***		-0.156***	
	(-3.254)		(-4.412)		(-3.546)	
CO (Anton and Polk measure)		-0.347***		-0.390***		-0.412***
		(-4.021)		(-4.028)		(-3.601)
HHI	-0.0968	-0.0884	-0.00109	-0.0217	0.00400	-0.0298
	(-1.360)	(-1.170)	(-0.0175)	(-0.374)	(0.0523)	(-0.420)
Size	0.522***	0.526***	0.516***	0.527***	0.542***	0.559***
	(11.92)	(12.20)	(12.19)	(12.62)	(13.02)	(13.38)
Volatility	1.737**	1.572**	1.768***	1.709***	1.731***	1.679**
	(2.735)	(2.533)	(2.956)	(2.925)	(2.884)	(2.853)
Leverage	-0.0710	-0.102	-0.0992	-0.108	-0.0759	-0.0772
	(-0.732)	(-1.020)	(-1.054)	(-1.177)	(-0.791)	(-0.818)
Log(Tenure)	0.534***	0.535***	0.536***	0.538***	0.535***	0.534***
	(13.72)	(14.15)	(14.89)	(15.20)	(14.00)	(14.38)
Observations	35,251	36,083	37,789	38,151	33,207	33,463
R-squared	0.654	0.654	0.653	0.652	0.656	0.657
Industry Definition	SIC4 CRSP	SIC4 CRSP	SIC4 COMP	SIC4 COMP	HP-400	HP-400
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	3,207	3,237	3,274	3,284	3,056	3,063

Table 7. Wealth-performance sensitivities as a function of common ownership: all executives.

This table presents regressions similar to those in Table 4 with the sample now covering all top executives (not just CEOs) from 1993 to 2014. We report coefficients from regressions of wealth-performance sensitivities on two measure of common ownership: MHHID and the Top 5 shareholder measure. We use industry definitions based on 4-digit SIC codes as well as the Hoberg & Phillips 400 definition. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable	Log(Wealth-Performance Sensitivity EGL)					
	(1)	(2)	(3)	(4)	(5)	(6)
CO (MHHID)	-0.0613*		-0.0639**		-0.137***	
	(-1.809)		(-2.647)		(-4.122)	
CO (Top 5 Sh Overlap)		-0.0740***		-0.0843***		-0.0589***
		(-4.420)		(-4.315)		(-3.149)
HHI	-0.0687**	-0.0347	0.0228	0.0453	-0.0639**	0.000991
	(-2.085)	(-1.289)	(0.620)	(1.263)	(-2.394)	(0.0409)
Size	0.576***	0.576***	0.575***	0.576***	0.600***	0.598***
	(12.81)	(12.46)	(13.10)	(12.95)	(11.99)	(12.05)
Volatility	-0.130	-0.128	-0.0664	-0.0252	-0.0981	-0.0708
	(-0.438)	(-0.433)	(-0.230)	(-0.0873)	(-0.330)	(-0.242)
Leverage	0.000114	0.0151	-0.0202	-0.00793	0.00707	0.00752
	(0.00210)	(0.267)	(-0.387)	(-0.142)	(0.118)	(0.119)
Log(Tenure)	0.306***	0.309***	0.307***	0.311***	0.293***	0.296***
	(7.721)	(7.933)	(7.956)	(8.234)	(7.386)	(7.454)
Observations	189,292	183,707	200,138	197,344	170,593	168,394
R-squared	0.754	0.754	0.752	0.752	0.745	0.745
Industry Def	SIC4 CRSP	SIC4 CRSP	SIC4 COMP	SIC4 COMP	HP-400	HP-400
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Executive FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Executives	35,434	34,680	36,728	36,384	32,189	31,896

