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Working Paper 07/63
January 2007

Economics Working Paper Series

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

The Influence of Pension Funds on Corporate Governance

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Abstract

Although pension funds have gained importance in the last two decades, their role has not been described in detail by economic models. This paper focusses on the scope of these institutional investors when they are not satisfied with a management team of a company in which the pension fund holds a block of shares. Stock holdings by pension funds are largely dispersed. Therefore, any intervention by pension funds in corporate governance requires the formation of a coalition of pension funds. The realization of a coordinated intervention, in turn, is subject to the problems related to the provision of public goods, such as free-riding. We find that stock dispersion among pension funds, the amount of noise traders, coordination costs and the attractiveness of the exit option are relevant factors for successful interventions. The overall probability for a successful intervention, however, is quite low.

Keywords: Pension Funds, Public Goods, Coase Theorem
JEL classification: G23, H41, Q50

[*]We would like to thank participants at the SURED-06 Conference in Ascona for constructive comments. We particularly benefited from comments by Lucas Bretschger. Moreover, we would like to thank Christa Brunschweiler and Gay Saxby for language editing.

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1 Introduction

Since the onset of the modern corporation with its separation of ownership and control, classical economists have focussed on the problems of aligning the interests of the "principal" (investors) and the "main agent" (company managers). Berle and Means were already concerned in 1932 that the dispersion of share ownership in large corporations could open up numerous possibilities for managers to pursue their own goals (low and insufficient effort, inefficient or extravagant investments, entrenchment strategies or self dealing actions), to the detriment of shareholders. In the aftermath of the stock market crash of 1929, many rules and regulations (e.g. disclosure requirements, insider trading rules) were implemented, to protect small investors. Due to this New Deal legislation, stock markets became safer and therefore more liquid; but it had the side effect of discouraging concentrated active stockholding (Bhide, 1993).

The defense of shareholders' interests against dysfunctional behaviour of managers has always been at the core of corporate governance theory. A wide body of literature focusses on the question of how to implement efficient incentive systems and monitoring structures. One way to overcome the classical principal/agent problem with regard to incorporated companies is to align the interests of management with those of stockholders through specially devised incentives in work contracts. A potential corrective measure to discipline an unsatisfactory management team exists in the market for corporate control. When the management of a public company with dispersed ownership lacks sufficient motivation or capabilities and is very poorly supervised, raiders could take over such a poorly performing firm. But as Grossman/Hart showed in their seminal paper in 1980, the market for corporate control can not be fully efficient, since such a raid is costly and atomistic investors will free-ride on the actions of the raider, i.e. not tender the shares, in order to enjoy the improvement in the firm. Partial solutions to overcome the free-rider problem may consist in a corporate charter, which encourages takeover bids (Grossman/Hart, 1980), the original existence of a large "toehold" (Shleifer/Vishny, 1986) or the possibility of "tunneling" (Johnson et.al, 2000).

As Bagnoli/Lipman in 1988 and Holmström/Nalebuff in 1992 pointed out, the problem of free-riding is only serious in models which assume atomistic stockholders. In cases in which each stockholder possesses not only one, but many stocks and where the number of stockholders is finite, tender offers for a majority of stocks have a positive chance of being successful, since shareholders have an incentive to tender a portion of their shares and keep another portion, from which they can profit in case of a successful takeover. In this regard, the potential increase in firm value can be viewed as a public good from which all stockholders partially profit.

As Olson showed in 1965, the free-rider problem becomes more severe, the higher the number of private parties necessary for the production of the public good. And the bigger the free-rider problem, the less likely it is that the public good will be produced by private parties, which have to voluntarily form a coalition. Palfrey/Rosenthal in 1984 first presented a formal model for calculating the probability of the production of the public good. Dixit/Olson in 2000 use a

similar model, but they assume that total contribution costs are fixed, whereas Palfrey/Rosenthal assume that the contribution of each participant is constant, independent of the number of cooperative parties. In our paper we also use the Palfrey/Rosenthal approach, but we assume that total contribution costs rise with the number of participants. The assumption of rising costs in our model is very plausible, since coordination of opinions and actions is more complex and costly the higher the number of parties involved.

In contrast to the vast literature on raiders and other blockholders, as far as we know the role of pension funds has not been investigated in theoretical models yet. One reason could be that pension funds invest in a very diversified manner and therefore very seldom appear in the public or media. Pension funds cannot act as raiders, taking over firms, both for legal reasons and because such an action does not fall within their purpose. Another reason is that, because of diversification, even a sizeable pension fund holds only a minor stake of a few percent in any one specific firm. CalPERS for example, the large and active California public pension fund, holds about 1400 different stocks and owns "between 0.5 and 2 percent of the outstanding stock for each company in its portfolio" (Hawley and Williams, 2000). Risk considerations lead such huge pension funds to be prone to liquid stocks, which usually also induces them to undertake only small or no monitoring efforts at all. If a stock position seems doubtful, an individual pension fund therefore will rather sell its stake than undertake the costly efforts of monitoring and intervening. But even selling a stake of the size of 0.5 to 2 percent will most likely have a negative impact on the stock price. This argument applies even more if all pensions funds want to sell the same stock at the same time.

This individualistic behaviour has to be viewed differently if we consider that nowadays pension funds as a group own a sizeable portion of the stock market. If some or all pension funds wanted to unload a displeasing stock position at the same time, the induced price drop affects not only the selling funds - through both in sold and unsold stocks - but also all other inactive pension funds. But taken as a group, pension funds could produce a public good by intervening in a coordinated way. This potential for pension funds has been recognised especially in the USA, where institutional investors have long replaced private investors. Hawley and Williams pointed out in 1980 already that institutional investors, whom they name "universal owners" (since they own all stocks), could potentially play a prominent role with regard not only to corporate governance questions, but also with regard to environmental problems. Tirole (2001) also questions if and how institutional investors such as pension funds should be active monitors and interfere if necessary with management.[1] Critical views claim that pension funds would not be specifically qualified to take on the role of monitoring firms operating in different industrial environments, and therefore should concentrate only on their role as fiduciaries for their clientele of active contributors and retirees.

