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Market Structure, Common Ownership and Coordinated Manager Compensation

by

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Abstract

We study oligopolistic competition in product markets where the firms' quantity decisions are delegated to managers. Some firms are commonly owned by shareholders such as index funds whereas the other firms are owned by independent shareholders. Under such an asymmetric ownership structure, the common owners have an incentive to coordinate when designing the manager compensation schemes. This implicit collusion induces a less aggressive output behavior by the coordinated firms and a more aggressive behavior by the noncoordinated firms. The profits of the noncoordinated firms are increasing in the number of coordinated firms. The profits of the coordinated firms exceed the profits without coordination if at least 80 % of the firms are commonly owned - an astonishing resemblance to the merger literature.

Keywords: Common ownership, index funds, shareholder coordination, manager compensation

JEL Classification: G32, L22, M52

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1 Introduction

Fund companies such as Blackrock and Vanguard, or sovereign wealth funds such as Norges Bank Investment Management hold shares of many public corporations, some of them certainly being direct rivals in their relevant product and services markets. This gives the common shareholders a clear incentive to cooperate or even collude. Of course, the antitrust authorities take care that collusive behavior is prevented. However, there are sophisticated possibilities for the firm owners to coordinate indirectly. One such channel is the strategic compensation of the managers of the coordinated firms (see, e.g., Schwalbe 2018). The common owners of public corporations usually have to hire managers to run their firms. Managers, however, have their own objectives and adjust their operational decisions to the incentive structure given by the compensation contracts. This interrelation unavoidably implies that the compensation schemes offered by the firm owners strategically influence the managers' output decisions and thus the firm profits.

In the theory of industrial organization, the strategic effects of the design of the manager compensation schemes are analyzed with two-stage games where firm owners simultaneously offer performance-related compensation contracts in the first stage and managers simultaneously decide on prices or quantities in the second stage. In these models, the compensation contracts consist of a linear combination of fixed salaries and performance-dependent payments. The latter, in turn, often are assumed to consist of a weighted linear combination of firm profits on the one hand and revenues (or equivalently sales) on the other hand (see, e.g. Vickers 1985, Sklivas 1987, and Fershtman and Judd 1987, 2006). Transferred into real-world terms, manager compensation is determined by a firm's size and profitability, a stylized fact with robust evidence (see, e.g., Tröger and Walz 2019 for DAX firms). The managers maximize their performance-dependent payments by choosing optimal prices or quantities. The main result of these models is that, due to the strategic effects, the incentives of the managers are biased. In the mode of quantity (or better capacity) competition they decide to produce more than the firm owners themselves would. The consequences are lower firm profits and higher consumer surplus and social welfare.

The influence of the ownership structure on the competitive behavior of firms has attracted a lot of interest in industrial economics. The competitive effects of cross holdings (single-owner firms may hold shares of rival firms) and joint ventures (set up by firms held by different groups of owners) have been dealt with for quite a time. For example, Reynolds and Snapp (1986) and Breshnahan and Salop (1986) have identified the incentives to mitigate competition in the cases of cross holdings and joint ventures, respectively. More recently, the topic of common holdings (sometimes also referred to as horizontal shareholdings) gained considerable attention in the analysis of the effects of large institutional investors. Given the increasing importance of equity funds (see, e.g. Bogle 2016 and Azar and Schmalz 2017), it is hardly surprising that a growing empirical literature on the topic has emerged. It is less the investment of one huge fund threatening to distort competition, but rather the fact that a number of different investment firms each own a noticeable part of different firms operating in the same relevant market. The primary goal of investment firms is to provide a simply structured and well diversified investment product for their customers. The most striking example is an index fund. When investing in a similar (or in case of index funds virtually the same) set of firms, investment firms have an incentive to coordinate the behavior of their portfolio firms. Even though investment firms might be competing for the investors' capital, they have no conflicting interest regarding the conduct of their portfolio firms. Therefore, they share the same incentives when designing the manager compensation schemes. Schmalz (2018) and Seldeslachts et al. (2017) show that these effects are substantial, albeit with different importance across the markets. In particular, anti-competitive effects are shown to exist within the airline and banking industry (see, e.g. Azar et al. 2016 and 2018). The average share (until Dec. 2019) of investment firms in DAX firms amounts to 42.0%. Even if we just include the five biggest shares of investment firms in the respective index firms, their share adds up to 16.9% (for more detailed information see table 1 in the appendix). There exists mixed evidence on the question of whether executive compensation is actually structured to sharpen (see Kwon 2016) or to soften competition (see Liang 2016 and Anton et al. 2018).