Table 8. Wealth-performance sensitivities as a function of common ownership: Difference in Difference Approach. This table presents the difference in difference estimates around the BlackRock-BGI merger that took place at the second quarter of 2009. Firms in the top tercile of "implied change" in common ownership (either MHHID or the Top 5 shareholder measure) are the treatment group, and firms in the bottom tercile are the control group. To compute "implied change" we first calculate the common ownership in December 2008, the year before the acquisition was announced (Q2 of 2009). We then calculate a counterfactual common ownership measure for the same period, with the only difference being that we treat the holdings of BlackRock and Barclays as if they were already held by a single entity. The difference between the "real" common ownership in 2008 and the "counterfactual" is what we label "implied change" which serves to assign firms into treated and control. The Post dummy takes value of 1 for the three years after the merger (2010, 2011, and 2012), and takes value of 0 for the event year and the three years before (2006 to 2009). We use CRSP 4-digit SIC codes as the main industry definition. The controls are as of the pre-event year, measured in 2008. Industry and year fixed effects are included in all specifications. Standard errors are clustered at the firm and year level. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable	Log(WPS EGL)		Log(WPS JM)		Log(WPS HL)	
	(1)	(2)	(3)	(4)	(5)	(6)
CO Variable	MHHID	Top 5 Sh	MHHID	Top 5 Sh	MHHID	Top 5 Sh
Treat	-0.116	0.124	-0.0179	0.198	-0.0842	0.0916
	(-1.135)	(0.909)	(-0.167)	(1.345)	(-0.970)	(0.722)
Treat * Post	-0.0668***	-0.401**	-0.107**	-0.409**	-0.0797*	-0.408**
	(-8.525)	(-3.418)	(-2.994)	(-3.167)	(-2.280)	(-3.305)
HHI	-0.170	-0.0995	-0.106	-0.224	-0.245	-0.219
	(-0.922)	(-0.542)	(-0.560)	(-1.203)	(-1.426)	(-1.302)
Size	0.145***	0.205***	-0.326***	-0.242***	0.534***	0.586***
	(3.731)	(4.881)	(-7.545)	(-5.301)	(12.87)	(14.00)
Volatility	0.952	2.399*	-0.736	1.153	1.657*	3.637**
	(1.009)	(2.084)	(-0.758)	(1.052)	(2.106)	(3.674)
Leverage	-1.057***	-0.737**	-1.660***	-1.190***	-0.128	-0.0140
	(-4.296)	(-3.146)	(-5.513)	(-4.060)	(-0.523)	(-0.0626)
Log(Tenure)	0.176***	0.177***	0.0832	0.133**	0.199***	0.210***
	(4.087)	(3.721)	(1.757)	(2.612)	(4.553)	(5.035)
Observations	7,238	6,300	7,238	6,300	7,238	6,300
R-squared	0.134	0.160	0.351	0.298	0.380	0.423
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Internet Appendix: Additional Empirical Results

Appendix Tables

Table A. I. Panel A: Virgin America's largest shareholders.
The data source is S&P Capital IQ, as of the second quarter 2016, and reflects the shareholder structure before the merger with Alaska Airlines.

Virgin America	[%]
Richard Branson	30.77
Cyrus Capital Partners	23.52
Virgin Group Holdings Ltd.	15.34
Vanguard	2.89
BlackRock	2.25
Alpine Associates Advisors	2.11
Hutchin Hill Capital	2.09
Societe Generale	1.84
Apex Capital	1.74
Morgan Stanley	1.70

Table A. I. Panel B: Major US airlines' largest shareholders.
The data source is S&P Capital IQ, as of the fourth quarter 2016. The table is taken from Azar et al. (2018).

Delta Air Lines	*[%]*	*Southwest Airlines Co.*	*[%]*	*American Airlines*	*[%]*
Berkshire Hathaway	8.25	PRIMECAP	11.78	T. Rowe Price	13.99
BlackRock	6.84	Berkshire Hathaway	7.02	PRIMECAP	8.97
Vanguard	6.31	Vanguard	6.21	Berkshire Hathaway	7.75
State Street Global Advisors	4.28	BlackRock	5.96	Vanguard	6.02
J.P. Morgan Asset Mgt.	3.79	Fidelity	5.53	BlackRock	5.82
Lansdowne Partners Limited	3.60	State Street Global Advisors	3.76	State Street Global Advisors	3.71
PRIMECAP	2.85	J.P. Morgan Asset Mgt.	1.31	Fidelity	3.30
AllianceBernstein L.P.	1.67	T. Rowe Price	1.26	Putnam	1.18
Fidelity	1.54	BNY Mellon Asset Mgt.	1.22	Morgan Stanley	1.17
PAR Capital Mgt.	1.52	Egerton Capital (UK) LLP	1.10	Northern Trust Global Inv	1.02

