

Determinants of Intercorporate Shareholdings¹

Øyvind Bøhren

Norwegian School of Management
Elias Smiths vei 15
N-1300 Sandvika, Norway
e-mail:oyvind.bohren@bi.no

Øyvind Norli

Stockholm School of Economics
Sveavägen 65
S-113 83 Stockholm, Sweden
and
Norwegian School of Management
Elias Smiths vei 15
N-1300 Sandvika, Norway
e-mail:oyvind.norli@bi.no

March 1997

Forthcoming *European Finance Review*

¹We have received valuable comments from the editor, B. Espen Eckbo, from Kristian Rydqvist, Kuldeep Shastri, David C. Smith, and from seminar participants at the Central Bank of Norway, the Norwegian School of Management, the Stockholm School of Economics, the 1996 meetings of the European Finance Association, and the 1996 meetings of the Financial Management Association. Financial support from the Norwegian Research Council (grant 109967/531) is gratefully acknowledged.

Abstract

This paper examines why firms choose to spend resources on acquiring ownership rights in other firms. Based on a unique data base of every individual intercorporate shareholding on the Oslo Stock Exchange during the period 1980–1994, we find that such investments serve at least three functions. First, they play a role in corporate governance, as managers in firms with low insider holdings, diffuse ownership structure and high free cash flow tend to mutually acquire equity stakes in each other, possibly in a collective attempt to protect their human capital in the market for corporate control. Second, interfirm equity holdings serve as financial slack for growing firms, reducing potential adverse selection costs by providing an internal funding source for new investments in long-term assets. Finally, our findings also suggest that intercorporate shareholdings are an integrated part of the investor's cash flow management system by being a liquidity buffer when cash inflows and cash outflows are non-synchronous.

1 Introduction

Intercorporate shareholding is a pervasive international phenomenon. According to recent estimates in 17 countries, its aggregate size is on average remarkably large but also quite variable across national markets. For instance, the ratio of intercorporate share value to total equity capitalization among listed firms is about 50% in Japan, 25% in Sweden, 15% in Norway, 10% in Spain, 1% in the U.S. and virtually zero in the U.K.¹ The resulting double-counting effect in market aggregates may seriously distort conventional measures of market size, market return, aggregate capital structure, market-wide P/E ratios, and also international portfolio weights.²

Whereas the aggregate size and the distortive measurement effects of intercorporate shareholdings are currently well documented, less is known about why the phenomenon occurs. Existing research on the determinants of intercorporate investments has so far focused on its role in two specific contexts which both relate to corporate governance. Sheard (1991), McDonald (1991), Prowse (1992), Flath (1993), and Berglöf and Perotti (1994), among others, analyze the complex web of trading and financing relationships within the Japanese keiretsu system. According to Berglöf and Perotti (1994), the predominant use of shareholdings within a Japanese keiretsu may be rationalized as an efficient way of enforcing collaboration and long-term commitment on the individual group members.

The second line of corporate governance research, which was initiated by Mikkelson and Ruback (1985) and Shleifer and Vishny (1986), studies the pre-bid acquisition of target shares (toe-holds) in the U.S. market for corporate control. According to recent findings by Betton and Eckbo (1995), this type of interfirm equity investments may be understood as a tool for influencing several aspects of the bidding process, such as the initial size and the subsequent revisions of the offer premium, target management resistance, the entrance of rival bidders, and the ultimate outcome of the corporate control contest.

The analyses of Japanese keiretsus and U.S. toe-holds provide valuable insights into the role

¹See McDonald (1989) and French and Poterba (1991) for more detailed evidence on Japan, French and Poterba (1991) on the U.S., Bøhren and Michalsen (1994) on Norway and Federation of Stock Exchanges in the European Community (1993) on Sweden, Spain, and the U.K.

²Intercorporate shareholdings cause double-counting if the aggregate equity market value is measured by just adding up the individual equity values of each firm. The resulting misestimation of market size and marketwide P/E ratios, which is sometimes quite dramatic, is analyzed empirically in Japan and the US over the 1970–1990 period by French and Poterba (1991). Bøhren and Michalsen (1994) estimate these two effects in the Norwegian market in 1980–1990 as well as the distorting effects on market leverage and market return. Fedenia, Hodder and Triantis (1994) analytically determine the distortions on market returns, the efficient set, and on empirical tests of asset pricing models.

of intercorporate shareholdings as a corporate governance mechanism. Still, the keiretsu system seems to be a unique Japanese phenomenon with no direct European parallel, and a toe-hold is a prelude to a quite rare event in most firms' lives. Therefore, in order to expand the current set of explanations on why intercorporate shareholdings are observed, our paper starts out with the premise that at least in Europe, a firm may choose to invest scarce resources in another firm's shares for other reasons than to discipline members of closely interrelated business groups (the keiretsu idea) or to efficiently prepare for a takeover (the toehold argument). Using firm-specific data for every intercorporate shareholding among all listed Norwegian firms in 1980-1994, we first complement the corporate governance approach by empirically exploring whether managers use such investments to diversify firm risk or to protect their human capital in the market for corporate control. In order to account for rationales other than corporate governance, we then investigate how interfirm equity holdings may serve as financial slack for growing firms, thereby reducing potential adverse selection costs in the market for new security issues. Next, we explore to what extent equity investments are actively used in short-term cash flow management as a buffer between non-synchronous cash inflows and cash outflows. Finally, we provide a wide range of descriptive statistics on each individual shareholding, such as the relative frequency of such investments, the size and duration of the holding, the composition of a firm's equity portfolio and its size relative to the firm's total assets.

We will be using intercorporate shareholding as the general term for an equity holding by one firm in another. A one-way shareholding is when firm A owns stocks in firm B and firm B owns nothing in A. Similarly, if two firms mutually own equity stakes in each other, we call this either a cross-holding, a two-way, or an interlocking shareholding.

The rest of the paper is organized as follows. Section 2 discusses the rationales for intercorporate equity investments and presents the econometric specification of the models. The sample characteristics and the findings from the empirical tests are reported in section 3, and section 4 concludes the paper.

2 Rationales for intercorporate shareholdings

If agents are symmetrically informed and if product, labor, and capital markets are all frictionless and perfectly competitive, intercorporate shareholdings will have no effect on the way resources are acquired, managed and valued. In the following, we gradually introduce mar-

ket imperfections which create a role for intercorporate shareholdings in influencing strategic alliances, corporate governance problems, adverse selection costs, and short-term cash flow management. In each case, we hypothesize how one-way and two-way intercorporate investments may be used to influence the well-being of a firm's owners and managers. In order to establish a relatively comprehensive framework, we present a wider set of potential determinants than what we eventually explore empirically in section 3.

2.1 Hypotheses

Strategic alliance

A strategic alliance is generally an attempt at creating value through cooperation. This may be achieved either by product market collusion or by synergy gains in joint R&D, production, and marketing. In the latter case of a synergy gain, a non-trivial issue is how to measure and split the joint costs and benefits of the cooperative venture. As formalized by Grossman and Hart (1986), the contracting problem occurs because of the high cost of writing an explicit contract which specifies the rights of each party in every conceivable contingency. Under such circumstances, joint ownership by interlocking shareholdings may be an efficient way of splitting the gain. Using the ownership structure as a sharing mechanism rather than explicit contracts would be particularly powerful when each participant's contribution to the joint profit is hard to verify.