[1]According to Tirole, institutional investors in the US mainly act as short-term stock market players, responsible for 80 percent of trading volume, with an average holding period of stocks of only 1.9 years. On the other hand, they are only rarely represented on the board.

There exist some empirical papers which focus on the role of pension funds. Smith (1996) investigated the approach and success of CalPERS (California Public Employees Retirement System), the largest public pension fund in the United States and very prominent due to its monitoring of companies. Between 1987/1988, CalPERS focussed on firms which had a bad governance structure (e.g. presence of "poison pills" etc.). From 1988 to 1993 CalPERS targeted large firms with a high percentage of institutional investors and whose stocks had an unsatisfactory stock performance. A short list of such firms was more closely investigated and CalPERS wrote a shareholder resolution with recommendations concerning changing the board of directors and executive compensation, which was discussed with the management of the company. If the management agreed to the changes, the resolution was withdrawn; otherwise, it was brought to vote at the general assembly. Empirically, Smith found mixed results; stocks of firms that agreed had an abnormal positive return of +1 percent, while stocks of resisting firms had an average negative return of -1 percent. Also, operating profits of targeted firms did not improve after intervention by CalPERS. Activism for the portfolio of CalPERS though showed positive results. While monitoring costs amounted to about half a million dollars per year, the increase in value of its holdings amounted to 19 Mio USD. After reviewing a wide set of empirical studies with regard to the effectiveness of pension funds' monitoring, Prevost and Rao (2000) conclude that results are mixed. No positive effect could be proven for both the operating performance and the stock performance of targeted firms. Prevost and Rao test the hypothesis that the primary function of a proposal of a pension fund is to act as a signaling mechanism in alerting the market that the targeted management is unwilling to negotiate a settlement with the pension fund. Prevost and Rao find in their event study that firms experienced negative wealth effects when targeted either by CalPERS, or by a coalition of public funds supporting one or more proposals on the same proxy. Firms which were targeted several times by public pension funds experienced permanent declines in market value. Some empirical studies focus not on performance data of shares of targeted firms, but on direct effects of monitoring. Faccio and Lasfer (2000) analyse the monitoring role of occupational pension funds in the UK, and conclude that these funds are not effective monitors. Del Guercio and Hawkins (1999) study shareholder proposals of the largest, most active funds in the USA up to 1993 and find that shareholder proposals are followed by significant corporate governance activity and wide corporate changes such as asset sales and restructurings. Crespi-Cladera and Renneboog (2000) investigate voting coalitions which aim at disciplining incumbent management. They find that Shapley values capturing the relative power of shareholder coalitions outperform models with percentage ownership stakes.

In this paper, we investigate under which conditions a group of homogenous pension funds has a chance at forming a coalition to exert pressure on the incumbent management team.[2] These huge pension funds hold widely diversified

[2]Incumbent management does not necessarily have to be incompetent or corrupt, but may simply be stubborn. As Jensen (1988) describes, "managers often have troubles abandoning strategies, they have spent years designing and implementing, even when these strategies no longer contribute to the organizations survival", p.23.

portfolios and can never act as raiders for fiduciary reasons. Their position in a single firm, albeit big from the point of view of a small shareholder, is nevertheless too small to pursue costly monitoring and intervening singlehandedly. Therefore, monitoring and intervention can only be undertaken by forming a coalition with other pension funds. Our one-period model of forming the coalition is similar to Palfrey/ Rosenthal (1984) or Dixit/Olson (2000), but in contrast to these authors we do not assume fixed or even declining contribution costs per participant, but rather rising contribution costs. This reduces the probability of a successful coalition outcome, but describes costs of coalition procedures more precisely. Additionally, we formalise the alternative option each pension fund has of unloading part or all of its stockholding if it is not content with a particular firm. Whether that option is economically feasible mainly depends upon transaction costs and the rate of reinvestment return.

The paper is organised as follows: in the next section, we examine under which circumstances a coordinated effort of pension funds has a chance of being successful. It will be shown that the formation of a winning coalition will be more likely when pension funds have a higher concentration of stocks of the targeted company. In the second subsection we investigate the case of pension funds using the "exit" option by selling the specific stock. Depending upon the size of the "market impact", e.g. the price decline of the sold stock, the financial result of both courses of action can be compared. In section 3 we discuss the results of the preceding two subsections in the context of current thinking on corporate governance issues and propose further research opportunities. In the concluding section we show possible implications for pension funds and policy makers.

2 Model for coalition building

Due to portfolio considerations, stock holdings by pension funds are largely dispersed. Therefore, it cannot be expected that any intervention by pension funds in corporate governance will be accomplishable without the pension funds forming a coalition. As we will argue below, the realization of a coordinated intervention is subject to several characteristics strongly linked to the problems known from public good provision such as free-riding. Essentially, free-riding may result in a failure of the Coase Theorem as participation in the coalition is voluntary. This is precisely the reason that pension funds may not engage in shareholder activism even though such action may result in a pareto-superior outcome. Coase argued that given a government that allocates property rights between parties and a court that enforces the agreed bargain, a precise allocation of property rights and the absence of any costs of information or negotiation would lead to a bargaining solution between two parties that internalizes any externalities between them. Moreover, Coase extended this argument to larger groups so that in his idealized world of zero transaction costs, efficient outcomes can be achieved no matter how large the groups are. According to Dixit and Olson (2000), Coase did not claim that he was offering a theorem, contrary to the economic literature based on Stigler (1971) who asserted that he did. A

typical formulation of the Coase Theorem states that in the absence of transaction costs, rational parties will necessarily achieve a Pareto-efficient allocation through voluntary transactions or bargaining. In reality however, transaction costs do matter and must be taken into account in defining a Pareto-efficient outcome. Dixit and Olson (2000) further argue that if the Coase Theorem applies, it must also be true that rational parties will conduct all those trades in private goods - and all those bargainings which internalize externalities or provide public goods - that yield positive net gains greater than the transaction costs of realising them. Consequently, the Coase Theorem under transaction costs implies a marginal condition according to which rational parties will necessarily achieve a Pareto-efficient allocation through voluntary transactions or bargaining.