United Continental Holdings	*[%]*	*Alaska Air*	*[%]*	*JetBlue Airways*	*[%]*
Berkshire Hathaway	9.20	T. Rowe Price	10.14	Vanguard	7.96
BlackRock	7.11	Vanguard	9.73	Fidelity	7.58
Vanguard	6.88	BlackRock	5.60	BlackRock	7.33
PRIMECAP	6.27	PRIMECAP	4.95	PRIMECAP	5.91
PAR Capital Mgt.	5.18	PAR Capital Mgt.	3.65	Goldman Sachs Asset Mgt.	2.94
State Street Global Advisors	3.45	State Street Global Advisors	3.52	Dimensional Fund Advisors	2.42
J.P. Morgan Asset Mgt.	3.35	Franklin Resources	2.59	State Street Global Advisors	2.40
Altimeter Capital Mgt.	3.26	BNY Mellon Asset Mgt.	2.34	Wellington	2.07
T. Rowe Price	2.25	Citadel	1.98	Donald Smith Co.	1.80
AQR Capital Management	2.15	Renaissance Techn.	1.93	BarrowHanley	1.52

Spirit Airlines	*[%]*	*Allegiant Travel Company*	*[%]*	*Hawaiian*	*[%]*
Fidelity	10.70	Gallagher Jr., M. J. (Chairman, CEO)	20.30	BlackRock	11.20
Vanguard	7.41	BlackRock	8.61	Vanguard	10.97
Wellington	5.44	Renaissance Techn.	7.28	Aronson, Johnson, Ortiz, LP	5.99
Wasatch Advisors Inc.	4.33	Vanguard	6.65	Renaissance Techn.	4.67
BlackRock	3.77	Fidelity	5.25	Dimensional Fund Advisors	3.17
Jennison Associates	3.49	Franklin Resources	4.52	State Street Global Advisors	2.43
Wells Capital Mgt.	3.33	Wasatch Advisors Inc.	4.39	PanAgora Asset Mgt.	2.22
Franklin Resources	2.79	T. Rowe Price	4.23	LSV Asset Management	2.22
OppenheimerFunds.	2.67	TimesSquare Capital Mgt.	3.91	BNY Mellon Asset Mgt.	1.84
Capital Research and Mgt.	2.64	Neuberger Berman	3.07	Numeric Investors	1.79

Table A. II. Wealth-performance sensitivities as a function of common ownership (without logs).

This table presents regressions similar to those in Table 4, but instead uses the EGL wealth-performance sensitivity measure without logs. The universe covers all CEOs from 1993 to 2014. We use industry definitions based on 4-digit SIC codes as well as the Hoberg & Phillips 400 definition. *** p<0.01, ** p<0.05, * p<0.1.