If the strategic alliance involves collusion, Reynolds and Snapp (1986) show that by its disciplining effect on the colluders, interlocking shareholdings may influence market power and hence break down a perfectly competitive market. Using a static Cournot model, they show that increased cross-holdings among competitors decrease market output and increase product prices. In the limit, where every firm's shares are owned by its rivals, aggregate production equals the monopoly output, and the monopoly price prevails. The interlocking ownership structure reduces everybody's temptation to cheat (i.e., to increase production beyond the collusive level), as the competitors' profit loss also hurts the cheater through a lower payoff on the cheater's equity stakes in its competitors. However, under less restrictive game-theoretic assumptions, where the Cournot game may be played repeatedly, Malueg (1992) demonstrates that the optimality of cross-holdings depends on the shape of the demand function for the firm's products. Thus, whether or not interlocking shareholdings is a value-maximizing ownership structure cannot be

determined until the demand elasticities in the product markets are specified.

To our knowledge, there is no direct empirical evidence on the relationship between product market collusion and intercorporate shareholdings. However, Eckbo (1983, 1992) examines large horizontal mergers, arguing that under the collusion hypothesis, acquisition of a large stake in the target firm signals increased industry monopoly rents, and thus increased market value of all the firms in the industry. The data do not support this collusion argument.

Corporate governance

According to existing research on the keiretsu system and the bidding process in takeovers as reported in section 1, intercorporate shareholdings have important roles to play in corporate governance. We will focus on a different aspect of corporate governance by studying how conflicts of interest between owners and managers may induce the management team to make interfirm equity investments to their own personal benefit rather than use it as a value-maximizing device for, say, disciplining cooperating firms of a keiretsu or reducing the cost of a takeover through a foothold.

A significant portion of the managers' human capital may be firm-specific and hence contingent on the firm's future existence. Therefore, relative to a value-maximizing financing and investment policy, self-interested managers may underlever and overdiversify the firm's assets in order to reduce the risk of financial distress (Jensen and Meckling, 1976). Realizing the managers' propensity to waste corporate resources on lowering diversifiable risk, the owners may reduce the agency costs by restricting managerial discretion over free cash flow, typically by choosing financial policies which involve a high leverage and a high dividend payout. The agency cost argument would therefore predict that given a firm's financing and dividend policy, the value of intercorporate investments increases with the investor's free cash flow. Moreover, because managers acquire shares in other companies in order to reduce firm-specific risk, we further hypothesize that the smaller the economic correlation of two firms, the more they will invest in each other by way of two-way holdings. In either case, the ownership structure of the investing firms will influence the seriousness of the cashflow problem (Shleifer and Vishny, 1995). We expect that the tendency to waste free cash flow on risk-reducing equity investments is less pronounced the higher the ownership concentration and the higher the managerial stockholding in the investing firm.

Both theory and empirical evidence suggest that agency costs of the stockholder-manager conflict partly explains target management resistance to a takeover (Comment and Schwert, 1993). One possible resistance strategy is to establish an agreement with another firm to mutually buy up each other's shares in the stock market. Such cross-ownership, combined with a back-up agreement, reduces the number of shares available to potentially hostile bidders and thus lowers the probability of a hostile takeover. Presumably, such defense agreements are easier to make when both parties feel threatened by a potential takeover. Hence, we predict that self-interested managers of firms who expect takeover attempts will cross-invest in each other. As with the case of corporate diversification, we expect that a concentrated ownership structure and significant managerial equity holdings reduce the managers' propensity to cross-invest in order to protect their human capital in the market for corporate control.

Adverse selection costs

The alternative to maintaining a liquidity buffer (financial slack) for funding new investments is to rely on new issues of debt or equity. However, as illustrated by the adverse selection argument of Myers and Majluf (1984), an uninformed investor who cannot distinguish between overpriced and underpriced firms will regard an equity offering announcement as a negative signal about the intrinsic value of the announcing firm. In order to hedge against the probability of the issue being overpriced, the market will therefore reduce the price of any firm which tries to issue new shares. In addition to such adverse selection costs, the issuing firm must also carry the direct flotation costs, which on the Oslo Stock Exchange are typically 3-5% of the issue proceeds.³ The same adverse selection mechanism is at work for public debt offerings. However, as debtholders are senior claimants relative to stockholders, the adverse selection effect is less pronounced, making debt a preferred alternative to equity as an external funding source. Thus, financial slack will be at the top of the financing pecking order, followed by new debt and finally new equity.

According to Myers and Majluf (1984), firms build up financial slack to avoid having to raise external funds. Since shareholdings in other firms is a form of financial slack, we expect that when firms spend resources on long-term assets, intercorporate shareholdings will decrease whereas debt and equity issue proceeds will increase.

³See Bøhren, Eckbo and Michalsen (1997) for OSE evidence and Eckbo and Masulis (1992) for further evidence of the cost of equity issues and the choice of a cost-minimizing flotation method.

Transaction costs

With a perfect capital market, firms instantaneously match any short-term imbalance between cash inflows and cash outflows by borrowing and lending. Moreover, stockout is a non-existing problem in a perfect product market, as goods and services can be delivered instantaneously at zero transportation costs. Consequently, there is no need to maintain buffers in terms of cash on hand or stocks of raw materials and finished products.

With positive transaction costs, optimal cash flow management may involve a policy where part of the liquidity buffer is invested in the bond and the stock markets at a positive expected return rather than being kept as cash on hand. Thus, holding shares in other firms can be viewed as an integrated part of the cash flow management system.

The optimal size of the liquidity buffer depends on the risk of the firm's cash flow as well as the size and timing differences between daily cash inflows and cash outflows. Moreover, the firm may maintain a liquidity buffer to finance significant, predictable cash outflows which are only made a few times per year. Typical examples are the payment of dividends, taxes, interest on debt, and loan amortizations. In the empirical analysis below, we focus on dividends, which in Norway are paid only once a year. Thus, the dividend is large relative to the firm's contemporaneous cash inflow, and there may be a non-negligible opportunity cost of keeping the required resources as cash rather than investing them temporarily in the stock market.⁴

The second determinant of the liquidity buffer under the transaction cost argument is cash flow volatility. A less predictable cash flow means that the buffer will be used more frequently. Moreover, the relatively high transaction cost of share trading reduces the attractiveness of equity investments as opposed to cash and deposits for the purpose of maintaining a buffer against daily cash flow shocks. Hence, we hypothesize that the value of intercorporate shareholdings increases with cash flow cyclability and decreases with cash flow volatility.

2.2 Econometric specifications

Table 1 summarizes the theoretical predictions that will be empirically explored in section 3. Relative to the discussion in section 2.1, we will not examine the strategic alliance rationale for interfirm investments.