2.1 The Model - voice only

Olson (1965,1996) and Dixit and Olson (2000) among others have argued that the Coase Theorem would lead in many cases to absurd conclusions as it does not take into account the number of parties who must participate in the internalization of externalities or the provision of public goods. The result of Pareto-inefficient outcomes is therefore not only due to transaction costs which would be covered by the modified Coase Theorem, but also to the existence of free-rider incentives. The latter in turn are a function of population size, N, and the minimum number of parties, M, necessary to produce a public good. We follow this line of argument based on Dixit and Olson (2000) that the Coasian claim that a 'meeting' of all beneficiaries of the public good will achieve unanimous agreement on the provision of that public good neglects the non-cooperative incentive to free-ride on the coalition's effort. As stated above, it is an inherent part of the Coase Theorem that participation and agreements are voluntary. Only focussing on the 'meeting' therefore overstates the power of the Coase Theorem and leads to an overoptimistic view of the efficiency of market outcomes.

We assume that the provision of a public good - the increase in the economic performance of the firm under consideration - requires a minimum number of pension funds M bearing its production costs, with $M < N$. Everyone is free either to join the coalition of size M or to free-ride. If there is a sufficient number of pension funds joining the coalition, so that the public good can be produced, intervention takes place. Hence, each agent - each pension fund in our case - has to formulate the probability of his participation in the coalition being pivotal or not. Obviously, the probability of being pivotal depends on M relative to N. If N is large compared to M the probability that one pension fund is pivotal is small, hence, each pension fund may decide in a non-cooperative manner not to join the coalition and to free-ride. This in turn means that intervention cannot take place because of the wide dispersion of stocks in the respective enterprize that are held by pension funds.

In the setting we present here, each pension fund is free to join the coalition or not. Additionally, as far as the distribution of shares of the firm under consid-

eration is concerned, we assume an equal distribution of shares held by pension funds ($i = 1, ..., N$), with $\alpha^{PF} = \sum_{i=1}^{N} \alpha_i < 1$ representing the overall amount of shares held by the N pension funds. The remaining shares $1 - \alpha^{PF}$ are held by noise traders. Moreover, we assume that the economic performance of the firm under consideration is reflected by the shareholder value. Normalizing the price per share to one, and assuming that the economic performance of the firm remains at its current level with a successful intervention and is zero otherwise, the benefit of the coalition Π_1 is equal to amount of shares held by each pension fund.

If the number of pension funds within the coalition reaches the critical level M, the intervention is successful, the costs C^I of the intervention are shared within the coalition and the expected increase in the economic performance of the firm exhibits the characteristics of a non-excludable public good. Although each pension fund is free in its decision to free-ride or to join the coalition, it is known to everybody that there is no increase in shareholder value if the coalition fails to form. Hence, the decision to free-ride is dependent upon the probability of success that the coalition will form without the participation of the pension fund willing to free-ride. Therefore, in order to decide whether to join the coalition or not, each pension fund has to formulate a rational expectation of whether the coalition will be successful without its participation. There are only two possible outcomes: success or failure. We denote by P (which is endogenous) the probability of any pension fund $i \in N$ joining the coalition. At this point, we can denote the probability of exactly M successes in N independent Bernoulli trials, where the probability of success in each trial is , as

$$b(N|M, P) = \frac{N!}{M!(N-M)!} P^M (1-P)^{N-M}. \tag{1}$$

From the perspective of an individual pension fund, the rational decision can be demonstrated as follows. If there are $(M-1)$ or more players out of $(N-1)$ players, then the expected net benefit of joining the coalition (IN) from the perspective of the $(N-1)$-th player amounts to

$$\sum_{n=M}^{N} \frac{(N-1)!}{(n-1)!((N-1)-(n-1))!} P^{n-1} (1-P)^{(N-1)-(n-1)} \left[\Pi_1 - \frac{C}{n}\right] \tag{2}$$

On the other hand, if more than M of $N-1$ players choose IN, the $(N-1)$-th player could choose OUT and free ride on the coalitions effort earning an expected benefit of

$$\sum_{n=M}^{N-1} \frac{(N-1)!}{n!(N-1-n)!} P^n (1-P)^{N-1-n} \Pi_1. \tag{3}$$

A mixed-strategy equilibrium requires indifference between joining the coalition and free-riding hence equalizing the last two expressions yields

$$\underbrace{\frac{(N-1)!}{(M-1)!((N-1)-(M-1))!}P^{M-1}(1-P)^{(N-1)-(M-1)}\left[\Pi_1\right]}_{\text{benefit of choosing IN}} \tag{4}$$
$$= \underbrace{\sum_{n=M}^{N}\frac{(N-1)!}{(n-1)!((N-1)-(n-1))!}P^{n-1}(1-P)^{(N-1)-(n-1)}\left[\frac{C}{n}\right]}_{\text{cost of choosing IN}}$$

The term on the LHS in Eq.(4) means that $M-1$ chose IN, hence $N-1$ is pivotal. The RHS is the cost share of the $(N-1)$-th player when he chooses IN.