	Wealth-Performance Sensitivity EGL (no logs)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Common Ownership (MHHID)	-17.77***	-30.08***	-17.79***	-16.77***	-6.312**	-23.43***	-10.31**
	(-4.718)	(-6.961)	(-6.673)	(-3.635)	(-2.350)	(-4.221)	(-2.409)
HHI		-12.60***	-4.724	-5.418	0.934	-9.679**	-4.990
		(-2.941)	(-1.163)	(-1.222)	(0.229)	(-2.180)	(-1.610)
Size		6.099***	10.38***	5.720***	10.02***	5.958***	10.16***
		(6.996)	(6.561)	(6.421)	(6.221)	(6.702)	(5.688)
Volatility		88.81***	74.60***	91.91***	81.69***	84.37***	84.95***
		(4.273)	(3.110)	(4.434)	(3.395)	(4.076)	(3.339)
Leverage		-33.38***	3.821	-38.18***	3.761	-36.45***	3.960
		(-6.378)	(0.835)	(-6.768)	(0.910)	(-6.378)	(0.853)
Log (Tenure)		6.767***	4.366***	7.648***	4.835***	7.101***	5.013***
		(5.470)	(3.772)	(5.864)	(4.150)	(5.646)	(4.453)
Observations	36,680	36,478	36,478	38,547	38,291	33,920	33,594
R-squared	0.097	0.182	0.253	0.180	0.651	0.186	0.656
Industry Definition	SIC4 CRSP	SIC4 CRSP	SIC4 CRSP	SIC4 COMP	SIC4 COMP	HP-400	HP-400
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	No	No	Yes	No	Yes	No	Yes
Firm FE	No	No	Yes	No	Yes	No	Yes
Number of Firms			3,239		3,285		3,067

Table A. III. Wealth-performance sensitivities as a function of common ownership: alternative WPS measures (without logs).

This table presents regressions similar to those in Table 5, but instead uses several measures of wealth-performance sensitivity without logs. The universe covers all CEOs from 1999 to 2014. We use industry definitions based on 4-digit SIC codes as well as the Hoberg & Phillips 400 definition. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable	WPS JM (No Logs)			WPS HL (no logs)		
	(1)	(2)	(3)	(4)	(5)	(6)
Common Ownership (MHHID)	-7.393***	-3.051**	-4.470***	-19.16***	-1.737	-9.264*
	(-5.525)	(-2.762)	(-3.589)	(-4.279)	(-0.381)	(-1.735)
HHI	-5.501***	0.0600	-3.749**	-2.204	0.971	-7.655
	(-3.537)	(0.0418)	(-2.236)	(-0.365)	(0.142)	(-1.676)
Size	1.614***	1.569***	1.770***	38.86***	38.25***	38.94***
	(4.254)	(3.760)	(4.332)	(8.992)	(8.859)	(8.239)
Volatility	42.12***	44.12***	42.20***	151.9***	162.2***	172.2***
	(5.658)	(5.273)	(4.873)	(3.730)	(3.806)	(3.867)
Leverage	-9.333***	-9.082***	-8.398***	8.072	7.397	11.44*
	(-4.586)	(-4.902)	(-4.295)	(1.454)	(1.430)	(2.090)
Log(Tenure)	2.821***	3.083***	3.097***	20.83***	21.30***	21.04***
	(4.587)	(5.036)	(4.993)	(8.515)	(8.784)	(8.433)
Observations	36,625	38,700	33,906	36,625	38,700	33,906
R-squared	0.750	0.743	0.747	0.690	0.685	0.690
Industry Definition	SIC4 CRSP	SIC4 COMP	HP-400	SIC4 CRSP	SIC4 COMP	HP-400
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	3,239	3,285	3,067	3,239	3,285	3,067

Table A. IV. Wealth-performance sensitivities as a function of common ownership: alternative common ownership measures (without logs).