⁴According to Bøhren et al. (1997), the median payout ratio (dividends per unit earnings after taxes) over the sample period is 23.0% for firms which pay a dividend. Moreover, as stock repurchases are practically ruled out by regulation, dividend payments is the only way resources can be transferred from the firm to the owners.

[Table 1 about here.]

To test the corporate governance, adverse selection, and cash flow management hypotheses, we first run a linear regression with the market value of the firm’s portfolio of intercorporate shareholdings (VIS) as the dependent variable. The independent variables are free cash flow (FCF), ownership structure (EIN and $E10$), net investment in long-term assets (INV), leverage (LEV), a dummy capturing whether or not the company issues equity during period t ($ISSD$), dividends (DIV), and cash flow uncertainty (CFU)⁵:

$$\begin{aligned}
 VIS_{it} = & \alpha_i + \beta_1 FCF_{it} + \beta_2 EIN_{it} + \beta_3 E10_{it} + \beta_4 INV_{it} \\
 & + \beta_5 LEV_{it} + \beta_6 ISSD_{it} + \beta_7 DIV_{it} + \beta_8 CFU_{it} + \epsilon_{it},
 \end{aligned} \tag{1}$$

where ϵ is an error term which is assumed to have the standard properties.

We operationalize the free cash flow (FCF_{it}) as after-tax cash flow from operations less gross investment in long-term assets, implicitly assuming that the investment figure reported by the firm in its accounting statement only reflects value-increasing projects. The variables EIN (fraction of equity held by insiders, i. e., managers and board members) and $E10$ (fraction held by the 10 largest owners) are included to test the conjecture that insider holdings and concentrated ownership both reduce the agency costs of free cash flow.

To test the two predictions deduced from the adverse selection argument, we include new investment in long-term assets in excess of depreciation (INV_{it}) and the book value of debt divided by the book value of assets (LEV_{it}). We also incorporate an equity issue dummy ($ISSD_{it}$), which equals one if the company issues new equity during period t and zero otherwise.

From the transaction cost logic, we inferred that the current year’s stockholdings in other firms increases with the dividend payments planned for next year (DIV_{it}) and decreases with the current cash flow uncertainty (CFU_{it}). Since we can only observe annual cash flow data for our sample firms, we proxy for cash flow risk with the standard deviation of daily stock price returns in period t .

Our second model looks once more at the transaction cost argument that equity investments are used to temporarily store liquidity until a significant, predictable cash outflow is due. Whereas model (1) captures the buildup of the buffer to finance next year’s dividends, model (2) relates the actual payment of the dividend (DIV_{it-1}) to the contemporaneous reduction of

⁵ VIS_{it} , DIV_{it} , INV_{it} , LEV_{it} , and FCF_{it} are normalized by the book value of assets.

the buffer, i.e., the sale of intercorporate shareholdings ($V SIS_{it}$):

$$VSIS_{it} = \alpha_i + \theta_1 DIV_{it-1} + \epsilon_{it} \quad (2)$$

To further investigate the corporate governance predictions from table 1, we estimate the following logistic probability model:

$$P(\text{TWOWAY}_{ijt} = 1) = \Gamma(\gamma_0 + \gamma_1 CORR_{ijt} + \gamma_2 TT_{ijt} + \gamma_3 EIN_{it} + \gamma_4 EIN_{jt} + \gamma_5 E10_{it} + \gamma_6 E10_{jt}), \quad (3)$$

where $\Gamma(\cdot)$ is the logistic distribution. The dependent variable in (3) is a dummy variable TWOWAY_{ijt} , which equals one if at time t firm i holds shares in firm j and firm j holds shares in firm i , and zero otherwise.

The corporate governance rationale suggests that the smaller the economic correlation between two firms, the more likely they will cross-invest in each other. To measure their co-movement, we use the correlation between daily stock returns for firm i and firm j during year t ($CORR_{ijt}$). Model (3) also lends itself to testing the claim that managers of takeover targets protect their human capital in the market for corporate control by teaming up with other takeover targets through interlocking equity investments. We define takeover target as firms with free cash flow above the 75th percentile. The dummy variable TT_{ijt} takes on the value one if both firm i and firm j are takeover targets, and zero otherwise. Finally, we include insider holdings and ownership concentration in both firms to account for respectively the value-maximizing incentives of managers and the monitoring incentive of external owners.

3 Data and analysis

The sample consists of all firms listed on the Oslo Stock Exchange (OSE) by year-end from 1980 through 1994. Information on intercorporate shareholdings was obtained manually by going through each firm's annual reports.⁶ Data on security prices, number of shares outstanding,

⁶Norwegian corporate law requires firms to report stockholding if its face value is at least NOK 50,000 (approximately \$6,900) or at least 5% of the face value of the owner's equity. Shareholdings in subsidiaries must be reported regardless of size. We disregard stockholdings which are not specified in the annual report because they are hard to obtain and negligible in importance. For instance, Bøhren and Michalsen (1994) found that in 1989, the market value of listed, intercorporate shareholdings left out in the annual report was only 0.4% of the specified, listed holdings.

earnings, cash flows, and balance sheet items were extracted from the computerized data base of AS Oslo Børs Informasjon.

We first present descriptive statistics of our sample firms in section 3.1, followed by the results from the empirical tests in section 3.2.

3.1 Descriptive statistics

Tables 2 and 3 summarize key properties of the aggregate value of intercorporate shareholdings, whereas tables 4 and 5 characterize the individual holdings.

Aggregate market value of intercorporate shareholdings

According to the second column of table 2, an average of 132 firms were listed on the Oslo Stock Exchange (OSE) in the sample period, varying between 163 firms in 1985 and 112 firms in 1991. The third column shows that in terms of constant 1994 Norwegian kroner (NOK), the aggregate equity market capitalization of all firms listed on the OSE is on average 118 bill. NOK (about \$18 bill.), reflecting a sharp increase from 38 bill. NOK in the beginning of the sample period to about 250 bill. NOK towards the end.

[Table 2 about here.]

Table 2 reveals that the Norwegian equity market is small by international standards. Only one other European country (Finland) has fewer firms listed by year-end 1994, and the OSE ranks number 12 among the 17 European countries for which comparable stock market data is available. The market value of Norwegian shares constitutes 14% of the listed share value in Scandinavia (Denmark, Finland, Norway, and Sweden), and it is 3% of the share value listed in London (Federation Internationale des Bourses de Valeurs, 1995).

According to columns 4 and 5 of table 2, an average of 81% of the listed firms have at least one other listed firm among its owners, whereas 59% of the firms own shares in other firms. These figures reflect that once a firm chooses to make investments in other firms' equity, it tends to do so in more than one company. Although not reported in the table, our sample also reveals that the intercorporate investors tend to much larger are than the firms they hold. By firm value (market value of equity plus book value of debt), the holding firm is on average 5.4 times larger than the held firm. The relative size of the intercorporate shareholder increases over time; from an average of 5.0 in the first part of the sample period to 6.5 in the second.