A theoretical study of the influence of common holdings on the managers' compensation schemes and hence on equilibrium market conduct and performance has been presented by Neus and Stadler (2018). They consider a model of quantity competition in a triopoly market with linear demand functions and asymmetric marginal costs of the firms. The present paper aims to extend this analysis by considering an oligopoly market, where m out of n firms are commonly held by institutional investors. This leads to interesting new insights on their investment incentives. Questions such as how does the number of coordinated firms in a market influence the manager compensation schemes, the managers' competitive behavior, the firms' profits and finally the social welfare are of special interest in this paper.

The rest of the paper is organized as follows: Section 2 presents the game-theoretical model. Section 3 relates the model to earlier contributions by considering some special cases. Section 4 summarizes the results, shows some policy implications, and concludes the paper.

2 The Model

We assume a homogeneous product market with the linear demand function

$$p = \alpha - Q \ ,$$

where $\alpha > 0$ is a measure of market size and $Q \equiv \sum_{i=1}^{n} q_i$ is the total amount of production of n competing firms. The firms' marginal production costs $c\,(< \alpha)$ are assumed to be quantity-invariant and of equal size. This leads to the firms' gross profits

$$\pi_i = (\alpha - c - Q)q_i \ , \quad i = 1, ..., n \ . \tag{1}$$

Managers are awarded according to observable and irreversible contracts offered by the owners. We follow the tradition of Fershtman and Judd (1987, 2006) and assume linear compensation contracts specifying the payments

$$s_i = f_i + g_i\psi_i \ , \quad i = 1, ..., n \ .$$

f_i denotes the fixed salary for the manager of firm i. $g_i > 0$ serves as a weight parameter which, in combination with f_i, guarantees that the total payment s_i to each manager is equal to a given market-specific payment $\bar{s}$. $\psi_i = (1 - \hat{\kappa}_i)\pi_i + \hat{\kappa}_i p_i q_i$ is the performance-dependent payment as a weighted sum of the performance measures profit π_i and revenue $p_i q_i$. This specification leads to the managers' objective functions $\psi_i = \pi_i + \hat{\kappa}_i c q_i$, where $\hat{\kappa}_i$ is the strategic contract parameter set by the owner of firm i. Following Neus and Stadler (2018), we define the transformed parameters $\kappa_i \equiv \hat{\kappa}_i c$ to obtain the performance-dependent manager payments

$$\psi_i = (\alpha - c - Q + \kappa_i)q_i \ , \quad i = 1, ..., n \ . \tag{2}$$

Manager delegation is modeled as a two-stage game, where owners simultaneously offer compensation contracts characterized by the (transformed) strategic variables κ_i in the first stage and managers simultaneously choose the production quantities q_i in the second stage. Owners aim to maximize their firm profits π_i or the common profits of the group of coordinated firms, respectively, while the managers aim to maximize the performance-dependent payments ψ_i.

In the second stage of the delegation game, the managers decide on the quantities q_i, given the contract parameters κ_i. The maximization of (2) with respect to quantities leads to the first-order conditions

$$q_i = \alpha - c - Q + \kappa_i \ , \quad i = 1, ..., n \ . \tag{3}$$

Summing up over all n firms in the market gives the total amount of production

$$Q = \frac{n(\alpha - c) + \sum_i \kappa_i}{n + 1} \ ,$$

the firms' production levels

$$q_i = \frac{\alpha - c + n\kappa_i - \sum_{j\neq i}\kappa_j}{n+1} \ , \quad i = 1, ..., n \ , \tag{4}$$

and hence the gross profits

$$\pi_i = \frac{[\alpha - c - \sum_i \kappa_i][\alpha - c + n\kappa_i - \sum_{j\neq i}\kappa_j]}{(n+1)^2} \ , \quad i = 1, ..., n \ . \tag{5}$$

