

# **Controlling owners and corporate cash holdings in the Nordic countries**

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July 26<sup>th</sup>, 2023

We contribute to the literature on corporate cash holdings by looking at the Nordic countries, where ownership concentration is quite heterogeneous, and in some firms very high. The large owners are also frequently rather poorly diversified, which allows us to study the relationship between ownership concentration and cash holdings in a high corporate governance environment, where a possible positive link is more likely to be due to the high risk aversion of poorly diversified owners rather than e.g. tunneling. We find that concentrated ownership is positively associated with higher cash holdings, and such a positive relationship also holds for the specific owner types of the management and the state. The existence of dual shares, which allows for control with less capital, significantly reduces the need for cash holdings. The corporate cash holdings have significantly increased in the post crises period, significantly more so in firms with highly concentrated ownership.

**Keywords:** Corporate cash, large owners, concentrated ownership, financial crisis, dual shares

**JEL classification:** G30, G32

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# 1 Introduction

International evidence points at firms increasing their cash balances and reducing their debt (Ferreira and Vilela 2004; Dittmar and Mahrt-Smith 2007; Bates, Kahle, and Stulz 2009; Chen et al. 2015)<sup>1</sup> despite that many arguments for holding cash should lead to the opposite.<sup>2</sup> On the other hand, the increased idiosyncratic risk (Campbell et al. 2001) may have an opposite effect through the precautionary motive (Bates, Kahle, and Stulz 2009). Furthermore, e.g., the financial crisis of 2008 has highlighted the benefits of holding corporate cash. Duchin, Ozbas, and Sensoy (2010) report that during the crisis, cash holdings of U.S. firms were positively associated with investments, while Campello, Graham, and Harvey (2010) reveal that financially constrained firms reduced cash much more than less constrained firms.

We conduct the first comprehensive study for Nordic companies of corporate cash holdings, their time trends and determinants. We contribute to the international literature by studying some aspects that previously have obtained less attention. Firstly, while the relationship between managerial holdings and corporate cash has obtained some attention, less attention has been directed towards ownership concentration as such, and corporate cash. The majority of studies that do look at large owners and corporate cash, do it for countries with weak investor protection (see e.g., Liu, Luo, and Tian (2015)), and provide evidence of tunneling. In contrast, the Nordic countries rank high in corporate governance and investor protection, indicating that tunneling is not likely, e.g., see Huang et al. (2020) for investor

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<sup>1</sup> Bates, Kahle, and Stulz (2009) report that the average cash to holdings ratio for U.S. industrial firms more than doubles from 1980 to 2006, while the debt ratio exhibits a sharp decline, even so that the average net debt becomes negative for some years. Dittmar and Mahrt-Smith (2007) report that the cash holdings of large traded U.S. firms more than doubled from 1990 (5% of all assets, in book value) to 2003 (13%). Ferreira and Vilela (2004) report that EMU corporations held 15% of their assets (in book value) in cash in 2000, while Chen et al. (2015) report an average ratio of 23.4% over 2000 to 2008.

<sup>2</sup> Such arguments relate to the better hedging possibilities and improvements in information technology, see e.g. Bates, Kahle, and Stulz (2009), as well as the efforts to improve corporate governance and investor protection to reduce agency problems. Thus, motives for holding cash due to the transaction motive, precautionary motive, or the agency motive should be smaller.

protection in the Nordic countries. There are, however, other reasons for why an agency problem of type two (between the controlling owner(s) and other owners) may exist. One source for such can be the poor diversification, and consequently a potentially higher risk aversion, of the main owner. Such an effect from poor owner diversification towards less corporate risk has earlier been reported for example by Faccio et al. (2011), who find that firms with less diversified large investors conduct less risky investments.<sup>3</sup> We study such an effect on another corporate asset class, cash holdings. The Nordic data offers an ideal setting to study that problem. Ownership concentration is quite large in the Nordic countries when compared to U.S. and continental Europe, but also quite heterogeneous in the cross-section, thus offering room for comparisons. The large owners are typically also poorly diversified, see e.g. Holmén, Knopf, and Peterson (2007) for Sweden, and Ødegaard (2009) for Norway.

Second, whereas prior literature offers some results concerning state (Chen et al. 2018) and family ownership (Ozkan and Ozkan 2004), we offer results concerning ownership concentration through any large owner, as well as for certain specific owner types such as the management and state. State ownership can be quite large in the Nordic countries, and is interesting to study, as the high level of corporate governance makes the tunnelling motive for cash holdings unlikely. State owned firms should also have a good access to external funding, making the sign of the effect of state ownership on cash holdings an interesting question. We also study the effect of dual shares.<sup>4</sup>

Third, the financial crisis and the subsequent sovereign bond crisis hit Europe badly by drying out the markets for corporate debt. The European Central Bank was late in increasing the liquidity on the market. Moreover, in the wake of the sovereign bond crisis, the solvency

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<sup>3</sup> This also relates to risk-taking in groups vs by individuals. More specifically, several papers document higher risk-taking in groups than by individuals (see e.g. Sutter 2007 and Bougheas, Nieboer, and Sefton 2013).

<sup>4</sup> Dual shares are in use to a varying degree in the Nordic countries. Masulis, Wang, and Xie (2009) find that when the divergence between insider voting rights and cash flow rights widens, corporate cash is valued less, and managers e.g. make value-destroying acquisitions. On the other hand, dual shares may reduce the problem with the large owner's poor portfolio diversification, as they allow for control with a smaller equity stake.

requirements for European banks were strengthened. As banks play a large role in the Nordic countries as providers of financing for corporations (Mallick and Yang 2011), this has had effects on the Nordic market. We therefore also study if these two crises had temporary or more permanent effects on corporate cash holdings in the Nordic countries.<sup>5</sup>

We find support for the precautionary motive, in terms of a significantly higher amount of cash held when cash flow to volatility is high. More profitable firms also hold significantly less cash. For the ownership variables, we find that both managerial ownership and a high ownership by the largest owner are significantly positively associated with larger cash holdings. The first relationship supports the existence of agency problems of type 1 i.e. a managerial entrenchment effect also on the Nordic markets, despite their high ownership concentration which might have suggested that there are less agency problems present between the owners and the management. The latter effect is in line with our hypothesis that the poor ownership diversification of the largest owner leads to increased risk aversion and higher cash holdings. Interestingly, we find that result for state ownership as well. The existence of dual shares in turn is significantly negatively associated with corporate cash holdings. This is in line with our hypothesis based on the owner being able to maintain control with a smaller amount of capital in dual share firms, and thus suffering less from poor personal portfolio diversification. Finally, our results indicate that corporate cash holdings are significantly larger during the post-crises period, which we interpret as a result of an increase in the precautionary motive.

The paper is structured as follows. In section two, we provide a literature review and derive our hypotheses. The data and variables are presented in section 3. Section 4 presents the results, while conclusions are presented in section 5.

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<sup>5</sup> We study the effects of a worsen availability of external financing on cash holdings in firms. In contrast, empirical evidence of how better availability to external financing can, through the precautionary motive, reduce the need for cash balances in companies is produced by Brisker, Çolak, and Peterson (2013), who study the effects of index inclusions on cash holdings.

## 2 Literature review

Bates, Kahle, and Stulz (2009) list four main motives for corporate cash holdings: the transaction, tax, precautionary, and agency motive. The *transaction motive* was already present in the early, classical inventory/cash optimizing models (Baumol 1952; Miller and Orr 1966), where partly transaction costs and partly the volatility of the inventory/cash (in the Miller-Orr model) drive the optimum. The transaction motive predicts e.g. that larger and more diversified firms have economies of scale and hence hold less cash. Supporting evidence has been provided e.g. by Mulligan (1997), and Subramaniam et al. (2011). The latter report robust evidence on diversified firms holding less cash. They attribute the result to complementary growth opportunities between segments, and to internal capital markets.

Static trade-off models (see e.g. Kim, Mauer, and Sherman (1998), Opler et al. (1999), and Amess, Banerji, and Lampousis (2015)) also include the *precautionary motive* to hold cash as a cushion for adverse shocks (to mitigate the costs of financial distress). Information asymmetries strengthen the precautionary motive. Also agency costs can be taken into account in such trade-off models, as they influence the costs of external financing, and reduce the market valuation of cash holdings. Studies indicating that the access to capital markets/bank debt are negatively related to corporate cash (Opler et al. 1999; Ozkan and Ozkan 2004; Ferreira and Vilela 2004) provide evidence for precautionary (but also transaction) motives for holding cash.

The *tax motive* was studied by Fritz Foley et al. (2007), who find that U.S. firms facing taxes on repatriation from abroad hold more cash. Their evidence thus suggests that multinationals may hold more.

One pioneering paper in the area of corporate cash holdings is Opler et al. (1999), who study many determinants of corporate cash holdings. Using U.S. data, they find support for a static tradeoff model for cash holdings. They find that firms with stronger growth opportunities and riskier cash flows hold more cash, while firms with easy access to the capital markets hold less. However, they also find evidence of firms accumulating more cash than predicted by the static tradeoff model, but that there is little evidence in favor of agency costs as such cash is not in a significant amount spent on new projects or acquisitions.

Later, however, ample evidence in favor of the *agency motive* (Jensen 1986) has been reported e.g. by Harford (1999) and Ozkan and Ozkan (2004). Harford (1999) finds that cash rich firms are more likely to make diversifying and shareholder wealth reducing investments. Ozkan and Ozkan (2004) study the determinants of cash holdings in the U.K., and find support for a non-monotonic relationship (first an alignment effect i.e. a negative relationship up to a management ownership level of 24%, then an entrenchment effect i.e. a positive relationship up to 65%, after which again a negative relationship) between managerial ownership and cash holdings. Moreover, variables such as board composition and ultimate shareholders do not influence the relationship. Instead, they find support for growth opportunities, cash flows, liquid assets, leverage and (lagged) bank debt<sup>6</sup> as determinants. They also find that the characteristics of the large owner matters (family or not).<sup>7</sup>

Relevant for our focus on ownership concentration, although not as such dealing with corporate cash, are the results by Faccio et al. (2011). They find that firms controlled by non-diversified large shareholders invest more conservatively than firms controlled by diversified large shareholders. The effect can be seen in different proxies for risk-taking: volatility of

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<sup>6</sup> In Ozkan and Ozkan (2004), bank debt obtained a negative coefficient estimate, in line with the hypothesis that bank financing may reduce agency costs and asymmetric information, and also convey positive information to the market. In this way, bank debt might imply that such firms have an easier access to the credit markets (James 1987; Mikkelson and Partch 2003).