Column 6 of table 2 shows the relative market value of intercorporate shareholdings, i.e., the value of all the shares held by OSE firms in other OSE firms divided by the aggregate market value of all OSE shares (equity market capitalization). On average, intercorporate shareholdings account for 15% of equity market capitalization over the sample period, which makes Norway an intermediate case between Japan at the high end and the U.S. at the low. In particular, the relative value of intercorporate shareholdings on the Oslo Stock Exchange is approximately five times higher than the corresponding U.S. ratio in 1980-1990, but only about one third of its Japanese counterpart (French and Poterba, 1991). Looking across the years, the relative value of interfirm equity investments increases towards the middle of the eighties, subsequently dropping off to the level observed in the beginning of the sample period.

According to columns 7 and 8, the aggregate value of one-way holdings exceeds the aggregate value of two-way holdings in each year. Taken as an average over the sample period, one-way holdings constitute 62% of the total value of intercorporate shareholdings. There is an increasing dominance of the one-way relation over time: In market value terms, the ratio of one-way to total holdings is 59% in the first sub-period and 67% in the second.

Table 3 shows the average kroner value of a firm's equity investments and also relates this value to the firm's total assets, current assets, and most liquid assets. According to the second column, the average value of a firm's stock portfolio over the sample period is 149 mill. (in constant 1994 NOK). Column 3 reveals that this value represents on average 7.2% of the firm's total assets, varying between a minimum of 5.3% and a maximum of 11.8% over the 15 years.

[Table 3 about here.]

According to the two right-most columns of table 3, the value of the firm's stockholdings is on average one fifth (19.8%) of the firm's current assets and about one fourth (27.4%) of its most liquid assets (cash, bank deposits, and securities (including stocks)). In either case, the relative value of stockholdings decreases over time. Going from the first to the second sub-period, the average ratio of intercorporate shareholdings to current assets falls from 21.1% to 18.2%. Correspondingly, the ratio of stockholdings to liquid assets declines from 30.7% to 23.5%.

Frequency and size of an individual stockholding

Tables 4 and 5 shift the focus from the aggregate to the individual equity stake. According to the first section (columns 2, 3 and 4) of table 4, our sample contains a total of 10,189 individual

equity investments among OSE firms. The average number of holdings per year is 685, which is about 4% of the potential maximum that may be observed in a market with 132 firms⁷. The number of holdings per year ranges from about 500 to about 1,000.

[Table 4 about here.]

The number of one-way relations is on average 76% of all holdings, whereas we found in table 2 that the corresponding ratio based on the market value is 60%. Thus, even though a two-way relationships is less frequent, it is on average larger than the one-way holding⁸.

The rest of table 4 provides more detailed information on the market value per holding. According to the second section, the mean individual fraction is 2.8%. Thus, if an OSE firm holds shares in another OSE firm, it owns on average 2.8% of that firm's outstanding equity. Splitting the sample into the two types of holdings, we find that the individual one-way fraction is on average 2.6% of the owned firm's market value, whereas the average size of a two-way holding is 3.6%, i.e., almost 40% larger.

The third section of the table reveals that all distributions underlying the means in the second section are heavily skewed towards small fractions. For instance, whereas the average holding is 2.8% over the sample period, the median is just 0.4%. Correspondingly, the median one-way holding is on average 0.3% (mean=2.6%), and the median two-way fraction is 0.7% (mean=3.6%). This skewness towards small fractions is also illustrated by figure 1.

[Figure 1 about here.]

Graph A of figure 1 is the full cumulative frequency distribution of ownership fractions, whereas graph B magnifies the portion of the distribution which covers fraction up to 5%. The figure reflects that more than 60% of all intercorporate shareholdings are below 1%, that more than 80% of them are less than 3%, and that approximately 93% of all holdings are below 10%. Thus, the typical holding is significantly smaller than what the means would suggest.

To provide more detailed information on holdings below 5%, the fourth section of table 4 reports the percentage of ownership fractions below this limit for all, one-way and two-way

⁷The maximum number of ownership relations (one-way plus two-way) with n firms is $n^2 - n$. With 132 firms, the maximum is 17,292

⁸A two-way relationship is counted as two observations rather than one. As the size of firm A's holdings in B typically differs from that of B's holding in A, we use this convention in order to construct a meaningful size distribution for such relationships

holdings. On average over the years, 87% of the intercorporate shareholdings constitute less than 5% of the owned firm's outstanding shares. Moreover, 89% of the one-way holdings and 82% of the two-way are below the 5% limit. Like in the other sections of this table, there is no striking time pattern over the sample period, and the overall impression is that the population is dominated by relatively small holdings.

Finally, in order to characterize the degree of diversification of a firm's intercorporate shareholding, we compute the number of firms in an investor's equity portfolio. As an average over the sample period, we find that the median number of firms per portfolio is 5, i.e., 4% of the available firms. The mean holding is in 9% of the firms, and 75% of the investing firms hold in less than 9% of the other firms. Thus, the typical stock portfolio held by an OSE firm contains shares in just a few companies and is therefore more subject to unsystematic risk factors than, say, a well-diversified mutual fund. If a major rationale for these investments is to be a close substitute for cash, this finding suggests that most OSE firms seem to hold a stock portfolio which is too undiversified and hence too volatile to serve this function in an optimal way.

The lifespan of intercorporate shareholdings

Intercorporate shareholdings may also be characterized by their lifespans, i.e., by the number of years an ownership relation exists between two firms. Given the 10,189 observations on dated ownership fractions, we classify lifespans in the following way. First, if an ownership relation exists in 1980 (the first year of the sample period), its starting year is unknown. Correspondingly, if a holding is observed in 1994 (the final sample year), its ending year is unknown. Therefore, regardless of whether or not these relations extend into one or more years in between these two points, any holding which is observed in 1980 or 1994 is deleted from our lifespan sample.

Second, an ownership relation starting after 1980 and ending before 1994 is given a lifespan of t years if the holding is observed in t consecutive annual reports. Third, when a holding changes from a two-way to a one-way relationship, we count this as two separate lifespans. Fourth, because our ownership data is taken from the firms' annual reports, we implicitly disregard any holding which both starts and ends its life between two consecutive year-ends.⁹

⁹The first selection criterion implies that our estimates of lifespans are biased downwards, i.e., towards short lifespans. A corresponding bias is due to the fact that the observation period may appear short (15 years), implying that any lifespan extending beyond the sample period is neglected. As will become evident from table 5, however, lifespans of at least 7 years (i.e. about half the length of the sample period) only account for less than 1% of the total number of lifespans.

The second selection criterion means that a T -year lifespan may include shares that are held for any period

[Table 5 about here.]

Applying these criteria to our data produces a sample of 3,877 lifespans.¹⁰ The first row of table 5 shows their frequency distribution over the range of lifespans from the minimum of one year to the maximum of 13 years. The most striking feature of this distribution is the dominance of short lifespans, particularly by those with a one year life. In fact, 62% of the holdings are terminated after just one year, the lifespan does not exceed 2 years in 82% of the cases, the average life is 1.74 years, and the median is 1 year. Only 7 out of 3.877 lifespans (0.1% of the cases) exceed eight years, just 80 cases (2.4%) last more than five years, and no cross-holding survives 11 years.