In aggregate M players are necessary to form a coalition. P adjusts such that any player is indifferent between joining and not joining the coalition, hence

$$\frac{\left(\begin{array}{c}N\\M\end{array}\right)P^M(1-P)^{N-M}}{\sum_{n=M}^{N}\left(\begin{array}{c}N\\n\end{array}\right)P^n(1-P)^{N-n}} = \frac{b(M|N,P)}{1-B(M|N,P)} = \frac{C}{\Pi_1 M} \tag{5}$$

An equilibrium implies that the shared costs among coalition members in relation to the expected increase in shareholder value has to equal the conditional probability at the margin that the coalition forms. Moreover, the cost-benefit relation on the right-hand side must be smaller than one ($\Pi_1 > \frac{C^I}{M}$), to make the formation of a coalition economically reasonable.

Figure 1 shows the cumulative probability that a coalition of size M will form (dashed line) as a function of P for a given N which is, not surprisingly, increasing in P. The solid line shows the behavior of the left-hand side in Eq. (5) which is declining in P. Formally, the left-hand side can be interpreted as a hazard rate which answers the question of how big the variation of the probability is that there are more than M successes in N independent Bernoulli trials, after an infinitesimally small increase in P, given that the probability of drawing more than M is $1-B(M|N,P)$. Obviously, the hazard rate is declining from 1 to 0 as P increases from 0 to 1.[3]
The equilibrium probability of success is determined endogenously by Eq. (5) depending on M, N, Π_1 and C^I. Since it is not possible to solve Eq. (5)

[3]For more details see appendix

analytically, we have to apply a numerical iteration method by discretization of the probability space.[4]

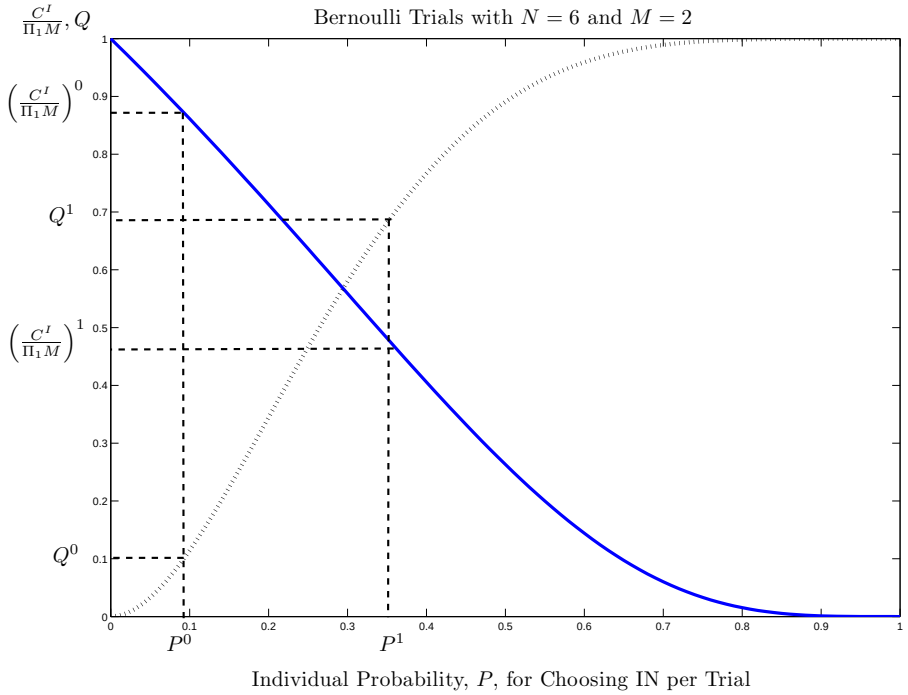

Figure 1: Determination of the endogenous probability, P (see Eq.(5)).
Solid line: hazard rate of M successes as a function of P for given N.
Dashed line: Cumulative probability that a coalition of size M will form as a function of P for given N.

In Table 1, we present numerical solutions for the individual probability P of joining the coalition and the cumulative probability, Q, that at least M pension funds are willing to join the coalition. As previously mentioned, pension funds hold large dispersed stocks varying between 0.5% and 2% in one firm. Therefore, no pension fund is supposed to hold a very large stock position. Intervention costs, C^I, consist of two blocks: monitoring costs, C^M, which are assumed to be fixed and which include the costs of collecting information about the firm and controlling the management and the coordination costs among the group of pension funds which choose to form a coalition, εM, with $\varepsilon > 0$. Therefore, C^I can be written as[5]

[4]A detailed description of the algorithm and an example for a MatLab-solution routine is shown in the Appendix. Dixit and Olson (2000) yield numerical solutions through the inversion of the incomplete β-function. Our method minimizes numerical effort and is exact up to $1 \cdot 10^{-9}$.

[5]We assume a linear cost function without further loss of generality. Convex cost functions would just alter the quantitative results.