In the first stage of the game, since managers' total payment $s_i = \bar{s}$ is fixed, the firm owners maximize their (gross) profits. Let us assume that m out of n firms are commonly held by a couple of investment companies. Then, the $(n - m)$ independent firm owners (NC) maximize their profits (5) with respect to the contract parameters κ^{NC}, whereas the shareholders of the m commonly owned firms (C) maximize the sum of their profits

$$\pi^C = (\alpha - c - Q)\sum_{i\in C} q_i$$

with respect to the contract parameters κ^C. Due to symmetry within each of the two groups, the first-order conditions consist of the system of m linear reaction functions

$$\kappa^C = \frac{(n+1-2m)[(\alpha - c) - (n-m)\kappa^{NC}]}{2m(n+1-m)}$$

of the coordinated firms and $(n - m)$ linear reaction functions

$$\kappa^{NC} = \frac{(n-1)[(\alpha - c) - m\kappa^C]}{n^2 - mn + m + 1}$$

of the noncoordinated firms. In the subgame perfect Nash equilibrium, where all n first-order conditions simultaneously hold, the manager compensation schemes are determined by the contract parameters

$$\kappa^C = \frac{(n+1)(n+1-2m)}{Nm}(\alpha - c)$$

and

$$\kappa^{NC} = \frac{(n+1)(n-1)}{N}(\alpha - c) \quad > \quad \kappa^C \ ,$$

where

$$N \equiv n^3 + 2n^2 + 3n + 2 - m(n+1)^2 > 0 \, .$$

Table 1 presents the values of the contract parameters of the coordinated (C) and the noncoordinated (NC) firms for a standardized market size.

Table 1: Subgame perfect contract parameters ($\alpha - c = 1$)

	m \ n	1	2	3	4	5	6
κ^{NC*}	1	———	0.2000	0.2000	0.1765	0.1538	0.1351
κ^{C}	2		- 0.2500	0.0000	0.0417	0.0500	0.0500
κ^{NC}			———	0.3333	0.2500	0.2000	0.1667
κ^{C}	3			- 0.3333	- 0.0476	0.0000	0.0145
κ^{NC}				———	0.4286	0.2857	0.2174
κ^{C}	4				- 0.3750	- 0.0625	- 0.0156
κ^{NC}					———	0.5000	0.3125
κ^{C}	5					- 0.4000	- 0.0667
κ^{NC}						———	0.5556
κ^{C}	6						- 0.4167
κ^{NC}							———

$^*\kappa^{NC}(m=1) = \kappa^{C}(m=1)$

The positive contract parameters κ^{NC} indicate compensation schemes which induce managers to aggressively expand production. The contract parameters κ^{C} are strictly smaller than the parameters κ^{NC}. Furthermore, if $m > (n+1)/2$, they even take on negative values inducing managers to inoffensively reduce production.

Given these strategic decisions of the owners, managers choose the quantities

$$q^C = \frac{(n+1)(n+1-m)}{Nm}\,(\alpha - c)$$

and

$$q^{NC} = \frac{(n+1)n}{N}\,(\alpha - c) \quad > \quad q^C \ ,$$

leading to the total production level

$$Q = mq^C + (n-m)q^{NC} = \frac{(n+1)[(n-m)(n+1)+1]}{N}\,(\alpha - c) \ .$$

Table 2 presents the quantities of the coordinated and noncoordinated firms.

Table 2: Subgame perfect quantities ($\alpha - c = 1$)

	m \ n	1	2	3	4	5	6
q^{NC*}	1	———	0.4000	0.3000	0.2353	0.1923	0.1622
q^{C}	2		0.2500	0.1667	0.1250	0.1000	0.0833
q^{NC}			———	0.5000	0.3333	0.2500	0.2000
q^{C}	3			0.1667	0.0952	0.0714	0.0580
q^{NC}				———	0.5714	0.3571	0.2609
q^{C}	4				0.1250	0.0625	0.0496
q^{NC}					———	0.6250	0.3750
q^{C}	5					0.1000	0.0444
q^{NC}						———	0.6667
q^{C}	6						0.0833
q^{NC}							———

$^{*}q^{NC}(m=1) = q^{C}(m=1)$

Evidently, all production levels are monotonically decreasing in the number n of firms in the market. Furthermore, the production levels q^{NC} of the independent firms are monotonically increasing in the number m of coordinated firms. The production levels q^{C} of the coordinated firms, however, vary in an interesting U-shaped relationship with the number of coordinated firms. Starting with $m = 2$, the production levels are decreasing at first and then increasing until the former level is reached again with all firms being coordinated ($m = n$).