The remaining part of table 5 shows separate frequency distributions and the means for one-way holdings, two-way holdings, small fractions (less than 5%), and large fractions (at least 5%). Two-way holdings have on average longer lifespans than one-way (1.92 vs. 1.66 years). For both types, large fractions last longer than small fractions; the difference being 0.38 years for one-way holdings and 0.17 years for two-way. Every frequency distribution in the table is characterized by the distinct skewness towards one-year lifespans, which is the median in every case.

3.2 Statistical tests

We first relate the sample firms' intercorporate shareholdings to their hypothesized determinants one by one, i.e., by individually exploring each hypothesis from table 1. Next, we test the three multivariate regression models from section 2.2, which allow us to study the firm's decision to invest in listed firms as the net impact of several individual determinants working simultaneously.

The rationales discussed in section 2.1 relate to firms in general in the sense that intercorporate shareholdings is just one out of many ways in which a firm can invest its financial resources. For instance, the transaction cost argument predicts how interfirm investments are used to optimize the composition of the liquidity buffer. However, as some firms have stock

from $T - 1$ to $T + 1$ year. The true life span is close to $T - 1$ years if the shares are bought close to Dec 31 and sold early in a later year. On the other hand, if the shares are bought early in one year and sold late in another year, the lifespan is registered as being T years, although the true lifespan is close to $T + 1$ years. If the distribution of lifespans is symmetric in the range from $T-1$ to $T+1$, however, the second criterion does not produce a biased estimate.

Our fourth sample selection criterion biases the estimate upwards, i.e., towards overestimating the true lifespan. The empirical significance of this potential bias has not been checked.

¹⁰The first selection criterion in the previous note reduces the number of lifespans by 1,095.

market investments as a major corporate activity, the effect of the firm's overall strategy on intercorporate shareholdings may dominate its role in resolving problems of corporate governance, adverse selection or cash flow management. Since banks and insurance firms fit into this category, the holdings by these firms from are ignored in this section.

Univariate analysis

In table 6, we focus on the separate impact of several individual determinants (free cash flow, ownership structure, net investment in long-term assets, leverage, dividends, and cash flow uncertainty). For each variable, we split the sample into the three percentiles [0, 33], (33, 67], and (67, 100]. Within each percentile, we report the number of firms in the percentile (N), the mean and median relative size of these firms' stockholdings (value of the shares divided by the book value of the investor's total assets), and its standard deviation. To allow for a univariate test of differences in stockholdings between firms with low values (33rd percentile) and high values (67th percentile) of a given determinant, the table also shows p-values of the t-statistic for differences in means (p-t) as well as p-values of the Wilcoxon rank sum statistic (p-W) and the medians statistic for differences in medians (p-M). Given our earlier finding that the distribution of intercorporate shareholdings is heavily skewed, we have more confidence in the two non-parametric median tests than in the normality-assuming t-test.

[Table 6 about here.]

Table 6 suggests that firms with high free cash flow (67th percentile) do not own significantly more shares than firms with low free cash flow (33rd percentile). However, consistently with the corporate governance argument, we find that a univariate increase in either ownership concentration or insider holdings reduces the tendency for managers to invest corporate resources in other firms. For instance, the median equity portfolio as a fraction of total assets is 0.4% for firms with low insider holdings (33rd percentile) and 0.1% when insider holdings are high (67th percentile).

The non-parametric tests fail to support the adverse selection rationale for intercorporate shareholdings. The median size of the equity portfolio in firms that invest heavily to expand their long-term assets is significantly higher than in low-investment firms. Moreover, the median stockholding of firms with high and low leverage is not significantly different.

The median value of the equity portfolio is significantly higher for firms which pay high dividends (67th percentile) than for firms with low payouts (33rd percentile). Moreover, firms with high cashflow volatility tend to use less resources for equity investments than low-uncertainty firms. Both observations are consistent with the transaction cost conjecture¹¹.

Multivariate analysis

Table 7 reports the results of estimating the three models from section 2.2. Since our sample involves panel data, i.e., repeated observations of the same variable in the same firm over an extended period of time (up to 15 years), we control for unobserved, firm-specific and systematic effects which are not picked up by the hypotheses by estimating the two linear models (1) and (2) using the fixed effect regression developed in Mundlak (1961), as well as the random component technique introduced by Maddala (1971). As the two approaches produce essentially identical results, both regarding the sign and the significance of the estimated coefficients, panels (1) and (2) of table 7 only report the findings from the random component models.

[Table 7 about here.]

When discussing the findings in table 7, we focus on one of the three theory classes (rather than one model) at a time by going horizontally across the table, comparing the results from different models whenever relevant. Notice that the panel number equals the corresponding model number from section 2.2.

Starting out with corporate governance, from panel (1) shows that when we consider the entire portfolio of a firm's equity investments, there is no empirical support for the notion that the size of this portfolio will grow with an increasing free cashflow or a less disciplining ownership structure. However, judging from panel (3), which predicts the probability that an individual shareholding involves a two-way relationship, the findings are consistent with the argument that managers of takeover targets, which by definition have a high free cash flow, mutually buy each others' shares, and that high insider holdings and high ownership concentration both reduce this tendency to protect managerial human capital by value-destroying investments. Still, intercorporate shareholdings do not seem to be driven by a managerial urge for corporate

¹¹The large difference in number of observations in each percentile is caused by the discontinuity of dividend payments across firms. Dividends are not paid in more than 33% of the firm-years.

diversification, as interlocking shareholdings are more frequent the higher the correlation between the two parties' stock returns.

According to panel (1), the value of the firm's portfolio of intercorporate shareholdings is significantly reduced when new investments in long-term assets are made or if the firm's financial leverage is increased. Moreover, there is no significant relationship between stock investments and equity issues, which are at the bottom of the pecking order. This finding is consistent with the adverse selection argument that intercorporate shareholdings are actively used as a component of financial slack, and that firms prefer debt to equity as an additional source of financing when internal funds are insufficient to finance the asset expansion.

Considering finally the transaction cost rationale, panel (1) shows that next year's dividend (DIV_{it} , which is based on the earnings in year t , but not paid out until the first half of year $t+1$) has a highly significant, positive impact on the firm's equity investment in year t . This supports the argument that the firm temporarily invests funds in corporate stocks that will later be sold and paid out as cash dividends. This interpretation is reinforced by the model in panel (2), where the value of stockholdings which are actually sold during a year is found to be positively related to dividends paid out during that same year. The coefficient of the dividend term suggests that on average, about half the cash required to pay the dividend is financed by selling off parts of the stock portfolio. However, we get no empirical support for the related transaction cost idea that as cash flow uncertainty increases, the equity component of the liquidity buffer is reduced.

4 Conclusions

Drawing on rationales from corporate governance, adverse selection in issue markets, and short-term cash flow management, this paper explores why firms choose to spend resources on acquiring ownership rights in other firms. Using ownership structure data for all firms listed on the Oslo Stock Exchange (OSE) in 1980–1994, we describe the anatomy of interfirm equity investments and test six predictions about its determinants.