<sup>7</sup> They also try to control for potential endogeneity in many ways (an average cross-sectional analysis as well as GMM).

ROA, likelihood of firm survival, difference between maximum and minimum ROA, and the volatility of ROE. They also report that a reduction of diversification among large shareholders due to an exogenous shock results in reduced risk taking for the owned firm. Faccio et al. (2011) concludes that the conservative behavior of large, poorly diversified, owners might lead to forgoing some NPV positive projects that are demanded too risky.

Further support for the agency motive as a determinant for corporate cash is offered e.g. by Dittmar, Mahrt-Smith, and Servaes (2003), and Ferreira and Vilela (2004), who report that firms hold more cash when investor protection is weaker, and by Pinkowitz, Stulz, and Williamson (2006), who find a weaker link between firm value and cash holdings in countries with poor investor protection. Dittmar and Mahrt-Smith (2007), and Pinkowitz, Stulz, and Williamson (2006) report that cash is worth less when agency problems are bigger. Dittmar and Mahrt-Smith (2007), and Harford, Mansi, and Maxwell (2008) find that entrenched managers build more cash and spend it quicker. Kalcheva and Lins (2007) document that when investor protection is low, firm value is lower when controlling managers hold more cash.<sup>8</sup> Chen et al. (2018) find that state ownership is positively related to cash holdings and attribute their findings to agency issues. However, contrary evidence for the agency cost motive is reported e.g. by Bates, Kahle, and Stulz (2009). They find in an international comparison that neither e.g. managerial entrenchment, firm characteristics, or the valuation of cash would be related with the increase in cash in such a way that it would indicate the existence of agency problems.<sup>9</sup>

The results of Bates, Kahle, and Stulz (2009) point at the *precautionary motive*, i.e. that firms hold cash as a cushion for adverse shocks. Newly listed firms, and firms in industries

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<sup>8</sup> In high investor protection countries, there is no such link.

<sup>9</sup> Bates, Kahle, and Stulz (2009) instead find e.g. that firms that increase cash most have low cash flow and high Tobin's Q, characteristics that are usually not associated with agency problems, but instead may point towards a precautionary motive for cash holdings. They also find no evidence for a decrease in the value of cash. Instead, they find a link between the disappearance of dividends and cash hoarding, as it is the non-dividend payers that over time experience a reduction in debt and an increase in cash.

more subject to idiosyncratic risk hold more cash. Bates also note that the increase in cash holdings is related to the disappearance of dividends, as it is the non-dividend payers that accumulate cash. Additional support is provided by e.g. Opler et al. (1999) as riskier firms and firms with poor access to capital markets hold more cash. Begenau and Palazzo (2021) find that an increase in the precautionary savings motive (largely driven by the decline in initial profitability of R&D heavy new listings) explains about half of the upward trend in corporate cash.<sup>10</sup> Also the results of Chen et al. (2015), who study the link between cultural dimensions (individualism and uncertainty avoidance) and corporate cash holdings, can be interpreted as offering support for the precautionary motive. They report that corporate cash holdings are negatively related to individualism, and positively to uncertainty avoidance.

## **2.1 Hypothesis development**

In summary, there is prior evidence for all four main suggested reasons for cash holdings, with the agency and precautionary motives being the dominant ones in the literature. We contribute to the prior literature by studying several ownership variables such as the ownership concentration of the largest owner.

Our main hypothesis is based on the idea that a very large individual ownership stake in one company, such as the one frequently occurring in the Nordic markets, is unavoidably associated with a poor personal portfolio diversification of the largest owner, unless he or she is extremely rich. A poor diversification implies that the controlling owner carries more of the company's unsystematic business risk, which may lead to compensating actions (hedging/risk reduction) e.g. in terms of higher corporate cash holdings. Based on this idea, our first hypothesis is:

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<sup>10</sup> Brown and Petersen (2011) find support for firms using cash reserves to smooth R&D expenditures.



*Hypothesis 1.* Concentrated ownership (measured by the ownership stake of the largest owner) is positively associated with cash holdings.

Next, we test for two specific owner types. Our second hypothesis is based on the agency motive and the results of e.g. Ozkan and Ozkan (2004) and Harford, Mansi, and Maxwell (2008), i.e. that entrenched managers build up higher cash balances due to a higher risk aversion. Our second hypothesis is as follows:

*Hypothesis 2.* A higher managerial ownership is associated with larger cash holdings.

The third hypothesis relates to the state as an owner in public companies. Chen et al. (2018) report that state ownership is positively related to cash holding levels around the world. They discuss two effects of state ownership, that associated with agency problems as managers of state-owned companies are typically entrenched bureaucrats, pursuing political goals rather than maximizing shareholder value. On the other hand, state owned companies can be expected to have access to better financing due to e.g. implicit government guarantees, and better access to credit. Chen et al. (2018) find that while state ownership in general is associated with larger cash holdings, the strength of the country-level institutions affects the view on cash, with larger valuation discounts in weak corporate governance countries. As the Nordic countries rank good in investor protection and corporate governance (see e.g. Huang et al. (2020), and Aggarwal et al. (2009))<sup>11</sup>, we posit that in the Nordic countries, companies in which the state is the largest owner have lower cash holdings.

*Hypothesis 3.* State ownership is associated with lower cash holdings.

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<sup>11</sup> Aggarwal et al. (2009) e.g. ranks, among 23 western countries in their Figure 2, the Nordic countries in terms of the mean of the firm-level governance index as follows: Denmark (rank 13), Finland (rank 3), Norway (rank 20), and Sweden (rank 18).

The argument for our fourth hypothesis comes from the existence of dual shares on the Nordic markets. While dual share structures are less common now than decades ago, there are still many firms with such a share structure listed on the Nordic stock exchanges.<sup>12</sup> The existence of dual shares has in prior literature been associated with agency costs (see e.g. Cronqvist and Nilsson (2003)). If we assume that the agency motive would be the sole driving force, one could expect that firms with a higher control wedge would hold more cash. On the other hand, as our main focus is on the poorly diversified large owner, the existence of dual shares has another effect as well. Dual shares make it possible to achieve higher control using less capital, as the voting premium (the price difference between high and low voting rights shares) is typically marginal as compared to the difference in voting rights. Hence, ultimate large owners in dual share firms should have a lower preference for risk reduction as compared to similar large owners in a single share structure company.<sup>13</sup> Our fourth hypothesis is:

*Hypothesis 4.* The existence of dual shares is associated with lower holdings of cash.

Finally, our fifth hypothesis is based on the fact that in Europe, there was a liquidity squeeze following the financial crisis. Moreover, the financial crisis was followed by a sovereign debt crisis, leading to further disruptions on the credit markets. Firms with bigger cash holdings managed better over the financial crisis (see e.g. Lian, Sepehri, and Foley (2011), and Joseph et al. (2022)). Also, Song and Lee (2012) provide evidence that Asian firms increased their cash holdings significantly following the Asian financial crisis by decreasing their investment activities. We expect that the precautionary motive led to an increase in post-crisis corporate cash holding also in the Nordic markets, where bank lending is a relatively

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<sup>12</sup> In our sample, 35.14% of firms in year 2003 (the first year of data in our panel data sample) have a dual share structure in place, while 23.8% have a dual share structure in place in year 2020 (last year).

<sup>13</sup> This view is consistent with e.g. the empirical results of Holmén, Knopf, and Peterson (2007), who report that owner-managers in Sweden use debt, dual class shares, and (diversifying) M&As to strategically trade off corporate control and the drawback of poor portfolio diversification.

important source of external financing, and where the increased solvency requirements for banks after the financial crisis negatively affected banks' lending capacities. The fifth hypothesis is as follows:

*Hypothesis 5.* Cash holdings are larger in the post-crises period.

### **3 Sample and data**

In this section, we describe the sample construction and the variables.

#### **3.1 Sample construction**

We construct a sample of firms headquartered in the Nordic countries (Denmark, Finland, Norway, and Sweden) between years 2003 and 2020. These data provide us with an ideal setting to test the relation between controlling owners and corporate cash holdings in a relatively homogenous set of countries, with similar institutional and cultural factors, but where firm-level ownership characteristics are quite heterogeneous across firms.

We gather data on firm-level accounting variables from Compustat. Data on managerial ownership, topholder ownership (the percentage of shares owned by the largest shareholder), and voting rights are from FactSet. After calculating the variables, merging the databases, removing firms operating in the financial industry (Standard Industrial Classification (SIC) codes between 6000 and 6999), and singleton observations, we are left with an unbalanced panel data sample consisting of 5,079 firm-year observations for a total of 719 firms. Of these 5,079 firm-year observations, 796 for Danish firms, 1,198 for Finnish firms, 1,107 for Norwegian firms, and 1,978 for Swedish firms, respectively. Table 1 shows the distribution of firm-years by year and country.

<< TABLE 1 HERE >>

### 3.2 Variables

We follow Chen et al. (2018) and employ the natural logarithm of cash and marketable securities divided by a firm's sales ( $\ln(\text{Cash holdings to sales})$ ) as dependent variable in our main analysis. In robustness tests, we use the natural logarithm of cash and marketable securities divided by a company's total assets ( $\ln(\text{Cash holdings to total assets})$ ) as well as cash and marketable securities divided by sales ( $\text{Cash holdings to sales}$ ) (rather than the natural logarithm) as alternative measures of cash holdings.