In the subgame perfect equilibrium, the owners of the coordinated firms realize the gross profits

$$\pi^{C} = \frac{(n+1)^2(n+1-m)}{N^2 m}\,(\alpha - c)^2\ ,$$

whereas the noncoordinated firms realize the profits

$$\pi^{NC} = \frac{(n+1)^2 n}{N^2}\,(\alpha - c)^2 \quad > \quad \pi^{C}\ .$$

Table 3 presents the profits of the coordinated and noncoordinated firms.

Table 3: Equilibrium firm profits ($\alpha - c = 1$)

	m \ n	1	2	3	4	5	6
π^{NC*}	1	———	0.0800	0.0300	0.0138	0.0074	0.0044
π^{C}	2		0.1250	0.0278	0.0104	0.0050	0.0028
π^{NC}			———	0.0833	0.0278	0.0125	0.0067
π^{C}	3			0.0833	0.0136	0.0051	0.0025
π^{NC}				———	0.0816	0.0255	0.0113
π^{C}	4				0.0625	0.0078	0.0029
π^{NC}					———	0.0781	0.0234
π^{C}	5					0.0500	0.0049
π^{NC}						———	0.0741
π^{C}	6						0.0417
π^{NC}							———

${}^*\pi^{NC}(m=1) = \pi^{C}(m=1)$

It is evident that the profits of all firms are monotonically decreasing in the number n of firms. Due to $\partial N/\partial m < 0$, we can also conclude that the profits π^{NC} of the firms held by the independent owners are monotonically increasing in the number m of coordinated firms. However, a U-shaped relation exists between the number m of coordinated firms and their profits π^{C}. The impact of that number on the profits of the commonly held firms depends on the owner structure. Starting at $m = 1$ (no coordination), the profits decrease at first, but eventually at $m = n-1$ increase. If only a few firms are commonly owned, there is a loss of profits. But if many firms are commonly owned, the profits increase and become higher than the profits without coordination. Thus there is a clear incentive of index funds to invest in as many firms as possible. In fact, it is the policy of the competition authorities that prevents the investors from a complete coordination with $m = n$.

The welfare in the market is defined as the sum of the producer surplus

$$\Pi = m\pi^{C} + (n-m)\pi^{NC} = \frac{(n+1)^2[(n-m)(n+1)+1]}{N^2}(\alpha - c)^2$$

and the consumer surplus

$$CS = (1/2)Q^2 = \frac{(n+1)^2[(n-m)(n+1)+1]^2}{2N^2}(\alpha - c)^2\ ,$$

so that social welfare adds up to

$$W = \Pi + CS = \frac{(n+1)^2[(n-m)(n+1)+1][(n-m)(n+1)+3]}{2N^2}(\alpha - c)^2 \ .$$

Table 4 presents the values of the social welfare.

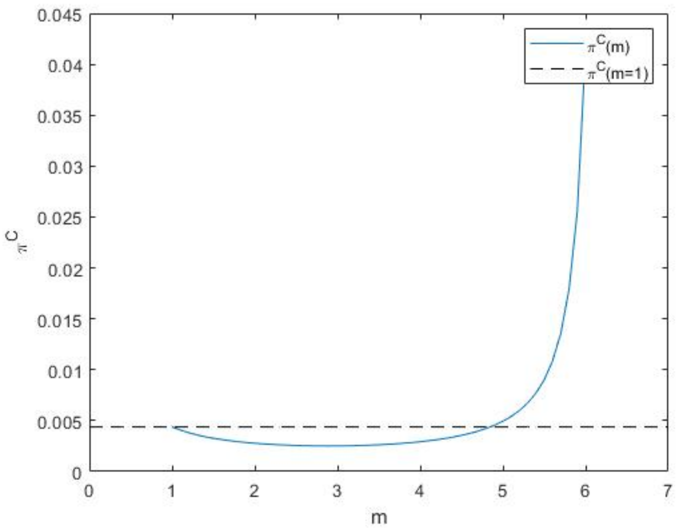
Table 4: Equilibrium social welfare ($\alpha - c = 1$)

m \ n	1	2	3	4	5	6
1	0.3750	0.4800	0.4950	0.4983	0.4993	0.4996
2	———	0.3750	0.4861	0.4965	0.4987	0.4994
3		———	0.3750	0.4898	0.4974	0.4991
4			———	0.3750	0.4922	0.4980
5				———	0.3750	0.4938
6					———	0.3750

As expected, the welfare is increasing in the number n of firms in the market, but decreasing in the number m of coordinated firms.