Our descriptive statistics reveals that most OSE firms have at least one other OSE firm in its ownership structure, that the investing firm is normally the larger of the two, that most holdings are small and short-lived, and that an intercorporate shareholder's portfolio is rather undiversified. Compared to the two-way relationship, the one-way is more common, has a larger aggregate value, but is individually smaller and has a shorter life. There is a trend over the

sample period for relatively fewer firms to invest in other firms, for the relative size of the investor to grow, and for the two-way relation to become less prevalent.

When exploring the theoretical predictions, we employ three different models. The test of the corporate governance arguments suggests that neither the level of free cash flow nor the potential managerial motivation to reduce firm risk by corporate diversification can credibly explain why intercorporate shareholdings occur. However, consistent with the notion of entrenchment by self-interested managers, we find that two-way holdings are more common among firms with particularly high free cash flow. As a high free cash flow exposes the firm to a potential takeover, the finding supports the argument that managers of takeover targets cross-invest in each other to jointly protect their human capital in the market for corporate control. Interestingly, we also find that high insider holdings and a concentrated ownership structure both reduce the managerial tendency to cross-invest.

Our second set of determinants is based on asymmetric information between the firm and the capital market. Consistent with the notion of adverse selection costs in the security issues market, we find that intercorporate shareholdings play a role as financial slack for growing firms. Firms tend to sell off stockholdings to finance new investments in long-term real assets, and firms with small share portfolios have more debt in their capital structure than other firms.

The tests of the transaction cost arguments suggest that investment in other firms' shares is an integrated part of a firm's cash flow management system. Firms which expect a significant cash outflow during the year, like the annual dividend in our sample, temporarily invest about half the required cash in the stock market. There is no convincing support for the related liquidity management motivation that firms with relatively risky cash flows rely less heavily on stockholdings in their liquidity buffer.

Overall, we conclude that no single explanation stands out as the dominating determinant for intercorporate shareholdings. Our findings suggest that the motivations for such investments may range from strategic concerns in corporate governance to the design of the daily cash flow management system.

References

- Berglöf, Erik and Enrico Perotti. 1994. "The Governance Structure of the Japanese Financial Keiretsu." *Journal of Financial Economics* 36, 259–284.
- Betton, Sandra and B. Espen Eckbo. 1995. "Toehold strategies, competition and takeover contests." Technical Report, university of British Columbia.
- Bøhren, Øyvind, B. Espen Eckbo and Dag Michalsen. 1997. "Why Underwrite Rights Offerings? Some New Evidence." *Journal of Financial Economics* 46, 223–261.
- Bøhren, Øyvind, B. Espen Eckbo, Dag Michalsen and David C. Smith. 1997. "Corporate Dividend Policy in Norway." Unpublished working paper, Norwegian School of Management.
- Bøhren, Øyvind and Dag Michalsen. 1994. "Corporate Cross-ownership and Market Aggregates. Oslo Stock Exchange 1980-1990." *Journal of Banking and Finance* 18, 687–704.
- Comment, Robert and G. William Schwert. 1993. "Poison or Placebo? Evidence on the Deterrent and Wealth Effect of Modern Antitakeover Measures."
- Eckbo, B. Espen. 1983. "Horizontal Mergers, Collusion, and Stockholder Wealth." *Journal of Financial Economics* 11, 241–272.
- Eckbo, B. Espen. 1992. "Mergers and the Value of Antitrust Deterrence." *Journal of Finance* 47, 1005–1029.
- Eckbo, B. Espen and Ronald W. Masulis. 1992. "Adverse Selection and the Rights Offer Paradox." *Journal of Financial Economics* 32, 293–322.
- Fedenia, Mark, James E. Hodder and Alexander J. Triantis. 1994. "Cross-Holdings: Estimation Issues, Biases, and Distortions." *Review of Financial Studies* 7, 61–96.
- Federation Internationale des Bourses de Valeurs. 1995. *FIBV Statistics 1994*. Paris: Federation Internationale des Bourses de Valeurs.
- Federation of Stock Exchanges in the European Community. 1993. *Share Ownership Structure in Europe*. Oslo: Oslo Stock Exchange.
- Flath, David. 1993. "Shareholding in the Keiretsu, Japan's Financial Group." *Review of Economics and Statistics* 75, 249–257.
- French, Kenneth R. and James M. Poterba. 1991. "Were Japanese Stock Prices too High?" *Journal of Financial Economics* 29, 337–363.
- Grossman, Sanford J. and Oliver D. Hart. 1986. "The Cost and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94, 691–719.
- Jensen, Michael C. and William Meckling. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs, and Capital Structure." *Journal of Financial Economics* 3, 305–360.
- Maddala, G.S. 1971. "The Use of Variance Components in Pooling Cross Section and Time Series Data." *Econometrica* 39, 341–358.
- Malueg, David A. 1992. "Collusive Behavior and Partial Ownership of Rivals." *International Journal of Industrial Organization* 10, 27–34.

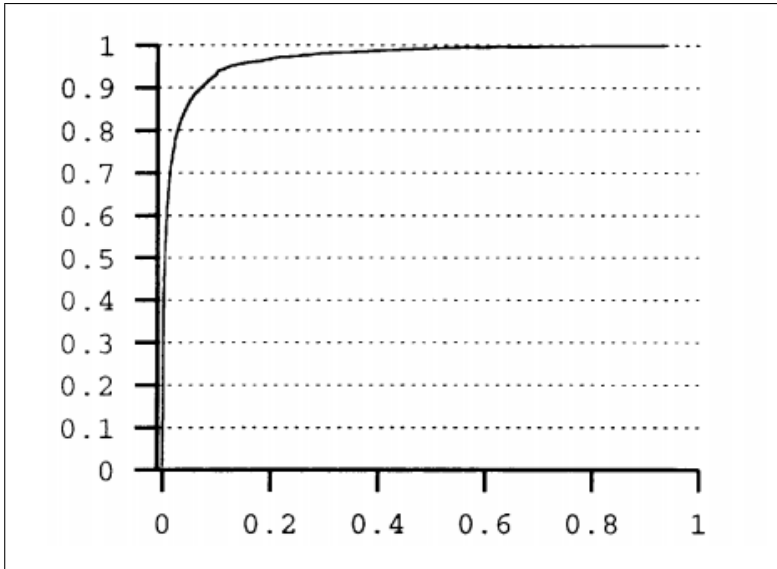
- McDonald, Jack. 1989. "The Mochiai effect: Japanese Corporate Cross-Holdings." *Journal of Portfolio Management* 16, 90–94.
- McDonald, Jack. 1991. "Origins and Implications of Cross-Holdings in Japanese Companies." Technical Note #79 Graduate School of Business, Stanford University.
- Mikkelson, Wayne H. and Richard S. Ruback. 1985. "An Empirical Analysis of the Interfirm Equity Investment Process." *Journal of Financial Economics* 14, 523–553.
- Mundlak, Yair. 1961. "Empirical Production Function Free of Management Bias." *Journal of Farm Economics* 43, 45–56.
- Myers, Stewart C. and Nicholas S. Majluf. 1984. "Corporate Financing and Investment Decisions when Firms have Information that Investors do not have." *Journal of Financial Economics* 13, 187–221.
- Prowse, Stephen D. 1992. "The Structure of Corporate Ownership in Japan." *Journal of Finance* 47, 1121–1140.
- Reynolds, Robert J. and Bruce R. Snapp. 1986. "The Competitive Effects of Partial Equity Interests and Joint Ventures." *International Journal of Industrial Organization* 4, 141–153.
- Sheard, Paul. 1991. "The Economics of Interlocking Shareholding in Japan." *Ricerche Economiche* 65, 421–448.
- Shleifer, Andrei and Robert W. Vishny. 1986. "Large Shareholders and Corporate Control." *Journal of Political Economy* 94, 461–488.
- Shleifer, Andrei and Robert W. Vishny. 1995. "A Survey of Corporate Governance." Unpublished working paper, Harvard University and University of Chicago.