As our main variables of interest, we employ several measures of controlling ownership. First, we use topholder ownership ( $\text{Topholder ownership (\%)}$ ) as an overall proxy for controlling owners. Second, to test for the effect of specific owner types on cash holdings, we include managerial ownership, calculated as the total percentage of shares owned by insiders ( $\text{Insider ownership (\%)}$ ), and an indicator for whether the state owns most of the shares in a company ( $\text{State is topholder (=1)}$ ). Third, we employ indicators for majority ownership (management and state, respectively), and fourth, in additional specifications, we include an indicator for the existence of dual shares. The dual shares indicator equals one when the variable  $\text{Wedge}$ , which is the total number of votes divided by the total number of outstanding shares (here we follow Ferrell, Liang, and Renneboog (2016)), differs from one, and takes the value of zero when wedge is equal to one.

In our choice of control variables, we follow prior literature (Amess et al., 2015; Chen et al., 2015; Chen et al., 2018; Ozkan and Ozkan, 2004; Phan et al., 2019; etc.):  $\text{Size}$  is the natural logarithm of total assets (measured in year-end US dollars);  $\text{ROA}$  is the return on assets calculated as the operating income before depreciation and amortization divided by total assets;  $\text{Dividend payer (=1)}$  is an indicator which equals one for firm-years in which a firm paid a dividend, and zero otherwise;  $\text{Leverage}$  is short-term debt plus long-term debt scaled by total assets;  $\text{NWC to total assets}$  is net working capital (current assets minus current liabilities)

scaled by total assets; *Cash flow to sales* is income before extraordinary items plus depreciation and amortization scaled by sales; *Cash flow volatility* is the yearly standard deviation of the variable *Cash flow to sales* measured over the current and three preceding years, *Capex to total assets* is total capital expenditures scaled by total assets; *Sales growth* is the one-year change in sales in per cent; *R&D to total assets* is research and development expenses scaled by total assets; *Market share* is a company's sales divided by the total sales (measured in year-end US dollars) for Nordic firms operating in the same industry (based on two-digit SIC codes); and *Market-to-Book* is market value of equity divided by book value of equity. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles to reduce the influence of outliers.<sup>14</sup>

In Table 2, we report descriptive statistics for the variables used in our main analysis. The mean cash holdings to sales for our sample of Nordic firms is 0.23 (the median is 0.09), and the mean (median) cash holdings to total assets is 0.13 (0.08). These numbers are similar, albeit somewhat higher, than those reported in prior literature: For instance, Chen et al. (2018) report average cash holdings to sales of 0.12 in their international sample of firms, while Ozkan and Ozkan (2004) report average cash holdings to total assets of 0.10 in their sample of UK firms. This is consistent with a view that ownership concentration levels in the Nordic countries are quite high compared to in other countries.

The mean (median) insider ownership is 44.1% (43.2%), while it is 26.3% (22.3%) for topholder ownership. There is some variation in controlling ownership across the Nordic countries. For instance, while mean insider ownership is quite similar in Sweden, Denmark, and Finland (40.6%, 41.1%, and 42.8%, respectively), it is higher in Norway (53.9%). An ANOVA test rejects the null hypothesis of equal means ( $F = 103.38, p < 0.001$ ). With respect to topholder ownership, Finland has the lowest mean (22.6%) while Norway has the highest

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<sup>14</sup> Our main results are robust to winsorizing at the 1<sup>st</sup> and 99<sup>th</sup> percentiles, or at the 2.5<sup>th</sup> and 97.5<sup>th</sup> percentiles.

(33.9%). An ANOVA again rejects the null hypothesis of equal means ( $F = 118.33, p < 0.001$ ) across the four countries.

<< TABLE 2 HERE >>

Figure 1 presents cash holdings to sales for different levels (deciles) of topholder and insider ownership, respectively. As shown in Figure 1a, both firms in the bottom decile and in the top decile of topholder ownership hold more cash compared to firms with average levels of topholder ownership (the middle deciles). Figure 1b shows the relationship between insider ownership and cash holdings in Nordic firms. As the figure depicts, firms with the highest levels of insider ownership (the top deciles) hold the higher percentage of cash to sales. This is first evidence that controlling ownership can have an effect on cash holdings.

<< FIGURE 1 HERE >>

## 4 The results

In this section, we present our main results.

### 4.1 Controlling ownership and cash holdings in the Nordic countries

To examine the relation between controlling ownership and cash holdings in our sample of Nordic firms, we estimate the following regression where the dependent variable is the natural logarithm of cash and marketable assets to sales in year  $t$ :

$$\ln(\text{Cash holdings to sales})_{i,t} = \beta_0 + \beta_1 \text{Controlling ownership}_{i,t-1} + \mathbf{X}'_{i,t-1} \delta + \theta_s + \eta_t + \varepsilon_{i,t}, \quad (1)$$

where  $i$  denotes the firm,  $t$  denotes the year, and  $s$  denotes the industry. *Controlling ownership* is either one of our measures of topholder ownership, insider ownership, state ownership, or an indicator for dual share status (total number of votes differs from total number of outstanding shares), respectively (varies by table and column).  $X'_{i,t-1}$  is a vector of firm-level control variables (*Size*, *ROA*, *Dividend Payer (=1)*, *Leverage*, *NWC to total assets*, *Cash flow to sales*, *Cash Flow Volatility*, *Capex to total assets*, *Sales growth*, *R&D to total assets*, *Market Share*, *Market-to-Book*),  $\theta_s$  are industry fixed effects (based on four-digit SIC codes),  $\eta_t$  are year fixed effects, and  $\varepsilon_{i,t}$  is the error term. In additional specifications, we include also country fixed effects (based on the headquarters of the company). Standard errors are clustered at the industry-level to be consistent with the included fixed effects (Petersen 2009). To reduce endogeneity concerns, we measure all our ownership variables and control variables in fiscal year  $t - 1$ .

The main findings for controlling ownership, measured as topholder ownership, are presented in Table 3. In column 1, where we include all the control variables as well as year fixed effects, we find that the coefficient estimate is 0.006 and statistically significant. Similarly, in column 2, where we include also industry fixed effects, the coefficient estimate is 0.005 and significant at the 1% level. The economic magnitude of the coefficient estimate in column 2 suggests that a one percentage point increase in topholder ownership is expected to lead to an on average 0.5% increase in firms' cash holdings to sales, *ceteris paribus*. In model 5, where we include also country fixed effects, we find similar results: The coefficient estimate is 0.004 with a  $t$ -statistic of 2.72.

Including topholder ownership as a continuous variable, we essentially assume that the relationship between controlling ownership and cash holdings is linear. Ozkan and Ozkan (2004), however, report a non-linear relationship between management ownership and cash holdings in U.K. firms. To test for a potential non-linear effect, we include indicators for

quartiles for insider ownership as main independent variables in column 3 (the benchmark group is quartile 1, i.e., firm-years with the lowest levels of topholder ownership). We find that the coefficient estimate for the indicator for quartile 4 is 0.183, and significant. This suggests that firms with the highest levels of topholder ownership (the top quartile) hold an economically and significantly 18.3% more cash than firms in the lowest quartile of topholder ownership, all else equal. The (borderline) significant negative coefficient estimate for Q3 indicates some nonlinearity in the relationship, in line with what Ozkan and Ozkan (2004) found for management ownership, although of a somewhat different form.

In column 4, we apply an indicator variable for whether the topholder owns a majority stake in the company (50% or more of the shares outstanding). This yields a similar positive relationship as the Q4 dummy, although now an even stronger one. In companies with majority ownership by the largest owner, cash holdings are roughly 28.6% higher than in companies with no majority owner. The results in column 6, with also country fixed effects included, are very similar. Overall, the results in Table 3 provide strong support for our hypothesis 1 that firms with a large (most likely poorly diversified) owner in the Nordic countries hold higher cash balances due to the higher risk aversion of the controlling owner. This is consistent with the more general results of Faccio et al. (2011) on firms with less diversified large investors carrying less risk.

<< TABLE 3 HERE >>

The coefficient estimates for our control variables enter mainly as expected: more profitable firms and firms with higher market shares hold lower levels of cash, while firms with higher net working capital to total assets, higher uncertainty about cash flows and higher cash flows in general (consistent with Chen et al. (2018) and Chen et al. (2015)), and higher R&D to total assets (consistent with Chen et al. (2015)) hold significantly more cash.



#### 4.1.1 Robustness

Re-estimating Equation (1) using the natural logarithm of cash holdings to total assets, rather than the natural logarithm of cash holdings to sales, as dependent variable keeps results intact (reported in Appendix Table 2). Similarly, when we re-estimate Equation (1) using cash holdings to sales (rather than the natural logarithm of cash holdings to sales) as dependent variable (see Appendix Table 3 Panel A), we find that results mainly hold up, except that the  $p$ -values for some of the main independent variables are higher or rendered not significant. Interpreting the coefficient estimate in column 4 of Appendix Table 3 Panel A shows that firms where the topholder has a majority stake hold on average 4.3 percentage points more cash to sales than firms where the topholder does not have a majority stake. The difference is both economically and statistically significant.

#### 4.2 Managerial and state ownership and cash holdings in the Nordic countries

In Table 4, we test hypotheses 2 and 3, which deal with two specific owner categories: the management (i.e. insider ownership) and the state. We include the same controls as in Table 3 as well as year and industry fixed effects (country fixed effects are also included in columns 3-4). Standard errors are clustered at the industry-level. In columns 1 and 3 (without or with country dummies), we include variables for the insider ownership (%) and a dummy for state as the largest owner, while in columns 2 and 4 (without or with country dummies), we use indicator variables for majority ownership in these owner categories.

For managerial ownership, we find a strong positive relationship in line with hypothesis 2, indicating that entrenched managers build higher cash balances. Our results are thus similar to prior ones in the literature such as by Ozkan and Ozkan (2004), and Harford, Mansi, and Maxwell (2008).