$$C^I = C^M + \varepsilon M \tag{6}$$

With regard to the coordination costs, we assume quite an optimistic scenario as the linearity in M suggests the collaboration among pension funds which minimizes coordination effort. Alternatively, we could assume that all the pension funds willing to form a coalition have to coordinate themselves on their own which would imply coordination costs of size $\varepsilon\frac{M^2-M}{2}$. Hence, the endogenous probabilities of coalition formation we derive below are upward biased. The qualitative results of the model, however, remain unaffected.
We normalize the price per share to one and, as before, the value of the firm is supposed to be zero if the intervention fails and to remain on its previous level if the intervention is successful.
Throughout the simulations 1a - 1c (see Table 1), we distinguish between two critical levels of shares α_{crit} necessary for a successful intervention. The most pessimistic value for α_{crit} is 0.5. According to empirical evidence, however, in most cases it is not necessary to have a majority in order to win a proxy vote. If the number of minority shareholders, for example noise traders is big, it may well be that an α_{crit} of one third may be sufficient to win. As can be seen in the baseline scenario (Table 1a) for an individual share per pension fund $\alpha_i = 0.55\%$, the minimum number of funds joining the coalition is 91 out of 100. An increase in the shares held by pension funds implies a lower M. A lower M in turn decreases the probability that one single pension fund is pivotal for the success of the coalition and therefore diminishes the willingness to bear the costs of the intervention. Hence, the incentive to free-ride on the coalition's effort is higher and the probability, P, for choosing to join the coalition (c.p.) lower. At the same time, however, intervention costs are decreasing implying a higher profit-cost ratio of the coalition which makes participation in the coalition more attractive and increases P. If a smaller coalition size also has lower coordination costs and therefore a lower cost-benefit ratio, the endogenous (individual) probability to join the coalition increases with the stock positions held by pension funds. Since the cost-benefit ratio is close to one and the minimum number of pension funds necessary for a successful intervention, M, is quite close to N, the cumulative probabilities, Q, for a successful formation of the coalition are nearly zero.[6]
In Table 1b, we analyze the effects of a lower α_{crit}, for example due to an increase in the number of noise traders. Obviously, a lower α_{crit} reduces M which increases the cost benefit-ratio of the intervention. Both, the reduction in M and the increase in $\frac{C^I}{\Pi_1 M}$ induce an increase in the incentive to free-ride on the coalition's effort, hence, P and Q decline. An increase in the number of shareholders who do not participate in a proxy vote reduces the chances for

[6]What is relevant for a successful formation of a coalition is the cumulative probability, Q, of drawing at least M IN's in N independent Bernoulli trials, which is determined by $Q = 1 - \sum_{n=0}^{M-1} \frac{N!}{n!(N-n)!} P^n (1-P)^{N-n}$.

successful coalition formation.

The higher are M and N, the more the cumulative density function is shifted to the right. Under such circumstances a cumulative probability for successful coalition formation significantly greater than zero can only be assured if the cost-benefit ratio is substantially smaller than one, for example due to a reduction in coordination costs. In Table 1c, we present the effects of a substantial reduction in coordination costs compared to the baseline scenario in Table 1a. The reduction in the coordination costs leaves M unaffected. A lower cost-benefit ratio, however, increases the incentive for each pension fund to join the coalition, hence P and Q are higher (see also Figures 2 and 3).

a) Baseline Scenario: $N = 100$; $C^M = 0.1$; $\varepsilon = 0.004$; $\alpha_{crit} = 0.5$

α_i	M	$\frac{C^I}{\Pi_1 M}$	P	Q
0.0055	91	0.9271	0.2930	$1.5987\ 10^{-14}$
0.006	83	0.8675	0.3233	$2.3759\ 10^{-14}$
0.0065	77	0.8152	0.3536	$2.5424\ 10^{-14}$

b) Higher fraction of noise traders: $\alpha_{crit} = 0.45$

α_i	M	$\frac{C^I}{\Pi_1 M}$	P	Q
0.0055	82	0.9490	0.1212	$4.885\ 10^{-15}$
0.006	75	0.8889	0.1919	$1.4766\ 10^{-14}$
0.0065	68	0.8289	0.2424	$1.2768\ 10^{-14}$

c) Lower coordination costs: $\alpha_{crit} = 0.5$; $\varepsilon = 4\ 10^{-4}$

α_i	M	$\frac{C^I}{\Pi_1 M}$	P	Q
0.0055	91	0.2725	0.9092	0.5762
0.006	83	0.2675	0.8082	0.3425
0.0065	77	0.2613	0.7374	0.2694

Table 1: Endogenous probability P for choosing to join the coalition and the cumulative Probability,Q, that at least M pension funds form a coalition.

Given the economic rationality of incentives to free-ride, we isolated three reasons which may be responsible for the failure of an intervention. A wide stock dispersion of pension funds reduces stock concentration in each firm which increases coordination costs since more members are necessary to form a coalition. High coordination costs lower the economic incentive to join the coalition and

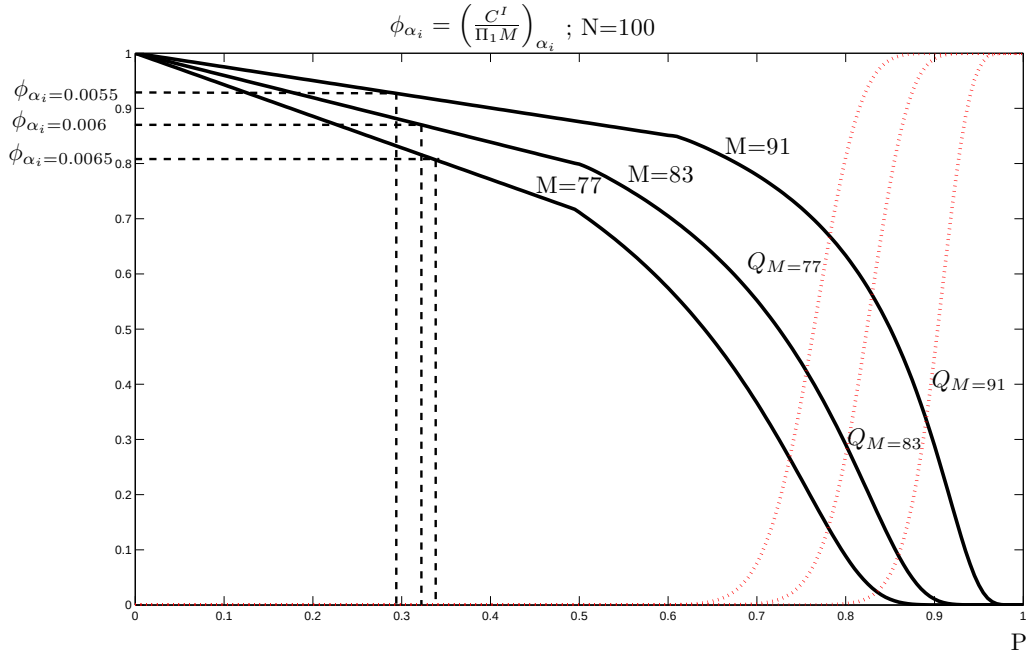

Figure 2: Graphical presentation of the Baseline Scenario (see Table 1a).