List of Figures

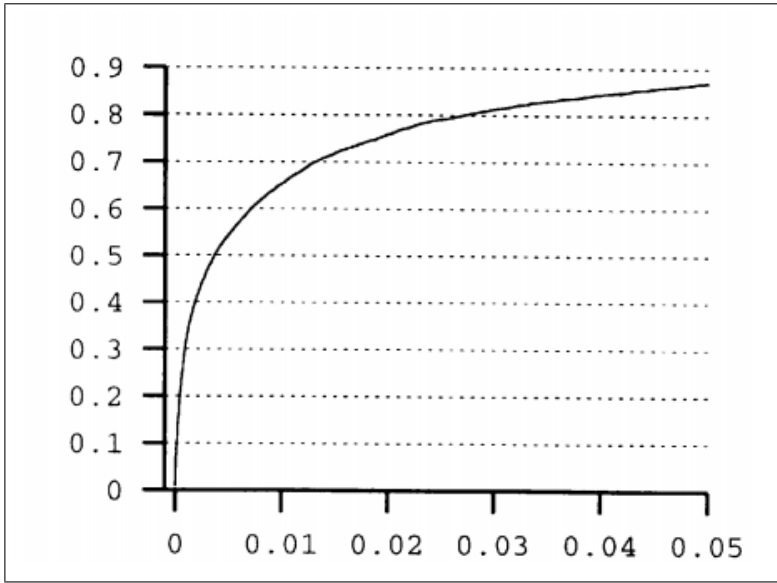
- 1 Cumulative frequencies of intercorporate shareholdings among all OSE firms over the period 1980–1994. 21

Figure 1
Cumulative frequencies of intercorporate shareholdings among all OSE firms over the period 1980–1994.

a. All holdings



b. Holdings below 5%



List of Tables

1	Summary of Theoretical Predictions	23
2	The Aggregate Market Value of Intercorporate Shareholdings on the Oslo Stock Exchange (OSE) 1980–1994	24
3	The Average Value of Intercorporate Shareholdings relative to the Value of other Assets for Firms listed on the Oslo Stock Exchange (OSE) 1980–1994	25
4	The Frequency and Size of One-way and Two-way Shareholdings in Firms listed on the Oslo Stock Exchange (OSE) 1980–1994.	26
5	The Lifespan of Corporate Cross-holdings in Firms listed on the Oslo Stock Exchange (OSE) 1980–1994. All rows sum to 100%	27
6	Characteristics for Equity Investing firms on the Oslo Stock Exchange (OSE) 1980–1994	28
7	Parameter estimates in multivariate regressions determining the value and probability of intercorporate shareholdings by firms listed on the Oslo Stock Exchange (OSE) 1980–1994	29

Table 1
Summary of Theoretical Predictions

Corporate Governance

The value of intercorporate shareholdings increases with the investor's free cash flow.

The smaller the economic correlation of two firms, the more they will cross-invest in each other.

Takeover targets cross-invest more in each other than other firms.

Transaction Costs

The value of intercorporate shareholdings increases with the cyclability and decreases with the uncertainty of the investor's cash flow.

Adverse Selection Costs

Firms sell off their equity holdings to finance new investments in long-term assets.

The value of intercorporate shareholdings is negatively related to the proceeds from debt and equity issues.

Table 2
The Aggregate Market Value of Intercorporate Shareholdings on the Oslo Stock Exchange (OSE) 1980–1994

Year	Number of firms listed	Equity market capitalization ^a	% of firms which are stockowners	% of firms with other listed firms as owners	Value of intercorporate shareholdings as % of equity market capitalization		
					Total	One-way	Two-way
1980	124	38	65	53	13	7	6
1981	116	33	77	61	15	9	6
1982	118	30	77	64	11	6	5
1983	119	59	80	67	13	7	6
1984	148	83	85	62	18	11	7
1985	163	114	85	65	22	14	8
1986	155	104	84	65	19	12	7
1987	146	94	78	61	16	9	7
1988	134	124	82	61	15	9	6
1989	129	192	83	59	14	9	5
1990	121	170	88	51	14	10	4
1991	112	140	84	57	14	10	4
1992	123	128	84	59	13	9	4
1993	131	210	82	49	14	8	6
1994	134	247	80	44	10	7	3
Mean	132	118	81	59	15	9	6

^aIn billion 1994 Norwegian kroner

Table 3
The Average Value of Intercorporate Shareholdings relative to the Value of other Assets for Firms listed on the Oslo Stock Exchange (OSE) 1980–1994

Averages are equally weighted and only include holding firms.

Year	Value of inter-corporate shareholdings ^a	Value of shareholdings as a percentage of the holder's total assets ^b	Value of shareholdings as a percentage of the holder's current assets ^c	Value of shareholdings as a percentage of the holder's most liquid assets ^d
1980	52	7.1	20.1	31.8
1981	50	6.1	20.6	31.0
1982	35	5.3	20.1	29.1
1983	70	7.0	21.4	30.4
1984	117	7.5	22.7	31.7
1985	176	8.4	23.4	33.8
1986	141	7.5	21.6	32.1
1987	116	5.5	19.2	26.9
1988	152	6.2	19.6	26.6
1989	236	6.1	22.0	28.3
1990	220	8.0	19.3	24.0
1991	185	11.8	19.7	24.0
1992	143	7.2	15.4	21.1
1993	305	8.4	17.6	22.8
1994	243	6.1	14.1	18.0
Mean	149.388	7.2	19.8	27.4

^aIn million 1994 Norwegian kroner.

^bTotal assets is market value of equity plus book value of debt.

^cCurrent assets are most liquid assets (see next note) plus receivables, stock of raw materials, and finished products.

^dMost liquid assets are cash, bank deposits, and securities (including stocks).

Table 4
The Frequency and Size of One-way and Two-way Shareholdings in Firms listed
on the Oslo Stock Exchange (OSE) 1980–1994.