For state ownership, our results are contrary to our expectations as expressed in hypothesis 3. We find support for a significant positive relationship between state ownership and corporate cash holdings. The results are especially strong for firms where the state is the majority owner. The economic magnitude is large: Firms where the state is the topholder hold on average 63% to 67.8% more cash than firms where the state is not a topholder. Additionally, when the state is the majority owner (owns 50% or more of the shares), firms are expected to have 77.6% to 78.4% higher cash holdings (models 2 and 4), all else equal. This is surprising, as the good levels of corporate governance in the Nordic countries does not make traditional arguments for such a relationship (for example tunnelling) likely. The results are neither likely to be due to sector effects, as these are controlled for by industry dummies. One potential explanation may be excess prudence/caution of managers in state-owned firms, as financial trouble in such firms tends to be associated with high national visibility and political turmoil. The managers would thus behave like persons whose high risk aversion dominates over their (lowish) incentives<sup>15</sup> for market value maximization.<sup>16</sup>

<< TABLE 4 HERE >>

Re-estimating the regressions in Table 4 with the natural logarithm of cash holdings to total assets as the dependent variable keeps results largely unchanged (reported in Appendix Table 4): the coefficient estimate for *Insider ownership (%)* enters positively and significantly, as does the coefficient estimate for the state is the topholder indicator. Although the results for majority insider owners are somewhat weaker than in Table 4, the coefficient estimate for the indicator for the state as majority owner remains positive and is highly significant.

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<sup>15</sup> Salaries and bonus systems in state owned companies are regularly subject to public debate and criticism, which tends to keep them moderate. I.e., the Finnish state expresses as its policy that compensation in state owned firms should be reasonable. The Swedish state banned bonus systems in state owned companies until a change in law in 2008. In 2009, restrictions (but not a total ban) were again introduced.

<sup>16</sup> This is related to the suggestion by Chen et al. (2018), i.e. that the managers of state-owned companies behave like entrenched bureaucrats.

Furthermore, results in Table 4 are robust to using cash holdings to sales (rather than the natural logarithm of cash holdings to sales) as dependent variable, as shown in Appendix Table 3 Panel B. The coefficient estimates for *Insider ownership (%)*, *State is topholder (=1)*, *Insider ownership  $\geq 50%$  (=1)* and *State ownership  $\geq 50%$  (=1)* are all positive and significant at the 5% level in columns 1-2, where we include the same controls as in Table 3 as well as year and industry fixed effects.

To gauge the economic significance of these results, we interpret the coefficient estimates in Appendix Table 3 Panel B (where the dependent variable is the natural logarithm of cash holdings to sales). For instance, the coefficient estimate for *State is topholder (=1)* shows that firms where the state is the topholder hold on average 6.9 percentage points more cash to sales than firms where the state is not the topholder. Additionally, firms in which the insiders have a majority stake in the company hold on average 3.1 percentage points more cash than firms where the insiders do not hold a majority stake, while firms in which the state has a majority stake hold 10.0 percentage points more cash than non-state-owned firms.

Overall, the results in this section provide strong support for our hypothesis 2 concerning managerial ownership, and are also consistent with the findings in Chen et al. (2018) that state ownership is associated with significantly higher levels of cash holdings.

### **4.3 Alternative explanations**

A potential concern with the results in Tables 3 and 4 is that they are driven by an endogeneity problem, such as omitted variables (observed or unobserved) or selection bias. First, to mitigate concerns that our findings for corporate cash holdings are driven by selection bias – e.g. that topholders, insiders, or the state invest more in companies with high cash holdings (Chen et al. 2018) – we use a propensity score matching method. In Table 5 column 1, we match Nordic firms with majority topholder ownership (*Topholder ownership  $\geq 50%$*

(=1)) to Nordic firms in which the topholder does not hold majority ownership (*Topholder ownership*  $\geq 50\%$  (=0)). In column 2, we do the same but for insider ownership, and in column 3 for state ownership. We match using the same controls and fixed effects as in Equation (1). We use logistic regression in the first-stage to match firms, we match only one firm per observation (nearest neighbor equals one), and demand that the propensity score has a maximum of 0.1 (i.e. caliper is equal to or lower than 0.1). Standard errors are corrected using the Abadie-Imbens procedure.

As shown in Table 5, results hold up when we employ propensity score matching. The indicator for majority ownership enters positively and significantly into all regressions, mitigating concerns that our results are driven by selection bias.<sup>17</sup>

<< TABLE 5 HERE >>

Second, to reduce concerns that unobservable time-invariant omitted variables – which affects both controlling ownership and cash holdings – are left out, we estimate a firm fixed effects model in Appendix Table 6. To be noted is, however, that a firm fixed effect is badly suited for a study such as ours, where the ownership variables, which are our focus of interest, are rather stable over time.<sup>18</sup> In such a case, a firm fixed-effects swamps the effects of all the time-invariant variables in the single firm-specific dummy variable, which makes the individual testing of separate such firm-specific variables hard if not impossible (Baltagi 2021).

Appendix Table 6 reports the results of the fixed effect model. We change clustering of standard errors to at the firm-level to be consistent with the included fixed effects. As shown in Panel A, results for insider ownership are robust to the inclusion even of these fixed effects:

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<sup>17</sup> Since we use a logistic regression in the first-stage, only observations for which there is variation in the dependent variable within a group are included. As we use four-digit SIC codes, we lose some observations for insider and topholder ownership (columns 1 and 2), but many for state majority ownership (as a very small number of firms are state-owned) (column 3). Re-estimating the propensity score matching using two-digit SIC codes in both the first- and second-stage regressions yields very similar results (as shown in Appendix Table 5).

<sup>18</sup> Especially, the state ownership variable exhibits, on the firm level, quite small variations over time.

The coefficient estimate is positive and significant (in model 1). However, the coefficient estimate (0.307) for the state majority ownership indicator is rendered not significant (in model 2). This is most likely due to the time-invariant natures of the topholder ownership and the state majority ownership variables being captured by the firm fixed effects.

In Panel B of Appendix Table 6, we estimate random effects GLS models (with year and industry fixed effects included) and find very similar results as in Panel A: The coefficient estimate for insider ownership is positive and significant, while the coefficient estimate for state majority ownership enters positively but not significantly.

#### **4.4 Dual shares**

We then proceed by testing our hypothesis 4 that the existence of dual shares is associated with lower holdings of cash. We estimate three models with a dummy for dual share firms (dual share firms are firms for which the total number of votes differs from the total number of outstanding shares). We include the same controls as in Table 3 as well as industry and year fixed effects. In column 2, we also include the continuous measure of insider ownership as well as the dummy for the state being the topholder. In column 3, we include dummies for majority ownership by the insiders or the state, respectively. The results are reported in Table 6.

Column 1 of Table 6 shows the results when only including the dual share dummy, i.e., without any ownership indicators. The variable is significantly negatively related to corporate cash holdings, in line with our hypothesis 4. Columns 2 and 3 of Table 6 show the results when managerial ownership and state ownership are also included, in column 3 by means of majority dummies. Both the dual shares indicator as well as the two owner category variables maintain their significance. In summary, our results indicate that the effect of the management's / large owner's risk aversion on corporate cash holdings is reduced when control can be obtained by a smaller capital stake (i.e., with less adverse effects on portfolio diversification).

<< TABLE 6 HERE >>

#### 4.5 The effect of the financial crisis on cash holdings in Nordic countries

In Table 7, we conduct a test of hypothesis 5 that corporate cash holdings increased following the financial crisis and the European sovereign debt crisis, potentially as a precautionary response to reduced availability of bank lending. We essentially estimate equation (1) but include as main independent variables indicators for crisis and post-crisis periods, respectively. To be precise, we include an indicator (*Financial crisis*) which takes the value of one for the years covering the financial crisis (years 2007-2009), and zero otherwise. As the European sovereign debt crisis hit European firms quite hard, we construct a second indicator variable (*Financial & Sovereign Debt crisis*) that extends the crisis period definition to include also the years 2010 to 2012. We then construct two indicators for the post-crises periods: *Post-Financial crisis* captures the post-financial crisis period, i.e., years 2010 to 2020<sup>19</sup>, while the *Post-Financial & Sovereign Debt crisis* indicator takes the value of one for years 2013-2020, and zero otherwise.<sup>20</sup> In all regressions in Table 7, we include industry fixed effects but exclude year fixed effects (as we include dummies for different time periods). Standard errors are clustered by industry.

<< TABLE 7 HERE >>

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<sup>19</sup> Here we follow Fahlenbrach and Stulz (2011), who study July 2007 to December 2008 as the financial crisis, but also note that the crisis did not end in December 2008, as bank stocks lost substantial ground in the first quarter of 2009 as well. Also e.g. Mollah and Liljeblom (2016) study the post-2009 period as the post financial crisis period.

<sup>20</sup> E.g. Mollah and Liljeblom (2016) study the year 2011 as the sovereign debt crisis period. To leave time for adjustments of cash balances, we start our post-sovereign debt crisis period from 2013.

In model 1 of Panel A in Table 7, where we include the indicator for the financial crisis as main independent variable, we find that Nordic firms' cash holdings fell on average by 7.2% compared to their cash holdings in the pre- and post-crisis periods. Similarly, as reported under model 3, Nordic firms' cash holdings dropped by 18.1% in the period covering both the financial crisis and the sovereign debt crisis (i.e., years 2007-2012), compared to the years prior and post the financial and sovereign debt crises. However, in sharp contrast, firms held on average roughly 10% more cash in the years following the financial crisis (model 2), compared to in the years pre- and during the crisis. Even more notably, Nordics firms held roughly 21% more cash in the period following the financial crisis and the sovereign debt crisis (i.e., in the years 2013-2020) than prior to and during the crises. These findings provide strong support for a precautionary motive, whereby firms in the Nordic countries increased their cash holdings in the wake of the crises, plausibly in response to banks' reduced capacities to extend credit to firms during this period.<sup>21</sup>

Finally, in Panel B of Table 7, we interact our majority controlling ownership indicators (topholder, insider, and state, respectively) with the post-financial and sovereign debt crisis indicator. This analysis reveals interesting results: As shown in model 1, while firms increased their cash holdings in the years following the crises in general, firms with a majority topholder owner increased their cash holdings significantly more. The coefficient estimate for the interaction term for the post-financial and sovereign debt crisis period dummy and the topholder majority ownership dummy is 0.286 and significant. Similarly, as shown in model 3, state-owned firms increased their cash holdings significantly more than non-state-owned firms in the years after the crises (the coefficient estimate for the interaction term is 0.46 and significant). In fact, they also held significantly higher levels of cash prior and during the crises.