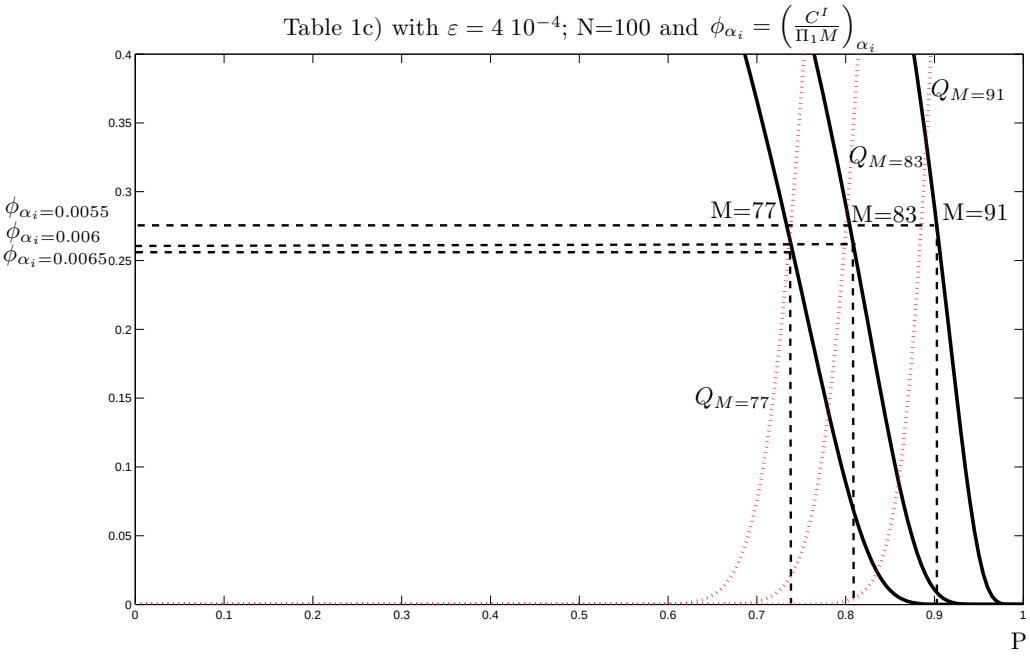

Figure 3: Graphical presentation of the effects of a reduction in the coordination costs compared to the Baseline Scenario (see Table 1c).

decrease the probability that one single pension fund is pivotal. Second, the higher the amount of noise traders, the smaller is the minimum size of the coalition, which again increases the individual incentive to free ride. Finally, a cost-benefit ratio close to one generates cumulative probabilities close to one. Cumulative probabilities significantly greater than zero can only be achieved if the cost-benefit ratio is much lower than one. Since monitoring costs are generally fixed, intervention costs could only be reduced by economizing on coordination costs, for example in a more efficient institutional setting such as delegated votes.

2.2 Exit option

Pension funds, which do not participate in the coordinated effort to improve a specific firm have two possible choices: They can hold on to the shares of the specific firm and thereby hope to free-ride on the actions of the coordinating pension funds, or they can sell their shares in that specific firm in order to reinvest the proceeds in the stock market. Because of the equilibrium condition between participation in the coordinated effort and free riding, these possibilities yield ex ante the same return. This outcome has to be compared with the situation where a specific pension fund uses an exit strategy and sells part or all of its stock position, α_i. We assume for the moment that the pension fund holds a widely diversified portfolio and therefore does not have to consider the risk impact of his decision to sell the specific stock. We further assume that stocks of this specific firm only yield a return of 0, when no intervention is undertaken, whereas the (opportunity) return of (re-)investing in the stock market is Π_M. A pension fund will sell as many stocks as possible, as long as the marginal return on the reinvestment exceeds transaction costs.
We assume that transaction costs induced by the sale consist of two different components. Obviously each trade involves a commission (payable to a broker and to the stock exchange), which is a small proportional transaction cost rate (k, k>0). Additionally, market impact has to be considered, especially in our model where the selling pension fund (the only informed market participant belonging to the group of pension funds) sells its holdings to uninformed small or noise traders. When small investors recognize (by viewing the offered volume) that the pension fund wants to unload its position in a specific stock, they will suspect that the pension fund has superior information and so additional stocks will only be bought at progressively lower prices[7]. Therefore market impact costs m, $(1 \leq m \leq 2-k)$ increase steadily with trading size. The net proceeds of selling a portion of that specific stock then amount to

$$s\alpha_i(1-k-(m^s-1)) = s\alpha_i(2-k-m^s) \tag{7}$$

[7]Since we only have one period of trading in our model, we assume that the pension fund appears only once at the market and discloses the amount of shares it wants to sell. A more detailed description of optimal trading and measuring of transaction costs is given in Grinold and Kahn (1999). In order to minimize market impact, large investors typically spread the trade over more periods while also having to consider opportunity costs.