This table presents regressions similar to those in Table 6, but instead uses the EGL wealth-performance sensitivity measure without logs. We use two alternative measures of common ownership instead of MHHID. The first measure captures for each firm's top 5 shareholders the amount of overlap among peers. The second measure is based on Anton and Polk (2014) and captures for each firm the average total value of stock held by the common funds of any two stock pair, scaled by the total market capitalization of the two stocks. The universe covers all CEOs from 1999 to 2014. We use industry definitions based on 4-digit SIC codes as well as the Hoberg & Phillips 400 definition. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable	Wealth-Performance Sensitivity EGL (no logs)					
	(1)	(2)	(3)	(4)	(5)	(6)
CO (Top 5 Sh Overlap)	-3.780*		-5.896**		-6.777**	
	(-1.953)		(-2.566)		(-2.847)	
CO (Anton and Polk measure)		-18.52***		-22.51***		-23.28***
		(-3.620)		(-4.328)		(-3.899)
HHI	4.929	4.098	3.341	1.301	-1.113	-2.809
	(1.366)	(1.098)	(0.846)	(0.351)	(-0.534)	(-1.276)
Size	10.36***	10.89***	10.19***	10.91***	10.18***	11.17***
	(6.182)	(6.262)	(5.961)	(6.102)	(5.501)	(5.505)
Volatility	84.26***	72.66***	81.85***	77.62***	85.23***	81.29***
	(3.544)	(3.153)	(3.365)	(3.327)	(3.290)	(3.307)
Leverage	4.889	3.621	4.095	3.428	3.565	3.720
	(1.075)	(0.796)	(0.936)	(0.827)	(0.767)	(0.813)
Log(Tenure)	4.492***	4.563***	4.816***	5.089***	5.116***	5.268***
	(3.802)	(4.052)	(4.231)	(4.558)	(4.551)	(4.875)
Observations	35,644	36,489	38,198	38,557	33,512	33,771
R-squared	0.637	0.638	0.639	0.640	0.637	0.638
Industry Definition	SIC4 CRSP	SIC4 CRSP	SIC4 COMP	SIC4 COMP	HP-400	HP-400
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	3,207	3,237	3,274	3,284	3,056	3,063

Table A. V. Wealth-performance sensitivities as a function of common ownership: not rank-transforming the common ownership variables.

This table presents regressions similar to those in Table 4 and Table 6, but instead uses measures of common ownership without rank-transforming them. The universe covers all CEOs from 1999 to 2014. We use industry definitions based on 4-digit SIC codes as well as the Hoberg & Phillips 400 definition. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable	Log(Wealth-Performance Sensitivity EGL)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CO (MHHID)	-0.364***			-0.287**			-0.404***		
	(-3.812)			(-2.675)			(-3.520)		
CO (Top 5 Sh Overlap)		-0.570*			-0.806**			-1.064***	
		(-1.728)			(-2.372)			(-2.949)	
CO (Anton and Polk measure)			-0.698***			-0.913***			-1.108***
			(-3.796)			(-3.603)			(-3.861)
HHI	-0.172	-0.108	-0.0900	-0.0786	-0.0180	-0.0533	-0.114	0.0196	-0.0397
	(-1.676)	(-1.138)	(-0.926)	(-0.801)	(-0.177)	(-0.554)	(-1.348)	(0.271)	(-0.547)
Size	0.518***	0.520***	0.524***	0.516***	0.513***	0.525***	0.545***	0.541***	0.560***
	(12.15)	(11.98)	(12.24)	(12.30)	(12.28)	(12.70)	(12.71)	(13.06)	(13.46)
Volatility	1.579***	1.760***	1.578***	1.738***	1.798***	1.723***	1.706***	1.738***	1.671***
	(3.839)	(4.313)	(3.888)	(4.347)	(4.480)	(4.351)	(4.236)	(4.339)	(4.217)
Leverage	-0.124	-0.0735	-0.100	-0.121	-0.0984	-0.103	-0.0925	-0.0759	-0.0758
	(-1.316)	(-0.802)	(-1.073)	(-1.387)	(-1.103)	(-1.190)	(-0.958)	(-0.777)	(-0.777)
Log(Tenure)	0.530***	0.533***	0.534***	0.532***	0.535***	0.537***	0.529***	0.534***	0.534***
	(14.20)	(14.34)	(14.62)	(15.44)	(15.81)	(15.95)	(14.56)	(14.82)	(15.17)
Observations	36,216	35,251	36,084	38,291	37,791	38,154	33,594	33,207	33,463
R-squared	0.654	0.654	0.654	0.651	0.653	0.652	0.656	0.656	0.657
Industry Definition	SIC4 CRSP	SIC4 CRSP	SIC4 CRSP	SIC4 COMP	SIC4 COMP	SIC4 COMP	HP-400	HP-400	HP-400
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	3,239	3,207	3,237	3,285	3,274	3,284	3,067	3,056	3,063

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The European Corporate Governance Institute has been established to improve *corporate governance through fostering independent scientific research and related activities.*

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