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<sup>21</sup> Another possible explanation for these findings is that firms increased their cash holdings in the aftermath of the crises because interest rates were generally very low, and therefore the opportunity cost of holding cash was also low.

In contrast, while firms in which the majority owner is an insider held more cash prior and during the crises (as evidenced by the positive and significant coefficient estimate for the controlling ownership dummy in model 2), these firms did not significantly increase their cash holdings relative to firms in which the majority owner is not an insider following the crises (as evidenced by the non-significant interaction term in model 2).

## **5 Conclusions**

We provide the first comprehensive study of trends in and determinants of corporate cash holdings in the Nordic countries. As ownership concentration in the Nordic countries is larger on average as e.g. in the U.S., and also shows a large cross-sectional variation across firms, our data allows to test for especially the effects of ownership variables on corporate cash holdings.

As reported by e.g. Faccio et al. (2011), poor large owner portfolio diversification may lead to risk avoidance, and thus larger corporate cash holdings, at the firm level. We contribute to prior literature by testing for this effect in the relationship between large owners and corporate cash holdings. In addition, we test for the effects of two specific owner types: the management and the state. As the Nordic countries rank high in e.g. investor protection, it is interesting to see whether the same agency problem of type 1 as encountered on other markets apply to inside ownership in the Nordics. As corporate governance is not bad in the Nordic countries, it is also interesting to study the effects of state ownership, as the competing explanations of better access to credit in state owned firms (hence a lower need for cash due to the precautionary motive) and entrenched managers in state owned firms offer opposite expected signs for the relationship between state ownership and corporate cash. Finally, we contribute by studying the effect of financial crises on cash balances.



We find support for the hypothesis that ownership concentration is associated with higher corporate cash holdings. We also find strong support for a positive relationship between managerial ownership and corporate cash, as well as support for a similar positive relationship between state ownership and cash holdings. Interestingly, the existence of dual shares has a weakening effect on these relationships. As dual shares allow for corporate control using less capital, and therefore reduces the problem of poor portfolio diversification for the main (not extremely rich) owner, this is in line with our hypothesis.

Furthermore, we also find that corporate cash balances have significantly increased since the financial and sovereign debt crises. The increase is also significantly related to corporate control, i.e., higher in firms with a large owner. We interpret this as a sign of a strengthened precautionary motive after the experiences of the crises.

Our paper has policy implications as it for example shows that state-owned firms in the Nordics own larger cash balances as compared to firms without a state majority stake. To the extent that such balances are not economically motivated (as the state owned firms could be expected to have a better access to credit markets), this would point towards entrenched managers, i.e., indicate that the incentives in state owned firms would not be perfectly aligned with market value maximization.

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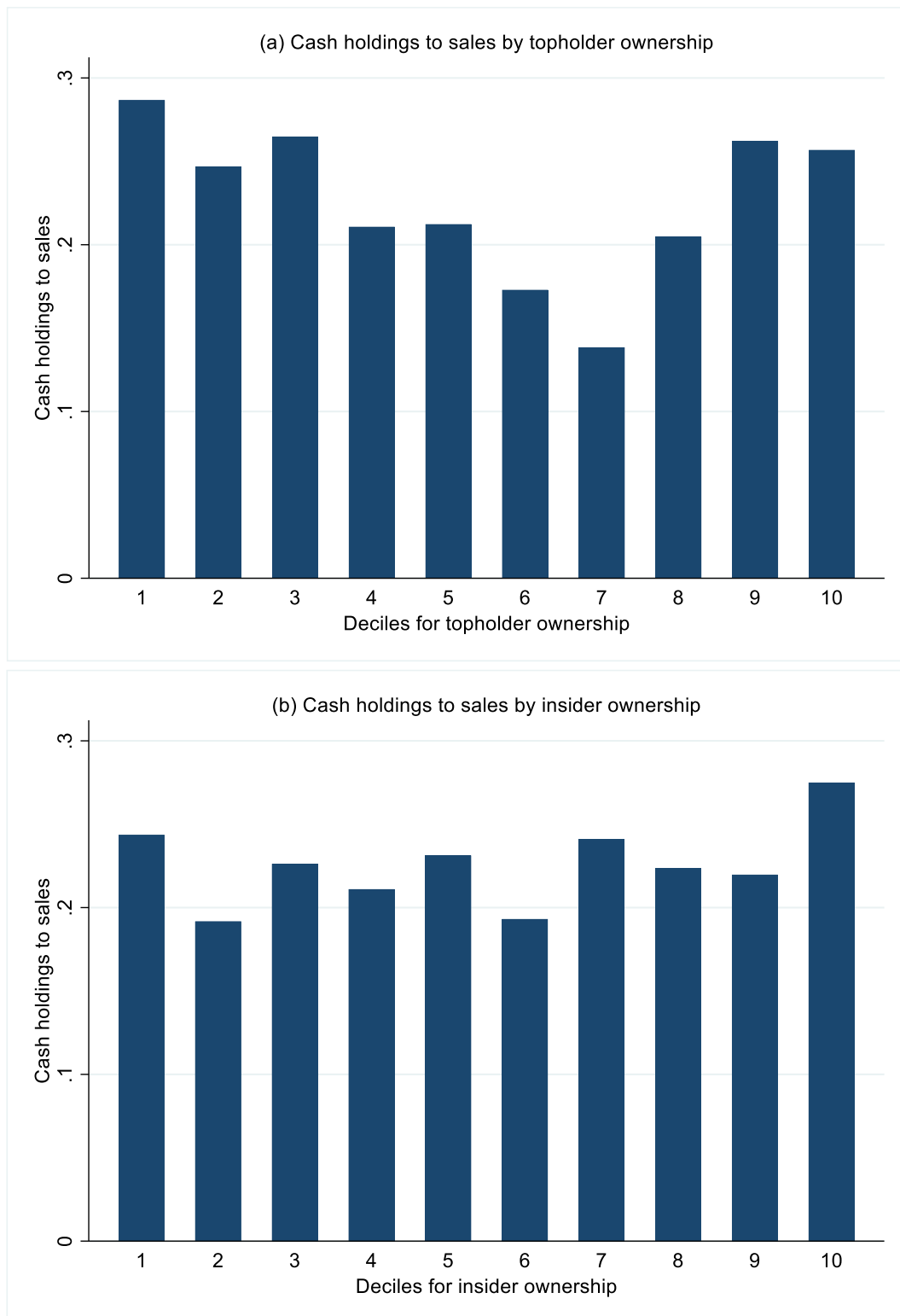
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## Figures

### Figure 1 Cash holdings to sales for different levels of insider and topholder ownership

The figure presents cash holdings to sales for different levels (by decile) of (a) topholder ownership and (b) insider ownership, respectively. The sample consists of 5,079 firm-year observations for 719 Nordic firms (Denmark, Finland, Norway, and Sweden) from 2003 through 2020.



## Tables

**Table 1 Distribution of firm-years**

The table shows the distribution of firm-years partitioned by year and by country for the full sample consisting of 5,079 firm-year observations for 719 Nordic firms (Denmark, Finland, Norway, and Sweden) from 2003 through 2020.

(1) Year	(2) Obs.	(3) Denmark	(4) Finland	(5) Norway	(6) Sweden
2003	98	38	12	11	37
2004	201	75	38	47	41
2005	259	104	53	55	47
2006	267	102	59	61	45
2007	286	105	72	70	39
2008	303	113	78	74	38
2009	306	114	75	76	41
2010	305	109	73	74	49
2011	290	101	69	73	47
2012	307	109	70	76	52
2013	319	116	73	78	52
2014	311	116	71	76	48
2015	309	118	67	73	51
2016	285	109	65	71	40
2017	276	111	59	68	38
2018	286	126	55	63	42
2019	321	151	59	70	41
2020	350	161	59	82	48
<b>Total</b>	<b>5,079</b>	<b>796</b>	<b>1,198</b>	<b>1,107</b>	<b>1,978</b>

**Table 2 Descriptive statistics**

Panel A reports summary statistics for firm-level variables for our sample consisting of 5,079 firm-year observations for 719 Nordic firms (Denmark, Finland, Norway, and Sweden) for years 2003 through 2020. *Cash holdings to sales* is cash and marketable securities divided by sales. *Cash holdings to total assets* is cash and marketable securities divided by total assets. Panel B reports descriptive statistics by country for selected variables. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles.