Market impact is highest when a pension fund wants to unload all its stocks (s=1) and the liquidity of the market is extremely low ($m = 2-k$). In this case, the stock price drops to zero. The pension fund will reinvest the net proceeds in the stock market. We assume that the pension fund will use the proceeds by investing proportionally in all the stocks of its portfolio in order to get the average return of the stock market, Π_M. This buy trade only incurs brokerage costs of k for the following two reasons: First, the buy tickets are smaller and second, the counterparty does not suspect an information asymmetry, since the volume of trades in this case is relatively small. It is now profitable for the pension fund to sell its shares of the "lemon" company and buy the market portfolio as long as as the full trading costs, primarily the continuously rising market impact costs on the sale side are still lower than the expected gain of improving the portfolio. The return on the reinvestment, Γ is

$$\Gamma = \Pi_M(1-k)s\alpha_i(2-k-m^s) \tag{8}$$

It should be noted that this return on reinvestment represents ex ante, that is, before the pension fund has taken its decisions, the opportunity costs of the other two options of either joining the coordinated effort or not doing anything and free-riding. By taking the derivative of Π_M with respect to s in equation (8), we derive the first order conditions for an optimal fraction s, to be sold by the pension fund

$$\Pi_M(1-k)\alpha_i(2-k-m^s) - \Pi_M(1-k)s^2\alpha_i m^{s-1}) = 0 \tag{9}$$

By solving equation (9) for s, we get s^*, the optimal fraction of stocks to be sold:

$$s^* = (2-k-m)^{1/2} \tag{10}$$

The lower the market impact m, the more it is profitable for the pension fund to use the exit strategy and sell the number of shares given by equation (10). Only the parameter k is directly observable, but direct transactions costs usually have the least influence because of their minimal size. The size of the market impact m will be determined by a number of factors: The higher α_i, the fraction of the firm in possession of the pension fund, and the lower the so-called "free float" - the shares which are held by the small investors - the bigger will be the price drop when the pension fund starts to unload a part of its shares. Additionally, if small investors or other market participants can find out who the seller is and if the pension fund has a good performance record in the eyes of the investing public, the market impact will be bigger. Disclosure rules can force pension

funds to declare their trading activities when they surpass certain thresholds, so that the regulatory environment can also impact how pension funds (and other large investors) act.
By the same rationality as described above we can derive the following equilibrium condition from the perspective of an individual pension fund

$$\sum_{n=M}^{N} \frac{(N-1)!}{(n-1)!((N-1)-(n-1))!} P^{n-1}(1-P)^{(N-1)-(n-1)} \left[\Pi_1 - \frac{C}{n}\right]$$

$$=$$

$$\sum_{n=M}^{N-1} \frac{(N-1)!}{n!(N-1-n)!} P^{n}(1-P)^{N-1-n} \left[(1-s)\Pi_1 + s\Pi_M\right]. \tag{11}$$

implying that

$$\frac{b(M|N,P)}{1-B(M|N,P)} = s^* \left(\frac{\Pi_M - \Pi_1}{\Pi_1}\right) + \frac{C^I}{\Pi_1 M}. \tag{12}$$

For $s^* = 0$ (no shares are sold, due to high transaction costs m), Eq. (12) is equal to Eq. (5) without existence of an outside option. For $s^* > 0$, a closer inspection of Eqs. (11) reveals that the existence of an exit option increases the return from free-riding on the coalition's effort (see RHS). Moreover, the right-hand side of Eq. (12) is increasing in s^* and Π_M. Since the left-hand side is monotonically decreasing from one to zero, the existence of an outside option lowers P and Q.

3 Coalition of "universal owners" and externalities in profits

One feature of pension funds has been omitted so far, because the one-period model presented above cannot take time into account. But pension funds as financial intermediaries do have a long time horizon with regard to their liabilities, i.e. future pensions for their members. Because of that, pension funds should take into account intratemporal and intertemporal externalities when they decide whether or not to closely monitor firms. Along this line of thought Hawley and Williams (2000) introduce a "universal owner" and define him as following: "A universal owner is a large institution that holds in its portfolio a broad cross section of the economy, holds its shares for the long term, and does not trade except to maintain its index". Hawley and Williams hypothesise that universal owners could assume the role of social planners, if some positive or negative external effects between profits of different firms exist. For example, if firm A hampers profits of firm B through the use of polluting technologies,

it could be very well in the interest of pension funds for firm A to switch to a clean production technology, even if the value of firm A is lower after the switch. Under the following condition, such a switch could be sensible from the viewpoint of a pension fund:

$$\alpha_B V_B(X_B) - \alpha_A V_A(X_A) \geq 0 \tag{13}$$

where $X_B > 0$ is the percentage gain of capitalised profits of firm B due to Firm A changing to a cleaner technology, and $X_A < 0$ is the capitalised reduction of profits of Firm A after the switch. We abstract here from changes in weights of the portfolio of the pension fund.

Pension funds, if they want to pursue this strategy, had best "coerce" heavily polluting firms into switching to a clean technology. But there are several caveats: 1. Only in rare cases (for example chemical firms polluting rivers and thereby hampering the fishing industry) can such direct negative externalities be proven and the direct economic impact measured. 2. The connection is not that clear cut, pension funds, especially if they operate in a coordinated matter, have to share homogenous beliefs about which industries are harmful to others. Monitoring activity in this regard would therefor also include an environmental dimension. From a corporate governance viewpoint, it is not clear if management of firm A should give in when approached by a pension fund asking to switch to a clean technology. By doing so it would impair the interest of shareholders, who held only stocks of firm A but none of B. Additionally, if these steps toward a cleaner technology could be undertaken continuously, management would face a dilemma: How should the conflicting goals of profit maximisation and reduction of pollution be weighted? In this respect, it has to be noted, that Tirole (2000) mentions a clear lack of mission as one of three problems for the implementation of the stakeholder society.

4 Concluding Comments

It has been shown that the formation of a coalition of pension funds for monitoring purposes is costly, which induces the incentive to free ride. The higher the incentive to free ride, which is more likely to be the case when ownership is more dispersed, the less likely the probability of the formation of a coalition.