Of special interest for competition policy is the derived relationship between the number m of coordinated firms and their profits. Figure 1 shows this relationship for the case of $n = 6$ firms in the market. The intersection point between the profits of the coordinated firms ($\pi^C(m)$) and the corresponding profits without coordination ($\pi^C(m = 1)$) determines the critical threshold value of m, above which investors gain from coordination via the manager compensation contract.

Figure 1: Number of coordinated firms and their profits (n=6)



The relative profitability of coordination within a smaller or larger group of firms results from the trade-off between two effects: the internalization of competition within the group of coordinated firms on the one hand and the loss of market share of the group in total on the other. In a small group of coordinated firms, the latter effect dominates the former. However, the market share effect becomes less important once the group size exceeds some critical threshold level m_0 which is endogenously determined.

There is an astonishing resemblance between our result and the well-known result derived by Salant, Switzer and Reynolds (1983) in merger theory. They have shown that at least 80% of the total number of firms in the market have to merge in order to raise their common profit.[1] Interestingly, we derive a corresponding condition, even if the underlying equations are much more complex. Table 5 shows the endogenously determined minimum number of coordinated firms m_0 and their minimum share (m_0/n) necessary to raise the common profits above the level without coordination $(m = 1)$.

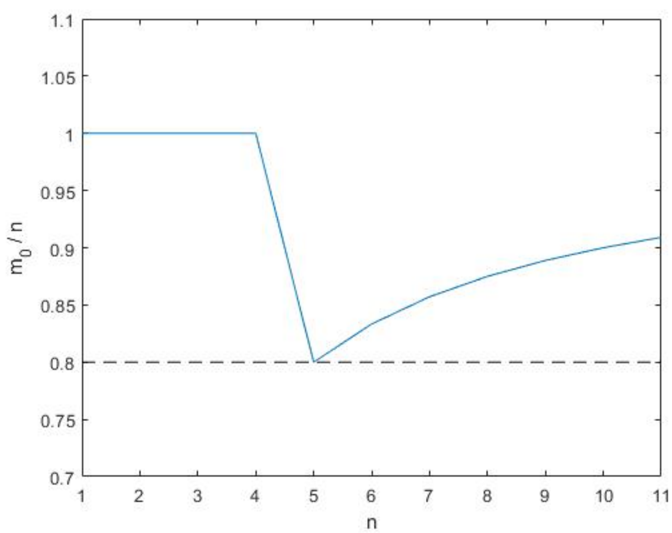
[1]This result is derived under the assumption that owners themselves decide on mergers. The condition for profitable mergers changes, if the merger decision is delegated to managers (see, e.g., Gonzales-Maestre and Lopez-Cunat (2001) and Ziss (2001)).

Table 5: Minimum share of coordinated firms implying an increase in profits

n	2	3	4	5	6	$\cdots$	$n \to \infty$
m_0	2	3	4	4	5	$\cdots$	$n-1$
m_0/n	1	1	1	0.8	0.83	$\cdots$	$(n-1)/n$

Figure 2 illustrates the relation between the number n of firms in the market and the minimum share (m_0/n) of coordinated firms necessary to raise the common profits.

Figure 2: Minimum share of coordinated firms implying an increase in profits



At least 80% of the firms need to be jointly coordinated via the manager compensation schemes in order to be profitable for the firms involved. As in Salant, Switzer and Reynolds (1983), this minimum occurs with $n = 5$ firms, where $m = 4$ out of those coordinate their manager compensation.