Year	Number of shareholdings			Mean shareholding			Median shareholding			Percent of holdings less than 5%		
	All	One-way	Two-way	All	One-way	Two-way	All	One-way	Two-way	All	One-way	Two-way
1980	532	380	152	.031	.026	.043	.006	.005	.007	87	89	82
1981	661	449	212	.027	.024	.034	.005	.004	.007	89	90	86
1982	711	485	226	.026	.023	.034	.004	.003	.008	88	90	84
1983	818	576	242	.023	.020	.032	.003	.002	.007	90	92	86
1984	942	710	232	.026	.023	.035	.003	.003	.008	87	88	83
1985	992	764	228	.031	.028	.039	.003	.003	.008	86	88	78
1986	873	651	222	.032	.030	.037	.003	.002	.007	85	87	80
1987	736	570	166	.029	.026	.039	.003	.002	.008	86	88	78
1988	593	449	144	.033	.033	.036	.003	.002	.008	84	86	81
1989	609	461	148	.031	.030	.034	.002	.002	.007	88	89	83
1990	577	463	114	.029	.028	.036	.002	.001	.006	89	90	85
1991	534	436	98	.025	.022	.039	.003	.002	.006	89	90	81
1992	517	427	90	.029	.026	.045	.005	.004	.010	86	88	77
1993	605	497	108	.028	.027	.033	.006	.006	.006	85	86	78
1994	571	459	112	.025	.027	.017	.005	.005	.005	87	87	88
Mean	685	519	166	.028	.026	.036	.004	.003	.007	87	89	82

Table 5
The Lifespan of Corporate Cross-holdings in Firms listed on the Oslo Stock
Exchange (OSE) 1980–1994. All rows sum to 100%

	Lifespan in Years													Mean
	1	2	3	4	5	6	7	8	9	10	11	12	13	
All cross-holdings	62	21	9	4	3	1	< 1	< 1	< 1	0	< 1	0	0	1.74
One-way holdings														
All	63	21	9	4	2	1	< 1	< 1	< 1	0	< 1	0	0	1.69
Small (< 5%)	64	21	9	4	2	< 1	< 1	< 1	< 1	0	< 1	0	0	1.66
Large (\geq 5%)	50	25	10	8	4	2	1	< 1	< 1	0	0	0	0	2.04
Two-way holdings														
All	58	20	9	5	5	3	< 1	< 1	0	0	0	0	0	1.92
Small (< 5%)	59	20	8	5	5	3	< 1	< 1	0	0	0	0	0	1.89
Large (\geq 5%)	51	21	15	4	4	4	0	0	0	0	1	0	0	2.06

Table 6
Characteristics for Equity Investing firms on the Oslo Stock Exchange (OSE)
1980–1994

The table relates intercorporate shareholdings to the investor's free cashflow, ownership structure, net investment in long-term assets, leverage, dividend payments, and cashflow uncertainty. For each variable, the sample is split into the three percentiles [0, 33], (33, 67], and (67, 1]. For each percentile, the table shows the number of firms in the percentile (N), the mean size, median size, and the standard deviation of these firms' equity investments. Based on the 33rd and the 67th percentile, the right panel shows p-values of the t-statistic for differences in mean stockholdings (p-t), as well as the p-value of the Wilcoxon rank sum statistic (p-W), and the medians statistic for differences in medians (p-M). The value of equity investments, free cashflow, investments, and dividends are normalized by the book value of assets.

	Value of stockholdings in the percentile			p-values		
	Percentile [0, 33]	Percentile (33, 67]	Percentile (67, 1]	p-t	p-W	p-M
Free cash flow						
N	447	460	446			
Mean	.044	.046	.060	.107		
Median	.002	.002	.001		.955	.764
Std	.112	.143	.173			
Fraction held by insiders						
N	476	491	475			
Mean	.050	.052	.035	.023		
Median	.004	.000	.001		.000	.005
Std	.115	.182	.097			
Fraction held by 10 largest owners						
N	329	339	328			
Mean	.075	.039	.029	.000		
Median	.003	.002	.000		.000	.000
Std	.199	.104	.085			
Investments						
N	518	534	517			
Mean	.054	.041	.042	.187		
Median	.000	.001	.003		.000	.000
Std	.179	.121	.097			
Leverage						
N	518	534	517			
Mean	.083	.029	.024	.000		
Median	.001	.001	.002		.523	.162
Std	.209	.077	.071			
Dividends						
N	712	340	517			
Mean	.026	.049	.070	.000		
Median	.000	.006	.004		.000	.000
Std	.090	.115	.189			
Cash flow uncertainty						
N	482	495	481			
Mean	.055	.053	.034	.007		
Median	.006	.000	.000		.000	.000
Std	.138	.171	.105			

Table 7
Parameter estimates in multivariate regressions determining the value and probability of intercorporate shareholdings by firms listed on the Oslo Stock Exchange (OSE) 1980–1994

The regressions in panel (1) and (2) are random component regressions.^a The numbers in parentheses are p-values. For the two random component models, the p-values are computed using the t distribution. For the logit model in panel (3), the p-values are computed using the chi-square distribution.

Independent variables	Dependent variables		
	Panel (1)	Panel (2)	Panel (3)
	<i>VIS_{it}</i>	<i>VSIS_{it}</i>	TWOWAY _{ijt} = 1
Intercept	0.013 (0.052)	0.011 (0.000)	−0.326 (0.225)
Free cash flow (<i>FCF_{it}</i>)	−0.006 (0.031)		
Correlation in returns between firm <i>i</i> and firm <i>j</i> (<i>CORR_{ijt}</i>)			1.355 (0.000)
Dummy for takeover targets (<i>TT_{ijt}</i>)			0.567 (0.002)
Fraction held by insiders (<i>EIN_{it}</i>)	0.064 (0.019)		−1.081 (0.008)
Fraction held by ten largest owners (<i>E10_{it}</i>)	0.044 (0.053)		−0.993 (0.005)
Fraction held by insiders in owned company (<i>EIN_{jt}</i>)			−1.102 (0.007)
Fraction held by ten largest owners in owned company (<i>E10_{jt}</i>)			−1.309 (0.000)
Investments (<i>INV_{it}</i>)	−0.048 (0.030)		
Leverage (<i>LEV_{it}</i>)	−0.046 (0.002)		
Equity issue dummy (<i>ISSD_{it}</i>)	−0.004 (0.603)		
Dividends paid next year (<i>DIV_{it}</i>)	1.287 (0.000)		
Cash flow uncertainty (<i>CFU_{it}</i>)	−0.032 (0.611)		
Dividend paid this year (<i>DIV_{it-1}</i>)		0.546 (.000)	
Goodness of fit:			
Adj. R-squared	0.036	0.01	
−2 Log L			2114
Number of obs.	864	1569	2374

Definitions:

VIS_{it} = Value of shares held by company *i* normalized by total assets.

VSIS_{it} = Value of shares sold during the year normalized by total assets.

SOLD_{ijt} equals one if firm *i* sells all its holdings in firm *j* in year *t*, and zero otherwise.

TWOWAY_{ijt} equals one if firm *i* owns shares in *j* and firm *j* owns shares in firm *i* in year *t*, and zero otherwise.

^a As the fixed effect regression produce essentially identical results, they are not reported.