<i>PANEL A: DESCRIPTIVE STATISTICS, FULL SAMPLE</i>					
	(1)	(2)	(3)	(4)	(5)
	Obs.	Mean	Median	p10	p90
Cash holdings to sales	5,079	0.23	0.087	0.017	0.55
Cash holdings to total assets	5,079	0.13	0.084	0.019	0.34
Topholder ownership (%)	5,079	26.3	22.3	8.36	52.7
Insider ownership (%)	5,079	44.1	43.2	14.9	75.4
State is topholder (=1)	4,631	0.042	0.000	0.000	0.000
State ownership $\geq$ 50% (=1)	4,620	0.020	0.000	0.000	0.000
Wedge (Total Votes/Total Shares)	4,983	0.964	1.000	0.869	1.000
Dual shares (=1 if Wedge < 1)	4,872	0.237	0.000	0.000	1.000
Size	5,079	5.73	5.55	3.47	8.31
ROA	5,079	0.091	0.099	-0.030	0.22
Dividend payer (=1)	5,079	0.56	1	0	1
Leverage	5,079	0.15	0.12	0	0.36
NWC to total assets	5,079	0.16	0.14	-0.077	0.44
Cash flow to sales	5,079	0.039	0.075	-0.097	0.23
Cash flow volatility	5,079	0.10	0.026	0.0057	0.26
Capex to total assets	5,079	0.039	0.028	0.005	0.096
R&D to total assets	5,079	0.026	0.000	0	0.11
Sales growth	5,079	0.084	0.055	-0.16	0.34
Market share	5,079	0.006	0.001	0.000	0.021
Market-to-Book	5,079	1.98	0.55	0.11	6.40

<i>PANEL B: MEANS FOR SELECTED VARIABLES, BY COUNTRY</i>						
Country	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Cash holdings to sales</i>	<i>Cash holdings to total assets</i>	<i>Topholder ownership (%)</i>	<i>Insider ownership (%)</i>	<i>State is topholder (=1)</i>	<i>Dual shares (=1)</i>
Denmark	0.193	0.118	27.17	41.06	0.97%	27.61%
Finland	0.137	0.120	22.57	42.77	6.15%	18.63%
Norway	0.317	0.133	33.90	53.94	8.07%	6.52%
Sweden	0.241	0.146	23.88	40.55	1.99%	38.63%

**Table 3 Main results – controlling ownership**

This table reports results for pooled OLS regressions for our sample of 5,079 firm-year observations for 719 Nordic firms for years 2003 through 2020. The dependent variable is the natural logarithm of *Cash holdings to sales* (cash and marketable securities to sales). The main independent variable is the percentage of shares owned by the topholder (*Topholder ownership (%)*). In column 3, we split this variable into indicators by quartiles of topholder ownership (benchmark group is the quartile 1, the quartile with lowest percentage of topholder ownership). In column 4, the main independent variable is an indicator for majority ( $\geq 50\%$ ) topholder ownership. All columns include year fixed effects, columns 2-5 include industry (based on four-digit SIC codes) fixed effects, and columns 5-6 include also country fixed effects. All columns include a vector of one-year lagged control variables (*Size, ROA, Dividend Payer, Leverage, NWC to total assets, Cash flow to sales, Cash flow volatility, Capex to total assets, Sales Growth, R&D to total assets, Market Share, and Market-to-Book*). All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. Robust *t*-statistics (clustered by industry) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
<i>ln(Cash holdings to sales)</i>					Country fixed effects	
Topholder ownership (%)	0.006*** (3.44)	0.005*** (3.02)			0.004*** (2.72)	
Topholder Quartile 4 (=1)			0.183** (2.35)			
Topholder Quartile 3 (=1)			-0.121* (-1.81)			
Topholder Quartile 2 (=1)			-0.051 (-0.83)			
Topholder ownership $\geq 50\%$ (=1)				0.286*** (3.49)		0.261*** (3.15)
Size	0.030 (1.05)	0.039 (1.12)	0.033 (1.00)	0.036 (1.08)	0.031 (0.92)	0.029 (0.89)
ROA	-1.359*** (-3.42)	-0.898*** (-2.71)	-0.917*** (-2.76)	-0.867*** (-2.62)	-0.809*** (-2.71)	-0.775** (-2.57)
Dividend payer (=1)	-0.045 (-0.65)	-0.019 (-0.30)	-0.019 (-0.30)	-0.016 (-0.27)	-0.002 (-0.03)	-0.001 (-0.01)
Leverage	0.311 (0.88)	-0.125 (-0.45)	-0.117 (-0.42)	-0.125 (-0.45)	-0.133 (-0.50)	-0.134 (-0.52)
NWC to total assets	2.274*** (10.98)	2.870*** (13.02)	2.834*** (12.92)	2.870*** (12.87)	2.852*** (12.89)	2.853*** (12.77)
Cash flow to sales	0.921*** (4.16)	0.312* (1.69)	0.323* (1.76)	0.306* (1.68)	0.312* (1.75)	0.304* (1.73)
Cash flow volatility	2.547*** (14.43)	1.686*** (9.55)	1.665*** (9.35)	1.674*** (9.53)	1.626*** (10.32)	1.613*** (10.27)
Capex to total assets	0.913 (0.95)	-0.458 (-0.70)	-0.542 (-0.81)	-0.466 (-0.73)	-0.645 (-1.00)	-0.644 (-1.02)
Sales growth	0.034 (0.41)	-0.019 (-0.29)	-0.013 (-0.20)	-0.020 (-0.31)	-0.044 (-0.69)	-0.045 (-0.71)
R&D to total assets	4.013*** (6.51)	1.428* (1.81)	1.451* (1.79)	1.435* (1.85)	1.751** (2.47)	1.766** (2.50)
Market share	-8.954** (-2.38)	-5.245 (-1.00)	-5.139 (-1.00)	-5.086 (-0.98)	-5.584 (-1.12)	-5.422 (-1.10)
Market-to-Book	0.016 (1.58)	0.008 (0.88)	0.006 (0.61)	0.008 (0.83)	0.015 (1.54)	0.014 (1.54)
Constant	-3.389*** (-19.15)	-3.292*** (-14.06)	-3.118*** (-14.24)	-3.187*** (-14.46)	-3.230*** (-14.75)	-3.141*** (-15.06)
Observations	5,079	5,079	5,079	5,079	5,079	5,079
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	Yes	Yes
R-squared	0.415	0.610	0.617	0.613	0.612	0.618



**Table 4 Managerial and state ownership**

The dependent variable is the natural logarithm of *Cash holdings to sales*, and the main independent variables are the percentage of shares owned by insiders and stakeholders, as well as the percentage of shares owned by the state. All columns include the same control variables as in Table 3. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. Robust *t*-statistics (clustered by industry) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: <i>ln(Cash holdings to sales)</i>	(1)	(2)	(3)	(4)
			Country fixed effects	
Insider ownership (%)	0.004*** (2.84)		0.003** (2.41)	
State is topholder (=1)	0.678*** (3.48)		0.630*** (3.53)	
Insider ownership ≥ 50% (=1)		0.142*** (2.87)		0.122** (2.51)
State ownership ≥ 50% (=1)		0.784*** (3.27)		0.776*** (4.01)
Size	0.046 (1.27)	0.045 (1.20)	0.036 (1.02)	0.036 (1.00)
ROA	-0.779** (-2.14)	-0.735** (-2.02)	-0.701** (-2.09)	-0.642* (-1.93)
Dividend payer (=1)	-0.022 (-0.34)	-0.017 (-0.26)	-0.001 (-0.02)	0.003 (0.05)
Leverage	-0.002 (-0.01)	0.006 (0.02)	-0.005 (-0.02)	0.002 (0.01)
NWC to total assets	2.820*** (12.02)	2.833*** (12.02)	2.808*** (11.86)	2.820*** (11.93)
Cash flow to sales	0.319 (1.62)	0.310 (1.57)	0.321* (1.69)	0.310 (1.63)
Cash flow volatility	1.741*** (9.62)	1.751*** (9.71)	1.685*** (10.48)	1.687*** (10.56)
Capex to total assets	-0.289 (-0.41)	-0.336 (-0.47)	-0.518 (-0.74)	-0.563 (-0.80)
Sales growth	-0.062 (-0.86)	-0.061 (-0.85)	-0.086 (-1.21)	-0.090 (-1.25)
R&D to total assets	1.617* (1.81)	1.625* (1.85)	1.914** (2.38)	1.966** (2.47)
Market share	-8.444* (-1.66)	-6.845 (-1.30)	-8.516* (-1.71)	-7.094 (-1.39)
Market-to-Book	0.007 (0.73)	0.007 (0.75)	0.015 (1.56)	0.016* (1.68)
Constant	-3.352*** (-13.42)	-3.267*** (-13.45)	-3.278*** (-14.04)	-3.211*** (-14.36)
Observations	4,726	4,726	4,726	4,726
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes
R-squared	0.611	0.616	0.623	0.622

**Table 5 Propensity score matching**

The table shows treatment effects for propensity score matching. The reported coefficients are the estimated average treatment effects in the population. In the first stage, we estimate logistic regressions predicting the treatment variable, which is an indicator for topholder majority ownership in column 1, an indicator for insider majority ownership in column 2, and an indicator for state majority ownership in column 3. The dependent variable in the second stage regression is  $\ln(\text{Cash holdings to sales})$ , and the treatment is the treatment variable from the first-stage regression. The same control variables as in Table 3, an intercept, as well as industry (based on four-digit SIC codes) and year fixed effects are included in both the first and the second stage regressions, respectively, but are not reported to save space. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. We require caliper to be lower than or equal to 0.1 (i.e., the propensity score matching score to be 0.1 or lower) and match one firm per observation (nearest neighbor equals 1). Robust  $t$ -statistics (corrected for heteroskedasticity using Abadie-Imbens procedure) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: <i>ln(Cash holdings to sales)</i>	(1)	(2)	(3)
	<i>Topholder ownership</i> $\geq 50\%$ (=1)	<i>Insider ownership</i> $\geq 50\%$ (=1)	<i>State ownership</i> $\geq 50\%$ (=1)
Controlling ownership	0.056*** (10.84)	0.098*** (2.83)	0.540** (2.00)
Observations	3,129	4,330	199
Control variables included	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

**Table 6 Dual shares**

The dependent variable is the natural logarithm of *Cash holdings to sales*, and the main independent variable is an indicator for dual shares existence (equals one when the total number of votes differs from the the total number of outstanding shares). Variable descriptions are in Appendix Table 1. Robust *t*-statistics (clustered by industry) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: <i>ln(Cash holdings to sales)</i>	(1)	(2)	(3)
Dual shares (=1)	-0.171** (-2.18)	-0.135* (-1.72)	-0.158* (-1.86)
Insider ownership (%)		0.003** (2.06)	
State is topholder (=1)		0.625*** (3.22)	
Insider ownership ≥ 50% (=1)			0.110** (2.03)
State ownership ≥ 50% (=1)			0.760*** (3.08)
Size	0.058 (1.61)	0.054 (1.47)	0.054 (1.42)
ROA	-0.868*** (-2.62)	-0.776** (-2.12)	-0.739** (-2.02)
Dividend payer (=1)	-0.038 (-0.62)	-0.029 (-0.47)	-0.023 (-0.36)
Leverage	-0.167 (-0.61)	-0.036 (-0.13)	-0.029 (-0.11)
NWC to total assets	2.850*** (13.21)	2.816*** (12.48)	2.829*** (12.56)
Cash flow to sales	0.307* (1.67)	0.286 (1.46)	0.279 (1.43)
Cash flow volatility	1.716*** (9.95)	1.760*** (9.82)	1.770*** (9.94)
Capex to total assets	-0.274 (-0.38)	-0.161 (-0.22)	-0.211 (-0.28)
Sales growth	-0.018 (-0.27)	-0.042 (-0.58)	-0.043 (-0.58)
R&D to total assets	1.466* (1.91)	1.564* (1.83)	1.556* (1.86)
Market share	-7.159 (-1.30)	-8.913* (-1.68)	-7.340 (-1.34)
Market-to-Book	0.002 (0.16)	0.004 (0.38)	0.004 (0.36)
Constant	-3.060*** (-13.20)	-3.179*** (-12.60)	-3.098*** (-12.65)
Observations	4,872	4,535	4,535
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
R-squared	0.618	0.626	0.625