3 Special Cases and Related Literature

The presented model is sufficiently general to include some special solutions as they are known from previous models. The extreme case of $m = 1$ is an important benchmark solution because it describes the management compensation without coordination. This solution was derived by Fershtman and Judd (1987).[2] In the first stage, the owners choose the compensation parameters

$$\kappa^{NC}(m=1) = \frac{n-1}{n^2+1}\,(\alpha - c)\ ,$$

which reach a maximum when there are two or three firms in the market.[3] With an increasing number of rivals, the strategic interaction between the owners declines and converges to zero when n approaches infinity. In the second stage, managers independently choose the quantities

$$q^{NC}(m=1) = \frac{n}{n^2+1}\,(\alpha - c)\ .$$

The firm owners realize the gross firm profits

$$\pi^{NC}(m=1) = \frac{n}{(n^2+1)^2}\,(\alpha - c)^2\ ,$$

and the social welfare amounts to

$$W(m=1) = \frac{n^2(n^2+2)}{2(n^2+1)^2}\,(\alpha - c)^2\ .$$

The opposite limit case of $m = n$ reflects the other benchmark solution where the index fund shareholders commonly own all the firms in the relevant market. In the first stage, the owners choose the compensation parameters

$$\kappa^{C}(m=n) = -\,\frac{n-1}{2n}\,(\alpha - c)^2\ ,$$

which indicate a sophisticated implicit collusion by giving their managers incentives to reduce production in order to increase the firm profits. Accordingly, managers independently choose the quantities

$$q^{C}(m=n) = \frac{1}{2n}\,(\alpha - c)\ ,$$

and firm owners realize the gross firm profits

$$\pi^{C}(m=n) = \frac{1}{4n}\,(\alpha - c)^2\ .$$

The social welfare amounts to

$$W(m=n) = (3/4)\,(\alpha - c)^2\ .$$

[2]Note that these authors used the transformed weight parameters $\kappa^{FJ} = 1 - \kappa/c$.

[3]Neglecting the integer problem, the maximum is reached at $n = 1 + \sqrt{2} \approx 2.41$.

As we have shown, the firm profits do not monotonically increase in the number of coordinated firms. Let us therefore consider the intermediate case of three firms where two of them are commonly owned by index fund shareholders. This parameter constellation $n = 3$ and $m = 2$ is a special case of the triopoly model of Neus and Stadler (2018) when the degree of heterogeneity in the market approaches zero and there are no differences between the firms' marginal costs. The common owners of firms 1 and 2 choose the contract parameters

$$\kappa_{1,2}^{C} = 0 \ ,$$

whereas the independent owners of firm 3 choose

$$\kappa_{3}^{NC} = (1/3)(\alpha - c) \ .$$

Accordingly, managers of the coordinated firms choose the quantities

$$q_{1,2}^{C} = (1/6)(\alpha - c)$$

so that the owners realize the gross firm profits

$$\pi_{1,2}^{C} = (1/36)(\alpha - c)^2 \ .$$

The managers of the independent firm 3 choose quantities

$$q_{3}^{NC} = (1/2)(\alpha - c) \ > \ q_{1,2}^{C}$$

so that the owners realize the gross firm profits

$$\pi_{3}^{NC} = (1/12)(\alpha - c)^2 \ > \ \pi_{1,2}^{C} \ .$$

The social welfare amounts to

$$W = (35/72) \ (\alpha - c)^2 \ .$$

Neus and Stadler (2018) additionally consider the case of asymmetric production costs and assume that index fund shareholders invest in the more efficient and therefore bigger firms. This scenario offers a further option for a reallocation of production between the coordinated firms. Production quantities and firm profits will be moved from the less efficient firms to the more efficient ones. Of course, this effect leads to higher profits of the coordinated firms as a whole and therefore additionally increases the gains of coordination.

It would be interesting to combine the versions of Neus and Stadler (2018) and the present one. However, the analysis of an oligopoly with more then three firms and asymmetric production costs is no longer tractable. Therefore, the two papers should be interpreted as complementary versions of the same theoretical approach. Further versions of this approach, dealing with different degrees of heterogeneity and price instead of quantity competition are left for future research.

Even being an interesting special case of an asymmetric ownership structure, that version proves to be too restrictive for a thorough analysis of the incentive structure of common holdings. The reason for this is that in the case of symmetry at least 80% of the firms have to be commonly owned to provide gains from coordination for the index funds. However, this threshold level of 80% indicates that in case of a triopoly only a full coordination is profitable.

4 Summary and Policy Implications

In many markets, several firms are commonly owned by institutional investors like index funds. Given such an asymmetric common-holding ownership structure, the index funds have an incentive to coordinate in designing their manager compensation schemes.