Whether or not active monitoring is encouraged by the public or the regulator, disclosures of stock holdings within the group of pension funds should at least be promoted. From the viewpoint of society, pension funds should be allowed to endorse shareholder resolutions originated by pension funds, which force firms to move towards a clean technology. Existing regulations which prohibit coordinated behaviour should be lifted for pension funds.

Pension funds, like other institutional investors, have gained considerable weight in stock markets in the last decades. With economic growth and improved regulations stock markets have become more liquid and therefore ownership has become more dispersed. In the absence of a market for corporate

control and in light of the principal-agent problem it can be dangerous for society, if all pension funds due to risk considerations only invest in a passive way. Also for a single pension fund such a strategy could be disadvantageous. We argue in our paper that active coordinated monitoring by pension funds can be value-enhancing. Additionally, pension funds as stockholders could also take on an active coordinated role, in order to force firms to implement newer and cleaner technology. A necessary condition for that to happen is that pension funds are able to coordinate their actions and are able to find a way to divide the monitoring costs. If pension funds adopt such goals and strategies, corporate governance can be understood as "the design of institutions that induce or force management to internalize the welfare of stakeholders" (Tirole, 2001, p.4). If that is achieved, pension funds would fully take on their role as "universal owners".

5 Appendix

5.1 Hazard Rate

Suppose the random variable T has a continuous probability distribution $f(t)$, such that the cumulative probability distribution is

$$F(t) = \int_0^t f(s)ds = Prob(T \leqslant t). \tag{14}$$

The probability that the spell is of length at least t is given by the survival function

$$S(t) = 1 - F(t) = Prob(T \geqslant t). \tag{15}$$

The hazard rate answers the following question. Given that the the spell has lasted until t, what is the probability that it will end in the next short time interval, Δt? Hence

$$\lim_{\Delta t \to 0} = \frac{F(t + \Delta t) - F(t)}{\Delta t S(t)} = \frac{\frac{\partial F(t)}{\partial t}}{S(t)} = \frac{f(t)}{S(t)}. \tag{16}$$

$\rightarrow$ The hazard rate is the rate at which spells are completed after duration t, given that they lasted until time t.

Binomial Distribution

The probability of observing up to M successes in N independent Bernoulli-trials is given by

$$B = B(M|N, P) = \sum_{n=0}^{M} \left(\begin{array}{c} N \\ n \end{array} \right) P^n (1 - P)^{N-n}. \tag{17}$$

The probability of observing more than M successes in N independent Bernoulli-trials is given by

$$1 - B(M|N, P). \tag{18}$$

Hence, the hazard rate of the binomial distribution is given by

$$\lim_{\Delta P \to 0} = \frac{B(P + \Delta P) - B}{\Delta P(1 - B)} = \frac{\frac{\partial B}{\partial P}}{(1 - B)} = \frac{b}{B}. \tag{19}$$

$\rightarrow$ The hazard rate of the binomial distribution answers the question, how big is the variation of the probability that there won't be more than M successes in N independent Benoulli-trials after an infinitesimal small increase in the probability of success in one trial, P, given that the probability of drawing more than M for fixed P and N is $1 - B(M|N, P)$.

5.2 Solution Algorithm

1. *Define a vector i with nk elements, with nk not smaller than 100.*
2. *Span up a vector of probabilities $P = \{P_{\{i=1\}} = 0, ..., P_{\{i=nk\}} = 1\}$.*
3. *Calculate $x_{\{i\}} = 1 - \frac{b_{\{i\}}}{\sum_{n=0}^{M} \frac{N!}{n!(N-n)!} P_{\{i\}}^{n} (1-P_{\{i\}})^{N-n}}$.*
4. *$1 - \frac{b}{\sum_{n=0}^{M} \frac{N!}{n!(N-n)!} P^{n} (1-P)^{N-n}}$ is declining in P. Find that $P_{\{i\}}$ for which $x_{\{i\}} < \frac{C}{VM}$ and set $i = max$ and $i - 1 = min$.*
5. *Define a new vector with $\frac{P_{\{max\}} - P_{\{min\}}}{nk-1}$ entries from $P_{\{min, i=1\}}$ to $P_{\{max, i=nk\}}$.*
6. *Go back to Step 3 until $\frac{C}{VM} - x_{\{max\}} < tol$, with $tol = 1\ 10^{-j}$ and $j \geq 9$.*

5.3 MatLab- solution routine


```
function dixitolsonnum
clc

N=30;
M=10;
nk=200
tol=0.00000001;
P=0:1/nk:1;

%C = (1-binopdf(M,N,0.048)/(binocdf(M,N,0.048)));
C=9.99/M;

i=1;

while i<nk+1
   x=1-factorial(N)/(factorial(M)*factorial(N-M))*P(i)^M*(1-P(i))^(N-M)/(binocdf(M,N,P↙
(i)))
   %x = 1 - binopdf(M,N,P(i))/(binocdf(M,N,P(i)))
   if (x<=C)
       P(i)
       max=i
       i=nk+1
   else
       i=i+1
   end
end

x
di=C-x

while di>tol

Pu=P(max-1)
Po=P(max)
step = (Po-Pu)/(nk-1)

P=Pu:step:Po;

i=1;

while i<nk+1
   x=1-factorial(N)/(factorial(M)*factorial(N-M))*P(i)^M*(1-P(i))^(N-M)/(binocdf(M,N,P↙
(i)))
    %x = 1 - binopdf(M,N,P(i))/(binocdf(M,N,P(i)))
   if (x<=C)
       max=i;
       i=nk+1;
   else
       i=i+1;
   end
end

P(max)
x
di=C-x
end
```

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