**Table 7 The effects of the financial crisis and the sovereign debt crisis on cash holdings in the Nordic countries**

The dependent variable is the natural logarithm of *Cash holdings to sales*. *Financial crisis* takes the value of one for years 2007-2009, and zero otherwise; *Financial & Sovereign Debt crisis* is an indicator for years 2007-2012; *Post-Financial crisis* is an indicator for years 2010-2020; and *Post-Financial & Sovereign Debt crisis* is an indicator for years 2013-2020. Panel A shows results for cash holdings for the crisis and the post-crisis periods. Panel B shows results for interactions between crisis period indicators and measures for majority ownership (topholder, insider, and state ownership, respectively). All columns include a vector of one-year lagged control variables (same as in Table 3) and a constant (not reported to save space), as well as industry fixed effects. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. Robust *t*-statistics (clustered by industry) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

<i>PANEL A: MAIN RESULTS FOR CRISES PERIODS</i>				
Dependent variable: <i>ln(Cash holdings to sales)</i>	(1)	(2)	(3)	(4)
Financial crisis (=1)	-0.072** (-2.06)			
Post-Financial crisis (=1)		0.098** (2.223)		
Financial & Sovereign Debt crisis (=1)			-0.181*** (-5.96)	
Post-Financial & Sovereign Debt crisis (=1)				0.207*** (5.37)
Observations	5,079	5,079	5,079	4,771
Controls included	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
R-squared	0.596	0.596	0.599	0.601
<i>PANEL B: CRISIS PERIOD AND CONTROLLING OWNERSHIP</i>				
Dependent variable: <i>ln(Cash holdings to sales)</i>	(1) Topholder ownership	(2) Insider ownership	(3) State ownership	
Post-Financial & Sovereign Debt crisis (=1)	0.161*** (4.09)	0.200*** (4.78)	0.201*** (4.77)	
Controlling ownership ≥ 50% (=1)	0.125 (1.33)	0.133** (2.22)	0.623** (2.53)	
Post-Financial & Sovereign Debt crisis (=1) * Controlling ownership ≥ 50% (=1)	0.286*** (2.75)	0.007 (0.10)	0.456*** (3.49)	
Observations	4,771	4,771	4,771	
Controls included	Yes	Yes	Yes	
Industry fixed effects	Yes	Yes	Yes	
R-squared	0.606	0.603	0.607	

## Appendix

**Appendix Table 1**  
Variable descriptions.

Variable Name	Variable Description	Source
<i>CASH HOLDINGS VARIABLES</i>		
Cash holdings to sales	<i>Cash and short-term investments (che), scaled by sales (sale).</i>	Compustat
Cash holdings to total assets	<i>Cash and short-term investments (che), scaled by total assets (at).</i>	Compustat
<i>OWNERSHIP VARIABLES</i>		
Topholder ownership (%)	<i>The percentage of shares owned by the largest shareholder (the “topholder”) (OS_TOP_HLDR_PCT05), measured in year t – 1.</i>	FactSet
Topholder ownership ≥ 50% (=1)	An indicator for majority topholder ownership.	
Insider ownership (%)	<i>The ratio of insider ownership in a company (number of shares owned by insiders divided by total number of outstanding shares) (OS_SEC_PCT_HLD_INSID), measured in year t – 1.</i>	FactSet
Insider ownership ≥ 50% (=1)	An indicator for majority insider ownership.	
State is topholder (=1)	<i>Equals 1 if the state is the topholder (OS_TOP_HLDR_INVSTR), 0 otherwise.</i>	FactSet
State ownership ≥ 50% (=1)	<i>Equals 1 if the state is the topholder (OS_TOP_HLDR_INVSTR) and owns at least 50 percent of the shares outstanding (OS_TOP_HLDR_PCT05), 0 otherwise.</i>	FactSet
Wedge	<i>The total number of votes in a company divided by the total number of outstanding shares.</i>	FactSet
Dual shares (=1)	<i>A proxy for dual shares. Equals 1 if wedge ≠ 1, i.e. voting rights are lower or greater than the number of outstanding shares, and zero when wedge = 1 (the company does not have dual share listings).</i>	FactSet
<i>FIRM-LEVEL CONTROL VARIABLES</i>		
Size	<i>The natural logarithm of total assets (at) (converted to year-end US dollars using year-end exchange rates from Federal Reserve Foreign Exchange Rates database in Wharton Research Data Services (WRDS)), measured in year t – 1.</i>	Compustat, Federal Reserve Foreign Exchange Rates
ROA	<i>Operating income before depreciation (oibdp) divided by total assets (at), measured in year t – 1.</i>	Compustat
Dividend payer (=1)	<i>An indicator for whether a company paid a dividend (dvt) in year t – 1, and zero otherwise. If data for this variable is missing, we set the indicator to zero.</i>	Compustat
Leverage	<i>Total debt (short-term debt (dlcfs) plus long-term debt (dltt)) divided by total assets (at), measured in year t – 1.</i>	Compustat
NWC to total assets	<i>Net Working capital calculated as current assets (act) minus current liabilities (lct), scaled by total assets (at), and measured in year t – 1.</i>	Compustat

Cash flow to sales	<i>Income before extraordinary items (ib) plus depreciation and amortization (dp), scaled by sales (sale), measured in year <math>t - 1</math>.</i>	Compustat
Cash flow volatility	<i>The standard deviation of the variable Cash flow to sales calculated for the current and the three preceding three years (<math>t - 3</math> through <math>t</math>).</i>	Compustat
Capex to total assets	<i>Capital expenditures (cape), scaled by total assets (at), measured in year <math>t - 1</math>.</i>	Compustat
Sales growth	<i>The growth rate of sales (sale) between year <math>t - 2</math> and <math>t - 1</math>.</i>	Compustat
R&D to total assets	<i>Research and Development Expense (xrd), scaled by total assets (at), measured in year <math>t - 1</math>.</i>	Compustat
Market share	<i>The ratio of sales (sale) to the total sales (sale) of companies in the same industry (based on two-digit SIC codes), measured in year <math>t - 1</math>. Sales are converted to year-end US dollars using year-end exchange rates from Federal Reserve Foreign Exchange Rates database.</i>	Compustat, Federal Reserve Foreign Exchange Rates
Market-to-Book	<i>The market to book value calculated as market value divided by book value (ceq). Market value is the year-end stock price (price) multiplied by the number of outstanding shares (cshoi), converted to US dollars using year-end exchange rates from Federal Reserve Foreign Exchange Rates database.</i>	Compustat, Federal Reserve Foreign Exchange Rates
<b>RECESSION INDICATORS</b>		
Financial crisis (=1)	<i>Equals 1 for years 2007-2009, and zero otherwise.</i>	
Post-Financial crisis (=1)	<i>Equals 1 for years 2010-2020, and zero otherwise.</i>	
Financial & Sovereign Debt crisis (=1)	<i>Equals 1 for years 2007-2012 (the financial crisis in years 2007-2009 and the sovereign debt crisis in Europe in 2010-2012), and zero otherwise.</i>	
Post-Financial & Sovereign Debt crisis (=1)	<i>Equals 1 for years 2013-2020, and zero otherwise.</i>	