This paper studied the consequences of such a coordination by considering a homogeneous oligopoly where m out of n firms are commonly owned by the same group of institutional investors. We showed that the strategic design of the manager compensation contracts may act as a device for the firms to implicitly collude in a market.

The total output in the market is reduced by shareholder coordination such that it is detrimental to consumer surplus and social welfare. Our results confirm the concerns about coordination activities of index funds with common holdings. This coordination behavior induces crucial implications with respect to reduced competition in the product markets.

Therefore, our model has direct consequences for antitrust authorities and competition law. Recently, the German Monopolies Commission has expressed concerns about competition-reducing effects of increasing common holdings induced by institutional investors (see Monopolkommission 2016, note S24). In the U.S., several legal scholars have debated necessary amendments to antitrust law. Posner et al. (2017) suggest a limitation of institutional investors' ownership to either not more than 1 % of the total size of a market or only one single firm per market. Funds committing to strict passivity should be excepted from this rule. These recommendations are fully in line with the results of our model. Elhauge (2016) pleads instead for a stricter case-by-case analysis on the basis of the current law. Baker (2016) questions the operability of the latter proposal.

In their critical discussion of the Posner et al. (2017) paper, Lambert and Sykuta (2018) raise doubts on the validity of the empirical evidence on the (net) harmfulness of common holdings when potential benefits are neglected, which may be seen in better diversification and better corporate governance, resulting in a better investment performance of private investors. Private gains, however, are "hardly a qualifying merger efficiency but only an anticompetitive wealth transfer" (Scott Morten and Hovenkamp 2017, p. 2038).

The relevance of common holdings for competition policy strongly suggests further investigations of the topic. Due to the simple structure of our approach, a generalization to heterogeneous markets and a complementary analysis of the mode of price competition should be possible.

Appendix

Table 1: Shares of Investment Managers

Firm	Share of the 5 biggest Investment Managers	Share of all Investment Managers
SAP SE O.N.	12.02%	37.24%
LINDE PLC EO 0.001	22.65%	83.00%
ALLIANZ SE NA O.N.	15.89%	40.42%
SIEMENS AG NA O.N.	12.72%	30.81%
BAYER AG NA O.N.	16.87%	45.13%
BASF SE NA O.N.	15.23%	36.07%
ADIDAS AG NA O.N.	19.38%	46.90%
DT.TELEKOM AG NA	10.70%	25.42%
DAIMLER AG NA O.N.	20.69%	39.76%
MUENCH.RUECKVERS.VNA O.N.	14.41%	40.17%
DEUTSCHE POST AG NA O.N.	13.82%	34.35%
VOLKSWAGEN AG VZO O.N.	9.77%	29.29%
DEUTSCHE BOERSE NA O.N.	20.62%	60.84%
INFINEON TECH.AG NA O.N.	20.93%	52.24%
VONOVIA SE NA O.N.	23.83%	60.51%
BAY.MOTOREN WERKE AG ST	10.25%	24.42%
E.ON SE NA O.N.	22.79%	42.28%
FRESENIUS SE+CO.KGAA O.N.	17.00%	39.35%
HENKEL AG+CO.KGAA VZO	13.13%	35.16%
RWE AG ST O.N.	15.25%	36.41%
DEUTSCHE BANK AG NA O.N.	15.49%	34.51%
MERCK KGAA O.N.	13,65%	46.44%
FRESEN.MED.CARE KGAA O.N.	12.68%	33.14%
MTU AERO ENGINES AG	38.99%	74.95%
CONTINENTAL AG O.N.	11.41%	25.35%

Firm	Share of the 5 biggest Investment Managers	Share of all Investment Managers
WIRECARD AG	26.92%	59.48%
BEIERSDORF AG O.N.	5.02%	16.20%
HEIDELBERGCEMENT AG O.N.	18.20%	44.74%
LUFTHANSA AG VNA O.N.	15.14%	34.63%
COVESTRO AG O.N.	20.10%	51.80%
Mean	16.85%	42.03%
Median	15.37%	39.56%

SOURCE: Thomson Reuters Eikon (2020). Shareholders History Report.

Retrieved January 14, 2020 from https://eikon.thomsonreuters.com/index.html

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