### Appendix Table 2 Ln(Cash holdings to total assets) – Topholder ownership

The table reports results for pooled OLS regressions for our sample of 5,079 firm-year observations for 719 Nordic firms for years 2003 through 2020. The dependent variable is the natural logarithm of *Cash holdings to total assets* (cash and marketable securities to total assets). The main independent variable is the percentage of shares owned by the topholder (*Topholder ownership (%)*). In column 3, we split this variable into indicators by quartiles of topholder ownership (benchmark group is the quartile with lowest percentage of topholder ownership). In column 4, the main independent variable is an indicator for majority ( $\geq 50\%$ ) topholder ownership. All columns include year fixed effects, columns 2-5 include industry (based on four-digit SIC codes) fixed effects, and columns 5-6 include country fixed effects. All columns include a vector of one-year lagged control variables (*Size*, *ROA*, *Dividend Payer*, *Leverage*, *NWC to total assets*, *Cash flow to sales*, *Cash flow volatility*, *Capex to total assets*, *Sales Growth*, *R&D to total assets*, *Market Share*, and *Market-to-Book*). All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. Robust *t*-statistics (clustered by industry) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: <i>ln(Cash holdings to total assets)</i>	(1)	(2)	(3)	(4)	(5)	(6)
					Country fixed effects	
Topholder ownership (%)	0.003** (2.22)	0.003* (1.90)			0.002 (1.54)	
Topholder Quartile 4 (=1)			0.100* (1.70)			
Topholder Quartile 3 (=1)			-0.089* (-1.68)			
Topholder Quartile 2 (=1)			-0.021 (-0.43)			
Topholder ownership $\geq 50\%$ (=1)				0.150** (2.00)		0.126 (1.64)
Size	-0.052** (-2.13)	-0.052* (-1.86)	-0.056** (-2.06)	-0.053* (-1.93)	-0.060** (-2.15)	-0.061** (-2.21)
ROA	0.320 (0.94)	0.592** (2.36)	0.583** (2.31)	0.608** (2.43)	0.635** (2.57)	0.651** (2.63)
Dividend payer (=1)	0.009 (0.16)	0.001 (0.03)	0.001 (0.02)	0.002 (0.05)	0.016 (0.36)	0.016 (0.37)
Leverage	-0.701** (-2.53)	-0.682*** (-3.15)	-0.675*** (-3.12)	-0.681*** (-3.15)	-0.694*** (-3.48)	-0.694*** (-3.50)
NWC to total assets	2.238*** (13.17)	2.704*** (15.84)	2.681*** (15.64)	2.704*** (15.70)	2.688*** (16.26)	2.688*** (16.13)
Cash flow to sales	0.018 (0.15)	-0.197** (-2.12)	-0.191** (-2.07)	-0.200** (-2.17)	-0.194** (-2.05)	-0.197** (-2.11)
Cash flow volatility	0.592*** (5.82)	0.372*** (3.65)	0.358*** (3.53)	0.366*** (3.59)	0.336*** (3.11)	0.330*** (3.07)
Capex to total assets	-0.310 (-0.36)	-0.356 (-0.62)	-0.409 (-0.70)	-0.358 (-0.62)	-0.554 (-0.99)	-0.551 (-0.98)
Sales growth	0.108 (1.50)	0.053 (0.90)	0.057 (0.97)	0.053 (0.90)	0.043 (0.76)	0.042 (0.76)
R&D to total assets	2.977*** (6.42)	1.548** (2.44)	1.558** (2.39)	1.553** (2.47)	1.686*** (3.04)	1.694*** (3.05)
Market share	0.515 (0.16)	7.020* (1.70)	7.113* (1.77)	7.085* (1.73)	6.871* (1.74)	6.931* (1.77)
Market-to-Book	0.024*** (3.10)	0.013* (1.73)	0.011 (1.49)	0.012* (1.71)	0.015* (1.67)	0.015* (1.67)
Constant	-2.787*** (-19.65)	-2.752*** (-16.11)	-2.648*** (-16.02)	-2.695*** (-15.99)	-2.688*** (-16.44)	-2.643*** (-16.03)
Observations	5,079	5,079	5,079	5,079	5,079	5,079
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	Yes	Yes
R-squared	0.354	0.545	0.546	0.545	0.549	0.549

### Appendix Table 3 Cash holdings to sales as dependent variable

The table reports results for pooled OLS regressions for our sample of 5,079 firm-year observations for 719 Nordic firms for years 2003 through 2020. The dependent variable is *Cash holdings to sales* (cash and marketable securities to sales; %). All columns include year fixed effects, columns 2-5 include industry (based on four-digit SIC codes) fixed effects, and columns 5-6 include country fixed effects. All columns include a vector of one-year lagged control variables (*Size, Leverage, NWC, ROA, Dividend Payer, Sales Growth, Market Share, Market-to-Book, Capex, R&D, Cash flow, and Cash Flow Volatility*). Control variables and the constant are included in all regression but are not reported to save space. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. Robust *t*-statistics (clustered by industry) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

<i>PANEL A: TOPHOLDER OWNERSHIP</i>						
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Cash holdings to sales</i>					Country fixed effects	
Topholder ownership (%)	0.001*** (2.65)	0.001 (1.51)			0.000 (1.02)	
Topholder Quartile 4 (=1)			0.036* (1.66)			
Topholder Quartile 3 (=1)			-0.013 (-0.80)			
Topholder Quartile 2 (=1)			0.013 (0.75)			
Topholder ownership ≥ 50% (=1)				0.043** (2.36)		0.033* (1.75)
Observations	5,079	5,079	5,079	5,079	5,079	5,079
Controls included	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	Yes	Yes
R-squared	0.510	0.610	0.611	0.610	0.615	0.615
<i>PANEL B: MANAGERIAL AND STATE OWNERSHIP</i>						
Dependent variable:	(1)	(2)	(3)	(4)		
<i>Cash holdings to sales</i>					Country fixed effects	
Insider ownership (%)		0.001** (2.26)		0.001 (1.51)		
State is topholder (=1)		0.069** (2.42)		0.054* (1.64)		
Insider ownership ≥ 50% (=1)			0.031** (2.21)			0.023* (1.68)
State ownership ≥ 50% (=1)			0.100** (2.12)			0.090* (1.72)
Observations		4,726	4,726	4,726	4,726	4,726
Controls included		Yes	Yes	Yes	Yes	Yes
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Industry fixed effects		Yes	Yes	Yes	Yes	Yes
Country fixed effects		No	No	Yes	Yes	Yes
R-squared		0.614	0.614	0.619	0.620	0.620



#### Appendix Table 4 Ln(Cash holdings to total assets) – Managerial and state ownership

The dependent variable is the natural logarithm of *Cash holdings to total assets*, and the main independent variables are the percentage of shares owned by insiders and stakeholders, as well as the percentage of shares owned by the state. All columns include the same control variables as in Table 3, as well as industry and year fixed effects. Columns 3-4 include also country fixed effects. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. Robust *t*-statistics (clustered by industry) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: <i>ln(Cash holdings to total assets)</i>	(1)	(2)	(3)	(4) Country fixed effects
Insider ownership (%)	0.003** (2.32)		0.002** (2.01)	
State is topholder (=1)	0.490*** (2.97)		0.463*** (3.06)	
Insider ownership ≥ 50% (=1)		0.078* (1.70)		0.060 (1.36)
State ownership ≥ 50% (=1)		0.705*** (3.69)		0.686*** (4.26)
Size	-0.056** (-2.03)	-0.058** (-2.04)	-0.064** (-2.34)	-0.066** (-2.35)
ROA	0.728*** (2.65)	0.770*** (2.81)	0.760*** (2.82)	0.811*** (3.03)
Dividend payer (=1)	-0.001 (-0.02)	-0.000 (-0.01)	0.015 (0.34)	0.016 (0.35)
Leverage	-0.582*** (-2.81)	-0.571*** (-2.71)	-0.589*** (-3.07)	-0.579*** (-2.99)
NWC to total assets	2.671*** (15.81)	2.675*** (15.44)	2.660*** (16.24)	2.664*** (16.01)
Cash flow to sales	-0.237** (-2.28)	-0.244** (-2.35)	-0.232** (-2.22)	-0.240** (-2.29)
Cash flow volatility	0.399*** (3.78)	0.407*** (3.85)	0.369*** (3.28)	0.370*** (3.28)
Capex to total assets	-0.128 (-0.21)	-0.163 (-0.26)	-0.338 (-0.56)	-0.375 (-0.62)
Sales growth	0.032 (0.52)	0.033 (0.54)	0.025 (0.41)	0.022 (0.37)
R&D to total assets	1.494** (2.05)	1.499** (2.05)	1.606** (2.49)	1.646** (2.53)
Market share	5.826 (1.38)	6.683 (1.57)	5.777 (1.40)	6.577 (1.58)
Market-to-Book	0.012 (1.55)	0.012 (1.61)	0.015 (1.56)	0.016* (1.67)
Constant	-2.778*** (-15.46)	-2.694*** (-15.10)	-2.707*** (-15.78)	-2.639*** (-15.45)
Observations	4,726	4,726	4,726	4,726
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes
R-squared	0.552	0.551	0.555	0.555

**Appendix Table 5 Propensity score matching: Two-digit SIC codes**

The table shows treatment effects for propensity score matching. The reported coefficients are the treatment effects. In the first stage, we estimate logistic regressions predicting the treatment variable, which is an indicator for topholder majority ownership in column 1, insider majority ownership in column 2, and state majority ownership in column 4. The dependent variable in the second stage regression is  $\ln(\text{Cash holdings to sales})$ , and the treatment is the treatment variable from the first-stage regression. The same control variables as in Table 3, an intercept, as well as industry (based on two-digit SIC codes) and year fixed effects are included in both the first and the second stage regressions, respectively, but are not reported to save space. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. We require caliper to be lower than or equal to 0.1 (i.e., the propensity score matching score to be 0.1 or lower) and match one firm per observation (nearest neighbor equals 1). Robust  $t$ -statistics (corrected for heteroskedasticity using Abadie-Imbens procedure) are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: <i>ln(Cash holdings to sales)</i>	(1)	(2)	(3)
	Treatment variable		
	<i>Topholder ownership</i> $\geq 50\%$ (=1)	<i>Insider ownership</i> $\geq 50\%$ (=1)	<i>State ownership</i> $\geq 50\%$ (=1)
Controlling ownership (=1)	0.212*** (4.15)	0.138*** (3.60)	1.519* (1.66)
Observations	4,797	5,021	1,247
Control variables included	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

### Appendix Table 6 Firm fixed effects and random GLS effects

The table shows results for firm fixed effects models (Panel A) and random effects GLS models (Panel B). The same control variables as in Table 3 and an intercept are included in all regressions but are not reported to save space. All continuous variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Variable descriptions are in Appendix Table 1. Firm fixed effects models include firm and year fixed effects. Firm random effects GLS models include industry and year fixed effects. Robust *t*-statistics (clustered by firm) are reported in parentheses below the reported coefficient estimates. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% levels, respectively.

<i>PANEL A: FIRM FIXED EFFECTS</i>		
Dependent variable: <i>ln(Cash holdings to sales)</i>	(1) <i>Insider ownership (%)</i>	(2) <i>State ownership ≥ 50% (=1)</i>
Controlling ownership	0.003** (2.14)	0.307 (0.48)
Observations	4,983	4,636
Control variables included	Yes	Yes
Year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes
R-squared	0.773	0.773
<i>PANEL B: RANDOM EFFECTS GLS</i>		
Dependent variable: <i>ln(Cash holdings to sales)</i>	(1) <i>Insider ownership (%)</i>	(2) <i>State ownership ≥ 50% (=1)</i>
Controlling ownership	0.002** (1.98)	0.507 (1.13)
Observations	5,092	4,741
Control variables included	Yes	Yes
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes