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# Myopic or monitoring institutional investors: The case of R&D intensity in Swedish listed firms

**Abstract**

By examining the effects of institutional ownership on R&D intensity, this thesis intends to explain whether institutional investors impose myopia on, or act as monitors in, their portfolio firms. Further, the thesis aims to examine if heterogeneity in investment strategies among institutional investors translates to heterogeneity in imposed myopia and monitoring. Based on the methodology of Wahal and McConnell (2000), we use data from 111 listed Swedish firms from 2002 to 2016, to regress R&D intensity on institutional ownership, alongside a set of control variables. We divide institutional investors into tertiles based on portfolio turnover and make similar regressions. The regressions are made with fixed effects for firm and year, and comprise change and level data. We find that institutional investors seem to discourage R&D intensity in their portfolio firms, and that this effect is reaffirmed when dividing institutional investors into tertiles. Thus, our results suggest that institutional investors impose myopia on their portfolio firms. Furthermore, we find no significant support for heterogeneity among institutional investors in imposing myopia.

**Authors:** Ludvig Boström (23461) and Jonas Johansson (23459)
**Tutors:** Johan Graaf and Peter Aleksziev

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**Keywords:** R&D intensity, institutional ownership, portfolio turnover, myopia

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# 1. Introduction

## 1.1. Purpose

The purpose of this study is to evaluate if institutional investors impose myopia on their portfolio firms, or if institutional investors could serve as an extra monitoring function in these firms. Furthermore, we aim to evaluate whether institutional investors with different investment strategies affect their portfolio firms in heterogeneous ways.

More specifically, we study the effects of institutional ownership on research and development (furthermore denoted as "R&D") intensity in Swedish listed firms during 2002–2016. We also study if institutional investors with different portfolio turnover have different effect on the R&D intensity, where portfolio turnover is a proxy for investment strategy. We have found two conflicting theories which suggest either a negative or a positive association between institutional ownership and R&D intensity and we further evaluate if there is any support for these theories. The study is based on the methodology developed by Wahal and McConnell (2000) and thus makes two types of regressions with fixed effects for firm and year; change and level regressions.

We define the *R&D intensity* of a firm as its R&D-to-Sales ratio, where *R&D* is defined as R&D expenditures. Institutional ownership is made up of different kinds of institutional investors, including: brokerage firms, investment advisors, pension funds, insurance companies, hedge funds, banks, trusts, research firms, foundations, private equity, and sovereign wealth funds. The expression R&D spending is only used when describing research which has used that specific expression.

## 1.2. Background

In December 2016, Swedish institutional investors held 27.8% of the listed shares in Sweden (SCB, 2016) and yet another 39.4% were held by foreign investors (of which a lion's share are institutional). As institutional investors through their ownership have significant power over many of Sweden's largest firms, it becomes of interest to investigate how this heavy presence of institutional investors affects the decisions made in Swedish listed firms. Firms play a pivotal part in the economy; as customers, suppliers, and employers, and thus it is important to

understand how their decisions are affected by what type of owners they have. Discussion has taken place about how institutional ownership affects corporate decisions regarding long-term projects and if a large fraction of institutional ownership eventually leads to an increase in myopic decisions. The CEO of one of Sweden's largest firms, Karl-Johan Persson at Hennes & Mauritz, expressed his concerns in an interview:

"Quarterly capitalism is a part of the job. I choose not to be affected by it that much. Of course I sometimes feel that headlines are set through a short-sighted view on businesses. That view is very unhealthy. I believe there is a risk that some firms are dragged into the short-sightedness." (Chef, 2012)

Sweden has a long history of innovation and in the European Commission's Innovation Union Scoreboard 2016, Sweden was ranked highest among all countries in the European Union (EU), with innovation performance of more than 20 percentage points above the EU average. In Sweden, the private sector has been an important contributor to innovation with 47% of the 100 most important Swedish innovations (Sandström, 2014).

Hill et al. (1988) claim that one reason for why U.S. firms lost market shares during the 1970s was the lack of investments in innovation. Furthermore, they claim that product and process innovation was the driving force behind growth and profitability, and without sufficient investments in innovation, firms fail to compete. Hill et al. (1988) find that innovation is directly connected to R&D expenditures, and that R&D expenditures are an important determinant for productivity growth. Thus, the R&D intensity in firms becomes important to consider when examining the competitiveness of a country.

Further, Kahle and Stultz (2016) find that since 1975, the relative importance of R&D has increased significantly in the U.S., at the expense of capital expenditures. They also highlight that in 1975, the average public corporation's capital expenditures were seven times the average level of R&D spending. Thereafter the situation has changed dramatically, and as of 2015, R&D spending trumps capital expenditures. Wahal and McConnell (2000) conduct their study with U.S. data from 1988–1994, and Brossard et al. (2013) underline that results from this period could have been driven by the high frequency of corporate takeovers and the R&D boom in the U.S. during the 1980–1990s.

Porter (1992) highlights that while U.S. institutional investors held a large fraction of the U.S. stock market during the beginning of the 1990s, it was still rare to see any institutional investor in the corporate board. The same is to an extent true in Sweden, but during the recent years, Swedish institutional investors have become more actively engaged in governing their portfolio firms, for example by taking a seat in the nomination committees (Affärsvärlden, 2017). The current concept of nomination committees in Sweden differs from that prevailing in the U.S. during the early 1990s. While the nomination committee is appointed by the shareholders in Sweden, the U.S. counterpart was more of a subcommittee of the board of directors (Lekvall, 2008). It is therefore possible that Swedish institutional investors today, to a larger extent, are engaged in the governing of firms than their U.S. counterparts from the early 1990s.

Ciftci and Cready (2011) find a positive relationship between R&D intensity and future earnings, and that the effect is more evident with larger firms. Firm value is also shown to have a positive relationship with R&D expenditures (Chauvin and Hirschey, 1993). Research also shows that increases in R&D expenditures have a positive effect on long-term operating performance in firms (Eberhart et al. 2004). However, Bushee (1998) mentions that temporary cutbacks on R&D could be a way to increase the short-term performance of the firm, suggesting that there might be a short-term argument for reductions in R&D expenditures.

As R&D seems to have become increasingly important, while research indicates a positive relationship between firm value and R&D expenditures, we find it even more interesting to investigate how institutional ownership affects the R&D intensity. With the differences between the U.S. during the 1980–1990s and Sweden in present day, it would interesting to extend the analysis of Wahal and McConnell (2000) to a modern Swedish context.

### 1.3. Accounting treatment of R&D

The reason for setting the sample period from 2002 to 2016 is that we want to limit the sample to firms with similar accounting treatment of R&D, which is true for Swedish listed firms from 2002 to 2016. During the recent decades, an increased phase of internationalisation has been seen. This has also influenced the accounting principles since a greater need for international comparability has emerged. Consequently, the European Commission started to cooperate with the International Accounting Standards Committee (IASC), the precursor of the International Accounting Standards Board (IASB), which later resulted in harmonisation of the accounting

standards for listed firms within the EU (Johansson et al., 2013). The International Financial Reporting Standards (IFRS), issued by the IASB, were effective in the EU from 2005, and apply to the consolidated accounts of all firms whose securities are traded on any regulated exchange within the EU.

Before IFRS were effective in 2005, Redovisningsrådets Rekommendationer 15 (RR15) were applicable in Sweden from 1 January 2002. RR15 were fully conformed to IAS 38, which state the accounting treatment for intangible assets in IFRS, with some minor exceptions. The prescribed accounting method in RR15 is a combination of asset recognition of development expenditures and immediate expensing of research expenditures. In RR15, firms were obligated to recognize development expenditures as assets, given that the translated recognition criteria from IAS 38 were met. Before RR15 were effective, the recommendation of Bokföringsnämnden, BFN R1, as well as Årsredovisningslagen (1995:1554), provided the accounting principles regarding R&D for Swedish listed firms. These accounting principles generally were more discretionary as they allowed firms to expense development expenditures immediately, but this discretionary freedom was removed in RR15.

The accounting treatment for intangible assets, which R&D is classified as, is outlined in IAS 38 Intangible Assets. In order to identify an intangible asset, the asset needs to be an identifiable non-monetary asset without physical substance. The IAS 38 states that no research should be recognised as assets and all expenditures on related research projects should be expensed during the period in which it occurs. Regarding development expenditures, IAS 38 states that there are some criteria that need to be met in order to recognise the development expenditures as assets. The criteria can be observed in appendix exhibit 1.

When development expenditures are recognised as assets, assets with a finite useful life are required to be amortised on a systematic basis over their useful lives, meaning the period in which economic benefits arise from the assets. If this period cannot be determined with reliability, the straight-line depreciation method is required. For assets with indefinite useful life, no amortisation should be performed, but the firm is required to review this decision on a yearly basis.

### 1.4. Contributions

This study contributes because there has, to the best of our knowledge, not been a study conducted within this field of research on solely Swedish data. This study sheds light on the effects of institutional ownership in Sweden, which earlier have been explained to have differences compared to the U.S. Segelod (2000) claims that managers in Sweden feel less pressure from the stock market than their U.S. counterparts, providing empirical evidence that myopic influence by institutional investors could have a lower effect in Sweden than in the U.S. Furthermore, the U.S. stock market mostly consists of firms with a dispersed ownership structure, contrary to Sweden with its large presence of controlling owners (Lekvall, 2008).

In regards to Wahal and McConnell (2000), this study contributes since their data are from 1988–1994. We thus provide more modern empirical results, not possibly affected by the corporate takeovers and R&D boom in the U.S. during the 1980–1990s. It is not possible to today conclude with assertiveness in which way institutional ownership affects R&D intensity. Most previous research is although leaning towards a positive effect, contrary to the widely spread notion that institutional investors are causing myopia. New studies are thus important to provide further empirical evidence on the matter. Thus, another contribution is that this study adds to the empirical research in this field and thus it helps disentangle the effect of institutional ownership on R&D intensity.

### 1.5. Delimitations

There are numerous interesting questions this study does not address. This study uses the expression R&D intensity interchangeably with R&D-to-Sales, measured as R&D expenditures divided by sales, and thus it is important to note that the study does not address any other metrics which could serve as measures of R&D intensity, such as number of patents. Patents could be interesting to study as they are more qualitative measures of the productivity of R&D. However, as R&D expenditures are easily accessible through databases, while it is more time consuming to collect data regarding patents, we use R&D-to-Sales as our measure of R&D intensity.

Even though earlier research indicates that there is a strong relationship between R&D intensity and innovation, it is outside of our scope to look at the productivity of the R&D. We only measure R&D intensity through the firms' R&D expenditures, not what the expenditures result

in. It is also outside the scope of this study to examine the relationship between private firms' R&D intensity and the competitiveness of Sweden.

In Sweden it is common for listed firms to have different classes of shares, that is A-shares, B-shares, C-shares, and so forth, which typically have different number of votes tied to them. Of these different share classes, only one might be listed or all of them could be listed. To avoid any possible problems with share classes, this study uses the total ownership of capital in a firm. However, it is the actual share of votes that determines the power to influence. Thus, it could be interesting to examine share of votes, but due to data availability and time limitation, we examine the share of capital in this study.

The sample of firms in this study is limited to Sweden. Thus, any conclusions drawn on the effects of institutional ownership on R&D intensity is limited to Sweden. The sample of institutional investors on the other hand is not limited to a single country. This study also does not intend to explain through which methods institutional investors affect R&D intensity, it simply concludes if there is a relationship between the two variables. There are several, direct as well as indirect, methods in which an institutional investor might exercise influence, but these methods are not to be investigated.

### 1.6 Findings

With our sample of 111 Swedish listed firms during 2002–2016, we find that institutional investors in general have a statistically significant negative effect on the R&D intensity in their portfolio firms. These results are contrary to the results of Wahal and McConnell (2000). When dividing the institutional investors into tertiles based on their portfolio turnover, we find further evidence for institutional investors discouraging R&D intensity in their portfolio firms. The results hold up for a robustness test where R&D-to-Assets is used instead of R&D-to-Sales.

The study continues with going through the previous literature in this field. Afterwards we pedagogically explain the two conflicting hypotheses why some believe that institutional investors encourage investments in R&D, while others believe the opposite. Then we introduce our method and explain each step of the process. Following the method, we go through the data we have used. Then the results are listed in a structured way, alongside a thorough discussion

about the results. Lastly we have the conclusion part, where we discuss what our contributions are and what areas could be interesting for further research.

# 2. Previous research and theoretical framework

## 2.1 Previous research

Jarrell et al. (1985) acted as pioneers when releasing their study of how the institutional ownership in corporate equity affected the degree of R&D investments in listed firms. With 324 firms from different industries, which they examined during 1980 to 1983, they dismissed the notion that institutional ownership caused managerial myopia. Instead they found evidence that there was a positive relationship between institutional ownership and R&D expenditures, but they could not with certainty establish causality in institutional ownership leading to higher R&D expenditures, or if institutional investors simply invest in R&D intensive firms. This would suggest that institutional investors could encourage long-term investments in R&D, at least it seemed that institutional investors were not deterred from investing in R&D intensive firms. However, this study has been criticised for not including any control variables (Hansen and Hill, 1991; Wahal and McConnell, 2000).

The research on the effects of institutional ownership on R&D intensity has primarily been conducted with data from the U.S. and the results have been somewhat conflicting. Some authors have concluded that institutional investors encourage myopic behaviour and that institutional investors mainly invest with a focus on short-term returns, which consequently leads to underinvestment in projects with long-term payoff, such as R&D (Graves, 1988; Jacobs, 1991; Porter, 1992). The reasoning behind this is argued to be the recurring performance reviews of institutional portfolio managers that impose pressure to yield high short-term returns, which prevent them from having long-term investment horizons. Graves (1988), Jacobs (1991) and Porter (1992) advanced the theory that institutional investors cause myopic behaviour in their portfolio firms and this research has later been used as a base for the widely spread notion that institutional investors have a damaging effect on investments in projects with long-term payoff (Brossard et al., 2013).

Graves (1988) specifically studies the relationship between institutional ownership and investments in R&D and finds a negative relationship. However, Graves (1988) has received some criticism for using a small sample of firms from one single industry (Hansen and Hill, 1991; Wahal and McConnell, 2000). Graves (1990) conducts another study with a sample of 133 firms from six different industries between 1965 and 1984 and he does not find empirical evidence supporting the view that institutional ownership leads to a lower level of R&D expenditures. Another study by Parthiban et al. (2001) finds that institutional ownership do not affect R&D spending on its own, but rather that activism by institutional investors have a positive impact on R&D inputs.

Other research has found evidence which suggests that institutional investors encourage R&D intensity through their monitoring capabilities and influence on management (Hansen and Hill, 1991; Kochhar and David, 1996; Aghion et al., 2013; Brossard et al. 2013). The data from these studies are from different time periods, and Brossard et al. (2013) study European data. Brossard et al. (2013) find no evidence for institutional investors preferring to invest in already R&D intensive firms, rather they encourage R&D intensity through their influence on management. There are also some empirical findings that announcements of R&D projects have been shown to generate abnormal returns (Jones and Danbolt, 2003), which also would suggest that institutional investors could encourage R&D investments, albeit for short-term reasons.

Aghion et al. (2013) show that institutional investors have a positive, but small, impact on investments in R&D, and find no support for a selection mechanism where institutional investors simply invest in R&D intensive firms. Furthermore, they claim that there are two reasons why institutional investors might encourage investments in R&D, with the first one being managerial slack, defined as managers preferring not to work harder than necessary. The other one is that investing in R&D carries a greater risk for managers as the payoff of the project is risky, and managers' pay is often linked to their employers' performance. It is not possible for managers to diversify idiosyncratic, that is firm-specific, risk. As a consequence of their diversification capabilities, institutional investors are not as exposed to idiosyncratic risk. Thus, they might influence managers to invest in R&D.

Studies have also made distinctions between different institutional investors. Bushee (1998) finds that in general, managers were less likely to cut R&D in order to meet an earnings target if the firms had a large fraction of institutional ownership. However, for firms with a large

fraction of ownership by institutional investors with a high portfolio turnover, there was evidence for increased earnings management through cutting R&D. Brossard et al. (2013) find evidence of "impatient" institutional investors having a negative impact on R&D expenditures.

### 2.1.1 Wahal and McConnell (2000)

This study replicates the study *Do institutional investors exacerbate managerial myopia?* written by Sunil Wahal and John J. McConnell, and published in 2000. The methodology of our study is based on the method of the reference study, although some deviations are made.

Wahal and McConnell (2000) use a sample of more than 2,500 listed U.S. firms for the years 1988–1994, rendering more than 17,500 firm-year observations, to examine the relationship between institutional ownership and property, plant and equipment (PP&E) and R&D expenditures. They see problems with studies conducted before 2000 in this field using too small samples and failing to correct for endogeneity, thus they develop a new method for measuring this relationship. They first conduct two-stage least squares regressions, and find a positive relationship between institutional ownership and PP&E and R&D expenditures. Then they make change regressions using fixed effects, where they do not find any evidence of institutional investors encouraging short-term behaviour in their portfolio firms. The change regressions rather indicate that there is a positive relationship between changes in institutional ownership and PP&E and R&D expenditures. Furthermore, they divide institutional investors into quintiles based on portfolio turnover, and then conduct change, as well as level, regressions to examine the relationship between different types of institutional investors and PP&E and R&D expenditures in firms. The reason they do not use the two-stage least squares approach for this part is because they cannot come up with any suitable instrumental variables. They find a positive relationship between the institutional investors with the highest level of portfolio turnover and both PP&E and R&D expenditures.

## 2.2. The effect of R&D on valuation and earnings management

Recent studies based on surveys of practitioners within the field of valuation, found that most used Discounted Cash Flow (DCF) and Relative Valuation (RV) models for valuation of firms (Imam et al., 2008; Bancel and Mittoo, 2014). A DCF model is a model used for estimating the future cash flows of a firm and then discounting them to today's value, to be able to estimate

the intrinsic value of the firm. By increasing the R&D expenses today, a firm is hoping to increase its future discounted cash flows, which would warrant a higher valuation today. The RV models are instead a way of measuring the value of a firm by comparing financial metrics. Graham et al. (2005) indicate that earnings per share (EPS) is the key financial metric which investors focus on. With the RV models, current lower earnings from R&D expenses could lead to a drop in the firm's value, given the same Price-to-Earnings multiple.

In a survey of 401 financial executives in firms, about 80% of respondents stated that they would consider reducing discretionary spending, such as R&D, in order to meet an earnings target (Graham et al., 2005). In the same survey, about 55% of financial executives revealed that they would delay the start of a new project in order to meet an earnings target, regardless if the project is creating value for the firm or not. Graham et al. (2005) highlight the importance of these findings as managers appear to be willing to sacrifice future cash flows in order to meet the desired accounting figures in the current year. However, Bushee (1998) finds that when institutional ownership is high, managers are less likely to cut R&D in order to reverse an earnings decline. In tandem, Bushee (1998) finds evidence that a high level of institutional investors with high portfolio turnover actually increase the possibility that a manager would reduce R&D expenditures in order to meet an earnings decline. These results suggest that managers are willing to manipulate their earnings in order to satisfy institutional investors with shorter investment horizons. Graham et al. (2005) also find that financial executives prefer to manage their earnings by engaging in real activities manipulation, such as a reduction of R&D expenditures, to accruals manipulation. Dechow and Skinner (2000) describe accruals manipulation as when managers boost the accounting figures as much as possible within the accepted accounting principles.

### 2.3. Theoretical framework

There are two conflicting theories which could explain either a negative or a positive association between institutional ownership and R&D intensity. We use the term *Myopic theory* for the theory that suggests a negative association, and the term *Monitoring theory* for the theory that suggests a positive association.

### 2.3.1. Myopic theory

During the 1990s, several papers suggested that institutional investors had an excessive focus on short-term earnings and short-term fluctuations in the share price, which came at the expense of the long-term value of the firm (Jacobs, 1991; Porter, 1992; Laverty, 1996). These papers also claim that the short-term earnings focus of institutional investors leads to managerial decisions with the aim of boosting the short-term accounting figures. One reason for this is argued to be that the accounting principles generally require a firm to expense certain long-term investments immediately (Laverty, 1996). This creates a trade-off between the current reported earnings of the firm and long-term investments, such as R&D (Porter, 1992; Laverty, 1996).

Another suggested reason for why institutional investors are said to cause myopia is the pressure on the institutional portfolio managers to report high short-term returns (Porter, 1992). Furthermore, Jacobs (1991) and Porter (1992) support the view that institutional investors use current earnings as proxies for the value of firms and that they use these figures for their investment decisions, which they argue create a short-sighted focus. Porter (1992) provides two main arguments for why they use the earnings figures as proxies. The first reason is that institutional investors might lack access to firm-specific information required to value long-term investments, and therefore rely on the reported earnings of firms. The second possible explanation is that the stock market pressures institutional investors to be short-sighted in their investment horizons, thus they have little incentive to value any long-term projects in their held firms. Thus, value proxies such as the reported earnings figures are easier to interpret and use, which might lead to underinvestment in projects with long-term payoff (Porter, 1992). Lang and McNichols (1997) provide evidence that institutional investors make investment decisions in response to the reported earnings of firms, which consequently puts additional pressure on managers to focus on the earnings figures.

Bushee (2001) suggests that institutional investors with shorter investment horizons exhibit a strong preference for near-term earnings, rather than projects with a longer investment horizon, such as R&D. Myopic behaviour is suggested by Bushee (2001) to be expected if there is a competitive pressure and/or frequent performance evaluations of portfolio managers. This provide them with incentives to search for securities in firms which report strong near-term earnings.

### 2.3.2. Monitoring theory

The argument behind why institutional investors would encourage investments in R&D mainly lies in that institutional investors could improve the governance in firms through their monitoring capabilities. Plenty of studies have claimed that institutional investors encourage investments in R&D (Hansen and Hill, 1991; Kochhar and David, 1996; Aghion et al., 2013; Brossard et al., 2013). Sophisticated investors would understand that reductions in R&D actually could be harmful to the value of the firm. Rational firm managers should therefore understand that short-term cuts in R&D would not lead to an increase in the share price, if it reduces cash flows in the future.

One reason for why institutional ownership may encourage R&D investments could lie in the separation of ownership and control. While investors supposedly are interested in the maximisation of the firm value, the managers of the firm might have other incentives, creating potential agency conflicts (Jensen and Meckling, 1976). Plenty of research suggest that managers in general have an aversion against risky projects even though they might be value creating for the owners, because payoffs from R&D investments are uncertain and poor outcomes of the projects reflect negatively on the managers' performance (Laverty, 1996; David et al., 2001; Aghion et al., 2013).

David et al. (2001) suggest that the reason for why investment in R&D might be suboptimal from a management point of view is that managers are likely to enjoy larger personal benefits from short-term earnings, such as enhanced reputation and faster career advancements. Laverty (1996) mentions the view that investments in long-term projects, such as R&D, are not in line with the short-term goals of the firms' managers. If managers are sole decision makers, they might reject risky R&D projects (David et al., 2001). Since institutional investors hold diversified portfolios, they are able to absorb a loss from a certain project, but as managers to a larger extent are exposed to the individual project risk, they might reject investment opportunities and instead favour less risky projects (Parthiban et al., 1996; David et al., 2001). Historically, research also supports the view that the presence of large shareholders in a firm improves its corporate governance as they can reduce potential agency conflicts in which managers do not act in the best interest of the owners (Shleifer and Vishny, 1986). This would suggest that large institutional investors could improve the corporate governance in their portfolio firms.

Aghion et al. (2013) suggest that the presence of institutional investors can contribute with better monitoring of managers, thereby encouraging R&D investments and increasing the R&D intensity. A large fraction of institutional investors might be an effective monitoring device in order to encourage R&D investments. Further, Aghion et al. (2013) suggest that institutional investors can encourage R&D investments as it lies in their interest to invest in R&D projects with a positive net present value. Previous research also highlights that managers often underinvest in R&D, while institutional investors on the other hand exercise influence over managers to invest more in R&D (Hansen and Hill, 1991; Kochhar and David, 1996; Brossard et al., 2013).

# 3. Method

## 3.1. Methodology

This study is based on the methodology developed by Wahal and McConnell (2000). We regress the change in R&D-to-Sales from t-1 to t, on the change in fraction of institutional ownership from t-2 to t-1. We also regress the level of R&D-to-Sales in t, on the level of institutional ownership in t-1. Similarly to Wahal and McConnell (2000) we use fixed effects because our use of panel data. We use fixed effects for firm and year. R&D-to-Sales is our dependent variable, and fraction of institutional ownership is our main independent variable. We use the independent variables total leverage ratio, operating income, Tobin's Q and strategic ownership, of which all are used by Wahal and McConnell (2000) except strategic ownership. We leave out insider ownership used by Wahal and McConnell (2000), because we lack reliable data.

The main reason for why it is interesting to conduct a change regression is that it is able to solve the endogeneity problem of a level regression, where it otherwise is difficult to distinguish whether institutional investors have any effect on decisions regarding R&D investments, or if they simply invest in firms with a higher or lower R&D intensity. The change regression can therefore help to provide a causal relationship between institutional ownership and R&D intensity. On the other hand, a concern with the change regression is that a large change in institutional ownership does not per se result in any change in influence over the firm, while a high level of institutional ownership with certainty gives a high degree of influence. If total

institutional ownership increases from 0% to 5% in a specific year, a rather large increase, it is still unlikely that these investors have any significant influence over the firm's R&D intensity.

We deviate from Wahal and McConnell (2000) in some regards. We do not make regressions with PP&E-to-Sales as a dependent variable, we solely focus on the R&D-to-Sales regressions. Due to our time constraint, we have chosen to only focus on one dependent variable, and as Kahle and Stultz (2016) show that R&D has become increasingly important relative to capital expenditures, we view R&D as the more interesting measure to study. We do not conduct any two-stage least squares regressions, because the time constraint leads us to focus on a few specific regressions.

The data for both change and level regressions are from 2002 to 2016, where the change data start on changes from 2002 to 2003, and the first firm-year observations thus are reported as from 2003 in the change data. This interval is chosen due to the fact that the accounting principles in use for these years are alike, and earlier data could have distorted our results due to the use of other accounting principles. Our sample of firms includes the historical constituents of OMX Stockholm All-share (OMXSPI) during our sample period, meaning that all historical firms in the index are considered. With this method, we also consider firms that have been delisted during our sample period, meaning we avoid possible survivorship bias among our sample firms.

In the sample construction, Wahal and McConnell (2000) exclude financial firms because their primary source, Compustat, did not report R&D expenditures for these firms. We also leave out financial firms. Similar to Eberhart et al. (2004) we want to narrow our focus to economically significant levels of R&D-to-Sales. Consequently, we choose to only include firms with a reported R&D-to-Sales ratio of 1% or higher at least one of the years in our sample period. Furthermore, if the firm is qualified, it is included in all years it has reported R&D expenditures, even if the R&D-to-Sales goes below 1%. The reason for also including firm-year observations when the observed R&D-to-Sales goes below 1% is that the change regressions need data for two consecutive years.

Wahal and McConnell (2000) break down institutional investors into quintiles with regards to portfolio turnover. We instead divide institutional investors into tertiles. The argument for this division is that we avoid the somewhat ambiguous quintiles two and four, which results would

be difficult to interpret. When dividing into tertiles, we end up with results that are easier to interpret as we only have three groups of institutional investors, one for the investors with the lowest portfolio turnover, one with medium portfolio turnover, and one with the highest portfolio turnover. If we had divided the investors into quintiles, quintiles two and four would be interpreted as investors with a relatively high (low) portfolio turnover.

Our data for institutional investors' portfolio turnover are based on the reported portfolio turnover provided by Thomson Reuters Eikon, whereas Wahal and McConnell (2000) use year-by-year data for portfolio turnover. Wahal and McConnell (2000) define institutional investors as those with investment discretion over $100 million in equity securities, as those institutional investors are required to report their holdings according to Section 13F of the Securities and Exchange Act (Rule 13F-1) with the Securities and Exchange Commission (SEC). With this data, Wahal and McConnell (2000) calculate the portfolio turnover for each institutional investor for each year, based on the figures during the fourth quarter. As the Swedish equivalent of the SEC, Finansinspektionen, no longer reports data for institutional investors' holdings in Sweden, it is not viable to conduct the analysis with the same methodology using Swedish data (Finansinspektionen, 2017). The reason Finansinspektionen no longer reports these numbers is because the numbers could not be validated, and thus we deviate from Wahal and McConnell (2000) to secure the validity of the data.

We instead use the portfolio turnover data provided by Thomson Reuters Eikon in this study. As Thomson Reuters Eikon do not report any historical figures for institutional portfolio turnover, we only use the latest reported portfolio turnover which was displayed when we collected the data in March 2017. As a consequence, our study do not capture any eventual changes in trading strategies for each individual institutional investor. The assumption that institutional investors have had the same portfolio turnover during each of the sample years is thus needed. This could possibly distort our results as an institutional investor which historically has had a relatively high (low) turnover, falsely could be categorised as an institutional investor with relatively low (high) portfolio turnover, if that institutional investor has changed its portfolio turnover during recent years. With the use of tertiles, instead of quintiles, this problem is somewhat mitigated, as only investors with significant changes in portfolio turnover or investors that are borderline cases for a tertile, are affected.

In order to construct the sample of institutional investors, we look at the annual holding data for each of our sample firms at the end of each year and we initially include all investors that Thomson Reuters Eikon classifies as institutional investors. Institutional investors consist of: brokerage firms, investment advisors, pension funds, insurance companies, hedge funds, banks, trusts, research firms, foundations, private equity, and sovereign wealth funds. We exclude all institutional investors that have not been one of the top 20 owners in terms of capital in any of our sample firms. They are only qualified in the years they are one of the top 20 owners. All qualified institutional investors are included in our sample, given that data for portfolio turnover exist in Thomson Reuters Eikon. The data for portfolio turnover are missing for some existing institutional investors, as well as for the institutional investors which are inactive today. As a result, there is a degree of survivorship bias in the sample of institutional investors. In the first year of our sample, we have portfolio turnover data for about 75% of institutional investors on average, whereas in the last year of our sample, the corresponding figure is about 94%. It could be that institutional investors with a certain type of investment strategy are more likely to cease to exist in our sample, which would bias our results.

The reasons for choosing top 20 owners are threefold. Firstly, the study aims to measure the effect institutional investors have on R&D intensity, and too small owners are not probable to have an impact on the actual business of the firm. This is in line with our choice to only include firms with an economically significant level of R&D-to-Sales; whereas for institutional investors we only want to include investors with an "economically significant" possibility to affect a firm's decisions. Secondly, when including all of a firm's institutional investors, the data become too unreliable for small institutional investors and distorts the division into tertiles based on the institutional investors' portfolio turnover data. Thirdly, the tertile division is based on the number of institutional investors, which means that if an institutional investor only holds a small share of one of the sample firm, the total aggregated ownership of that investor's tertile could be dispersed.

With the data for portfolio turnover, we divide our sample of institutional investors into tertiles. We repeat this exercise each year so that we for every investigated year have a tertile division based on investors that actually qualified into our sample that specific year. If an investor only were one of the top 20 owners in one of our sample firms during one specific year, the owner is only included in a tertile during that specific year. Therefore, as the division into tertiles are made relative to the other investors that are present in our sample during a specific year, the

cut-off limits for each tertile changes every year. As the cut-off limits are changing, an institutional investor that is classified as a medium turnover institution in a specific year might be classified as a low turnover institution in another year, depending on the composition of investors during that specific year. In table 1 one can observe cut-off portfolio turnover for each tertile and year.

Table 1

Cut-off limits for portfolio turnover tertiles

Nota bene: There is no maximum (minimum) cut-off limit for the highest (lowest) turnover tertile, as it by definition does not have any upper (lower) cut-off limit

| | Highest turnover tertile | Medium turnover tertile | | Lowest turnover tertile |
|---|---|---|---|---|
| Year | Min. | Max. | Min. | Max. |
| 2001 | 45.49% | 45.37% | 28.13% | 27.45% |
| 2002 | 44.49% | 44.24% | 27.45% | 27.13% |
| 2003 | 48.07% | 47.29% | 28.63% | 28.50% |
| 2004 | 48.07% | 46.29% | 28.21% | 28.19% |
| 2005 | 46.91% | 46.29% | 28.91% | 28.71% |
| 2006 | 42.52% | 42.39% | 27.16% | 27.13% |
| 2007 | 42.39% | 41.86% | 26.52% | 26.40% |
| 2008 | 45.14% | 43.16% | 26.52% | 26.50% |
| 2009 | 41.86% | 41.77% | 26.27% | 25.34% |
| 2010 | 40.53% | 40.26% | 26.27% | 25.34% |
| 2011 | 41.56% | 41.00% | 26.32% | 26.28% |
| 2012 | 38.90% | 38.63% | 24.72% | 24.42% |
| 2013 | 39.54% | 39.06% | 23.98% | 23.96% |
| 2014 | 39.69% | 39.62% | 24.72% | 24.68% |
| 2015 | 40.64% | 40.53% | 24.98% | 24.92% |

### 3.2. Variables

For the R&D intensity variable, the change from t-1 to t is used in the change regressions, and in the level regressions the level from t is used. For all other variables, the change from t-2 to t-1 is used in the change regressions, while the level from t-1 is used in the level regressions. The time lag is used as institutional investors cannot influence decisions made in the past.

*R&D intensity (R&D expenditures/Total sales)*

In order to determine the R&D intensity in each firm, the R&D-to-Sales metric is a common key ratio, and also used by Wahal and McConnell (2000). The benefits of using R&D-to-Sales are that it factors out the effects of inflation, which other measures such as R&D per employee or absolute number encounters (Hansen and Hill, 1991). It also eases the comparison between firms of different sizes.

*Total leverage ratio (Total debt/Total assets)*

Debt may affect R&D expenditures positively or negatively. Reich (1989) claims that highly levered firms might be more willing to reduce their long-term investments, such as R&D, in order to service their debt. However, there is also a possibility that debt could be used in order to fund R&D projects, but earlier research indicates that debt is not a preferred source of funding for R&D.

Hall and Lerner (2010) show that large firms appear to prefer internally generated funds in order to fund R&D projects. Giudici and Paleari (2000) highlight that traditional financial sources, such as debt, are inadequate to finance innovation, and that small technology-based firms financing preferences are consistent with the pecking order theory, meaning a preference for internally generated funds over debt, and debt over equity funding. Madrid-Guijarro et al. (2009) suggest that when a firm increases its leverage, the innovation activities decrease. Our expectation is therefore a negative relationship between total leverage ratio and R&D intensity, both for the change regressions and the level regressions. The total leverage ratio is used as a control variable in Wahal and McConnell (2000).

*Operating income (Operating income/Total assets)*

Wahal and McConnell (2000) use the control variable operating income, which is used as a proxy for the internal availability of funds. With high operating profits, firms are believed to

generate more cash internally. This is believed to have a positive effect on R&D-to-Sales, as using internally generated funds for investments are "cheaper" than using external funds according to the pecking order theory, first mentioned by Donaldson (1961) and later modified and popularised by Myers and Majluf (1984). The pecking order theory suggests that the reason for why internal funds are preferred is that an issue of equity would signal that the equity is overvalued, due to asymmetric information where management have superior knowledge of the firm's "real" value. The same is true for debt issuance, although the overvaluation signal is smaller for debt than for equity, since the value of debt is less sensitive to the value of the firm. Therefore, we expect a positive relationship between operating income and R&D intensity, both for the change and the level regressions.

*Tobin's Q ([Market value of equity + Book value of debt]/Book value of total capital)*

In order to control for the differences in growth opportunities across our sample of firms we include the Tobin's Q variable that is used by Wahal and McConnell (2000), although denoted as the Market-to-Book ratio. The ratio is calculated as the sum of market value of equity and book value of debt, divided by the book value of total capital at year-end. If the ratio is below (above) 100% for a specific firm, the cost of replacing the assets is higher (lower) than the value of its shares. This measure is expected to have a positive correlation with changes in and level of R&D-to-Sales, since a firm with a high Tobin's Q is expected by the market to grow. The definition of Tobin's Q includes market value of debt, but we make the assumption that the market value of debt is equal to the book value of debt.

*Total institutional ownership and tertiles of institutional ownership*

Firstly, we create a variable based on the total institutional ownership in our sample firms. We expect a positive relationship between total institutional ownership and R&D intensity, in accordance with most previous research. Thereafter, different institutional investors have different investment horizons, and to capture this effect, the fraction of institutional investors is replaced by three different tertiles of investors. Regarding the tertiles, we expect a positive relationship for the low portfolio turnover tertile, a lower coefficient on the medium portfolio turnover tertile, and an even lower or possibly negative coefficient on the highest portfolio turnover tertile. We expect no differences in signs between the change and level regressions.

*Strategic ownership (Number of shares held by strategic owners/Total shares)*

In addition to the control variables that Wahal and McConnell (2000) use, we have added a variable called strategic ownership, suggested by Brossard et al. (2013), which consists of families, corporations and government agencies. As strategic owners in general are not engaged in portfolio diversification, Brossard et al. (2013) suggest that they might be more risk-averse regarding long-term investment decisions, such as R&D, than institutional investors. The reason this variable is interesting to our study, is because Brossard et al. (2013) state that strategic ownership is more important in Europe than in the U.S. We expect to see a negative relationship between strategic ownership and R&D intensity.

### 3.3. Final models

The variables included in the final models and their abbreviations used in some of the tables, are observed in exhibit 1.

Exhibit 1

Variable names, abbreviations and computations

| Name | Abbreviation | Computation |
|---|---|---|
| Industry-adjusted R&D intensity | RDtoSales | R&D expenditures/Total sales |
| Strategic ownership | StratOwn | Number of shares held by strategic owners/Total shares |
| Total leverage ratio | Leverage | Total debt/Total assets |
| Operating income | OpInc | Operating income/Total assets |
| Tobin's Q | TobinsQ | (Market value of equity + Book value of debt)/Book value of total capital |
| Total institutional ownership | InstOwn | Number of shares held by institutional investors/Total shares |
| Lowest portfolio turnover tertile | Low | Number of shares held by tertile/Total shares |
| Medium portfolio turnover tertile | Medium | Number of shares held by tertile/Total shares |
| Highest portfolio turnover tertile | High | Number of shares held by tertile/Total shares |

The final models for the change regressions are ($\alpha$ is the intercept, $\beta_k$ is the regression coefficient, $u_{it}$ is the error term):

$$\Delta RDtoSales_{it} = \alpha + \beta_1 \Delta StratOwn_{it-1} + \beta_2 \Delta Leverage_{it-1} + \beta_3 \Delta OpInc_{it-1} + \beta_4 \Delta TobinsQ_{it-1} + \beta_5 \Delta InstOwn_{it-1} + Firm\ FE + Year\ FE + u_{it}$$

$$\Delta RDtoSales_{it} = \alpha + \beta_1 \Delta StratOwn_{it-1} + \beta_2 \Delta Leverage_{it-1} + \beta_3 \Delta OpInc_{it-1} + \beta_4 \Delta TobinsQ_{it-1} + \beta_5 \Delta Low_{it-1} + \beta_6 \Delta Medium_{it-1} + \beta_7 \Delta High_{it-1} + \text{Firm FE} + \text{Year FE} + u_{it}$$

The final models for the level regressions are ($\alpha$ is the intercept, $\beta_k$ is the regression coefficient, $u_{it}$ is the error term):

$$RDtoSales_{it} = \alpha + \beta_1 StratOwn_{it-1} + \beta_2 Leverage_{it-1} + \beta_3 OpInc_{it-1} + \beta_4 TobinsQ_{it-1} + \beta_5 InstOwn_{it-1} + \text{Firm FE} + \text{Year FE} + u_{it}$$

$$RDtoSales_{it} = \alpha + \beta_1 StratOwn_{it-1} + \beta_2 Leverage_{it-1} + \beta_3 OpInc_{it-1} + \beta_4 TobinsQ_{it-1} + \beta_5 Low_{it-1} + \beta_6 Medium_{it-1} + \beta_7 High_{it-1} + \text{Firm FE} + \text{Year FE} + u_{it}$$

### 3.4. Data and construction of sample

To construct our variables, data for R&D expenditures, sales, operating income, market capitalization, debt, and assets are collected from FactSet. For the data, we use the definition of R&D expenditures used by FactSet, which can be found in appendix exhibit 2. The annual report data are calendarised, meaning that firms with a broken fiscal year have had their data adjusted to the end of each year. Market capitalisation is also collected at the end of each year. Data for institutional ownership and strategic ownership are collected from Thomson Reuters Eikon, also from the end of the year.

After collecting the data for R&D expenditures and sales for each year, we calculate the R&D-to-Sales for each firm included in the OMX Stockholm All-share (OMXSPI) during that specific year. In our analysis we include all firms that for a specific year had a calculated R&D-to-Sales above 1%. If the same firm then has an R&D-to-Sales figure below 1% any other year of our sample period, we still include that firm-year observation in our sample. After calculating the R&D-to-Sales figure, we adjust for industry specific factors by subtracting the industry median figure of R&D-to-Sales from the firm-specific figure, with the same methodology as Wahal and McConnell (2000), where the industries are defined by Global Industry Classification Standard (GICS) sectors. The industry median can be observed in table 2.

Table 2
Industry median R&D-to-Sales

| | Consumer Disc. | Consumer Staples | Health Care | Industrials | Info. Tech. | Materials | Telecom. Services | Utilities |
|---|---|---|---|---|---|---|---|---|
| 2002 | 1.61% | 0.72% | 16.37% | 2.64% | 19.95% | 1.00% | 10.07% | 11.72% |
| 2003 | 1.07% | 0.71% | 17.81% | 2.48% | 16.14% | 1.00% | 6.30% | 12.06% |
| 2004 | 1.60% | 0.64% | 18.20% | 2.37% | 11.70% | 1.00% | 7.56% | 13.08% |
| 2005 | 1.46% | 0.57% | 14.96% | 2.23% | 11.12% | 0.97% | 3.02% | 11.75% |
| 2006 | 1.77% | 0.55% | 16.76% | 2.19% | 12.22% | 0.61% | 2.82% | 20.76% |
| 2007 | 2.38% | 0.56% | 27.26% | 2.21% | 10.46% | 0.97% | 1.64% | 19.54% |
| 2008 | 2.36% | 0.55% | 38.86% | 2.17% | 10.78% | 1.21% | 1.09% | 12.32% |
| 2009 | 2.11% | 0.82% | 38.36% | 2.62% | 10.82% | 0.79% | 0.86% | 1.82% |
| 2010 | 2.19% | 0.65% | 23.26% | 2.52% | 10.31% | 0.63% | 0.71% | 2.39% |
| 2011 | 2.61% | 1.02% | 18.16% | 2.41% | 10.09% | 0.69% | 0.46% | 3.00% |
| 2012 | 2.40% | 0.99% | 16.56% | 2.54% | 10.32% | 0.84% | 0.33% | 2.77% |
| 2013 | 2.62% | 1.12% | 16.53% | 2.59% | 12.05% | 1.18% | 0.28% | 3.13% |
| 2014 | 3.39% | 1.01% | 10.21% | 2.71% | 11.68% | 0.61% | 0.22% | 2.50% |
| 2015 | 3.73% | 0.95% | 12.96% | 2.97% | 8.83% | 0.49% | 0.14% | 2.05% |
| 2016 | 8.70% | | 13.44% | 3.05% | 12.50% | 1.31% | | |

Before further adjustments, the sample consists of 129 firms in the change data for industry-adjusted R&D-to-Sales, and 132 firms in the level data, with a total 1,110 firm-year observations for the change data and 1,258 firm-year observations for the level data. The reason for why there are more firms and firm-year observations in the level data is that while we have level data for each year, we only have change data if a firm reports R&D for two consecutive years.

We extract the ownership data from the historical holding list of each sample firm, provided by Thomson Reuters Eikon. The ownership data are downloaded to Excel sheets for each firm in our sample, with the firm's top 20 owners in terms of capital. Then we have created a separate Excel sheet where we have compiled the institutional investors and deleted all duplicates, rendering 223-298 unique institutional investors per year (see table 3). From this list, we then extract the data for portfolio turnover for each institutional investor. These data are collected from Thomson Reuters Eikon in March 2017, and are from a single point in time, because Thomson Reuters Eikon do not report historical portfolio turnover. Then we divide them into tertiles in terms of number of investors for each year. We divide the investors into three categories: low, medium and high portfolio turnover. Regarding the variable for strategic

ownership we have included the strategic owners of each firm according to the data provided by Thomson Reuters Eikon.

All other variables are constructed with the data provided by FactSet, and if data for any variable are missing, we drop that specific firm-year observation. Like Wahal and McConnell (2000), we also drop observations for financial firms. For the change data, we then have a total number of 997 firm-year observations, while the level data consist of 1,129 firm-year observations.

Further, we make one adjustment to the data. We drop all observations with a higher industry-adjusted change in R&D-to-Sales than 100 percentage points, both negative and positive, in the change data, and all observations with an industry-adjusted R&D-to-Sales level of more than 100 percent, in the level data. We do this because some of the observations have such high R&D-to-Sales numbers that it distorts our results. As some sample firms do not report an economically significant sales figure, the R&D-to-Sales ratio could become absurd. As an example, Mateon Therapeutics in 2005 had an industry adjusted R&D-to-Sales level of 709,741.69%. In appendix table 1 and 2 regressions for both change and level data can be observed without the adjustments for outliers.

After adjustments, the final data sample consists of 108 firms with 950 firm-year observations for the change data, and 111 firms with 1,073 firm-year observations for the level data.

### 3.5. Justification of method

A study of the effects of institutional ownership on R&D intensity in firms could have been conducted in several ways. It could have been done as a qualitative study, where focus would have been directed towards interviews or surveys directed to the different institutional investors to capture their view of the R&D intensity in firms. This would have resulted in in-depth results from the mind-set of the investors, and how they act as owners. However, it is unlikely that all investors would give honest answers on questions regarding imposed myopia, as short-termism is rather controversial. Interviews or surveys could also have been directed towards the managers of sample firms, to get insights into how they make decisions related to R&D intensity depending on the presence of institutional investors. In this case, the same problem would arise, as managers probably would not confess that they might act in their own best interest rather than the shareholders'. There would have been severe problems with generalisability, since our

sample would have needed to be extremely limited due to our time restriction. It is unclear whether the institutional investors and management would have answered our questions truthfully, rendering problems with reliability.

Another approach for a quantitative study would have been to not conduct a replication study, but rather create a method ourselves. This would have increased the possible contributions from our study, and also provided us with plenty of freedom in constructing variables. Although, significant risks are associated with this type of approach. Our relative lack of experience in writing research papers could have led us to run inferior regressions and thus draw unsound conclusions.

In the end, we chose to do a quantitative replication study of Wahal and McConnell (2000), a study which has taken caveats of previous research into account and thus have adjusted the method for possible problems.

# 4. Empirical results and analysis

Firstly, we display some descriptive statistics of the sample. Then we present the results for the total institutional ownership regressions, with a following discussion of our findings. We continue to present and discuss our findings regarding the tertiles of institutional ownership regressions. Lastly, we discuss other findings from our regressions.

## 4.1. Descriptive statistics

To further the reader's understanding of our data sample, we have some tables consisting of descriptive statistics in this section.

*Yearly institutional portfolio turnover*

Table 3 reports the mean portfolio turnover in each institutional ownership tertile, as well as the total number of unique institutional investors, per year. One can note that the mean portfolio turnover for each tertile is rather stable over the years, with some larger variation in the highest turnover tertile. It is also observable that the number of unique investors has increased over the years. There are also large differences in the mean portfolio turnover between the tertiles, which

illustrates that there is heterogeneity in terms of portfolio turnover in our sample of institutional investors.

Table 3
Mean portfolio turnover
Nota bene: Portfolio turnover tertiles are lagged to t-1

| Year | Highest turnover tertile | Medium turnover tertile | Lowest turnover tertile | Number of unique investors |
|---|---|---|---|---|
| 2001 | 72.60% | 35.12% | 15.29% | 223 |
| 2002 | 85.02% | 37.16% | 16.44% | 231 |
| 2003 | 84.31% | 36.13% | 15.23% | 229 |
| 2004 | 84.82% | 36.32% | 16.61% | 228 |
| 2005 | 78.38% | 34.51% | 14.44% | 239 |
| 2006 | 76.07% | 33.86% | 14.92% | 256 |
| 2007 | 76.62% | 34.62% | 14.71% | 274 |
| 2008 | 73.60% | 33.52% | 14.24% | 258 |
| 2009 | 71.97% | 33.18% | 14.57% | 259 |
| 2010 | 80.94% | 33.30% | 14.54% | 274 |
| 2011 | 70.46% | 31.86% | 13.70% | 270 |
| 2012 | 84.21% | 31.58% | 13.71% | 261 |
| 2013 | 84.57% | 32.01% | 14.00% | 289 |
| 2014 | 88.25% | 32.45% | 14.58% | 291 |
| 2015 | 93.87% | 34.17% | 14.40% | 298 |

*Yearly institutional ownership*

Table 4 reports the mean institutional ownership for each industry and year. Within our sample of firms, there have been a large increase in institutional ownership, with an increase of almost 20 percentage points between 2001 and 2015. However, it is important to note that we have some degree of survivorship bias among our sample of institutional investors, but even if we adjust for this bias, a large increase can be observed.

Table 4

Yearly mean institutional ownership by sector

Nota bene: Institutional ownership is lagged to t-1

| Year | Consumer Disc. | Consumer Staples | Health Care | Industrials | Info. Tech. | Materials | Telecom. Services | Utilities | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2001 | 15.21% | 38.07% | 20.03% | 15.68% | 9.16% | 19.13% | 5.03% | 9.03% | 14.94% |
| 2002 | 22.28% | 35.56% | 20.30% | 19.26% | 12.89% | 23.09% | 4.30% | 9.35% | 17.50% |
| 2003 | 22.32% | 44.07% | 16.57% | 24.02% | 11.76% | 22.35% | 9.46% | 13.49% | 18.04% |
| 2004 | 21.53% | 42.81% | 19.93% | 23.53% | 14.50% | 21.21% | 12.83% | 17.16% | 19.62% |
| 2005 | 25.62% | 37.42% | 25.66% | 21.46% | 17.25% | 26.69% | 12.34% | 16.68% | 21.59% |
| 2006 | 23.17% | 28.50% | 26.96% | 24.98% | 19.39% | 31.06% | 12.45% | 11.81% | 23.49% |
| 2007 | 29.09% | 52.98% | 26.33% | 32.13% | 19.81% | 36.45% | 15.60% | 20.08% | 27.31% |
| 2008 | 34.01% | 44.70% | 25.51% | 34.24% | 21.34% | 39.21% | 17.87% | 4.89% | 28.50% |
| 2009 | 34.28% | 47.83% | 24.97% | 29.24% | 21.56% | 36.84% | 17.86% | 3.09% | 26.78% |
| 2010 | 46.43% | 37.69% | 28.82% | 33.23% | 23.19% | 38.51% | 18.46% | 2.53% | 29.99% |
| 2011 | 48.12% | 42.31% | 29.14% | 35.65% | 27.10% | 39.47% | 19.12% | 1.59% | 32.40% |
| 2012 | 44.68% | 40.91% | 26.53% | 36.44% | 27.39% | 27.23% | 20.12% | 1.93% | 31.07% |
| 2013 | 48.31% | 38.59% | 29.81% | 35.51% | 27.86% | 32.79% | 19.45% | 1.79% | 32.07% |
| 2014 | 44.59% | 38.84% | 29.14% | 38.07% | 26.05% | 29.34% | 18.93% | 1.80% | 31.60% |
| 2015 | 42.31% | | 33.83% | 40.47% | 28.12% | 31.80% | | | 34.43% |

*Correlation matrixes*

Correlation matrixes between each independent variable are shown in table 5. As is expected, the total institutional ownership is seriously correlated with the different tertiles for institutional ownership, which is not a problem since the variables for institutional ownership and the tertiles are never used in the same regressions. There is also a high correlation between strategic ownership and the institutional ownership variables for obvious reasons. Another notable correlation is between Tobin's Q and leverage, which it should be because debt and assets are part of both Tobin's Q and leverage.

Table 5

Correlation matrixes

Panel A: Change data

| | StratOwn | Leverage | OpInc | TobinsQ | InstOwn | Low | Medium | High |
|---|---|---|---|---|---|---|---|---|
| StratOwn | | | | | | | | |
| Leverage | 0.0282 | | | | | | | |
| OpInc | -0.0436 | -0.0627 | | | | | | |
| TobinsQ | -0.0218 | -0.1254* | -0.0507 | | | | | |
| InstOwn | -0.0044 | -0.0123 | 0.0010 | -0.0314 | | | | |
| Low | -0.0312 | 0.0057 | 0.0188 | -0.0284 | 0.6349* | | | |
| Medium | 0.0539 | -0.0234 | -0.0214 | -0.0073 | 0.5912* | -0.1099* | | |
| High | -0.0565 | 0.0048 | 0.0032 | -0.0545 | 0.3426* | -0.0376 | -0.0128 | |

Panel B: Level data

| | StratOwn | Leverage | OpInc | TobinsQ | InstOwn | Low | Medium | High |
|---|---|---|---|---|---|---|---|---|
| StratOwn | | | | | | | | |
| Leverage | -0.0914* | | | | | | | |
| OpInc | 0.0747 | 0.0979* | | | | | | |
| TobinsQ | 0.0471 | -0.3427* | -0.0016 | | | | | |
| InstOwn | -0.3216* | 0.0692 | 0.2882* | -0.1070* | | | | |
| Low | -0.3170* | 0.1310* | 0.1785* | -0.1314* | 0.8444* | | | |
| Medium | -0.1775* | -0.0100 | 0.3167* | -0.0566 | 0.7555* | 0.3402* | | |
| High | -0.1304* | -0.0557 | 0.1005* | -0.0075 | 0.3799* | 0.0716 | 0.2751* | |

* $p<0.01$

*Industry and year distribution*

In table 6, the distribution of firm-year observations is displayed on the industry level. The sample of firms is dominated by health care, industrials and information technology firms, which account for about 83% of all firm-year observations. The reason for these industries' domination in firm-year observations is that these are the most R&D intensive industries.

Table 7 reports the frequency of our sample of firm-year observations with regards to the years, where there is a lower number for 2016 due to all firms not having reported Q4 results when we collected the data.

Table 6
Firm-year observation industry distribution

| Panel A: Change data | | | Panel B: Level data | | |
|---|---|---|---|---|---|
| Sector | Freq. | Percent | Sector | Freq. | Percent |
| Consumer Discretionary | 75 | 7.89% | Consumer Discretionary | 84 | 7.83% |
| Consumer Staples | 13 | 1.37% | Consumer Staples | 14 | 1.30% |
| Health Care | 217 | 22.84% | Health Care | 249 | 23.21% |
| Industrials | 297 | 31.26% | Industrials | 333 | 31.03% |
| Information Technology | 274 | 28.84% | Information Technology | 309 | 28.80% |
| Materials | 42 | 4.42% | Materials | 48 | 4.47% |
| Telecommunication Servi | 15 | 1.58% | Telecommunication Servi | 17 | 1.58% |
| Utilities | 17 | 1.79% | Utilities | 19 | 1.77% |
| Total | 950 | 100.00% | Total | 1,073 | 100.00% |

Table 7
Firm-year observation year distribution

| Panel A: Change data | | | Panel B: Level data | | |
|---|---|---|---|---|---|
| Year | Freq. | Percent | Year | Freq. | Percent |
| 2002 | n.a. | n.a. | 2002 | 62 | 5.78% |
| 2003 | 61 | 6.42% | 2003 | 63 | 5.87% |
| 2004 | 63 | 6.63% | 2004 | 69 | 6.43% |
| 2005 | 69 | 7.26% | 2005 | 72 | 6.71% |
| 2006 | 68 | 7.16% | 2006 | 72 | 6.71% |
| 2007 | 69 | 7.26% | 2007 | 76 | 7.08% |
| 2008 | 74 | 7.79% | 2008 | 82 | 7.64% |
| 2009 | 76 | 8.00% | 2009 | 82 | 7.64% |
| 2010 | 79 | 8.32% | 2010 | 79 | 7.36% |
| 2011 | 70 | 7.37% | 2011 | 73 | 6.80% |
| 2012 | 69 | 7.26% | 2012 | 75 | 6.99% |
| 2013 | 70 | 7.37% | 2013 | 77 | 7.18% |
| 2014 | 72 | 7.58% | 2014 | 73 | 6.80% |
| 2015 | 66 | 6.95% | 2015 | 70 | 6.52% |
| 2016 | 44 | 4.63% | 2016 | 48 | 4.47% |
| Total | 950 | 100.00% | Total | 1,073 | 100.00% |

*Variable statistics*

In table 8 is a list of our variables and some of their characteristics in our sample. All are reported in percentage points. Worth noticing is the high fluctuations in Tobin's Q, which is due to some of our sample firms having volatile share prices. One should note that R&D-to-Sales is industry-adjusted, which is why observations in the level data can be negative.

Table 8
Variable statistics in percentage points

Panel A: Change data

| Variable | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| RDtoSales | 950 | -0.36 | 10.71 | -80.93 | 85.85 |
| StratOwn | 950 | 0.17 | 7.03 | -59.00 | 70.16 |
| Leverage | 950 | -0.02 | 7.54 | -48.44 | 56.84 |
| OpInc | 950 | 1.41 | 16.78 | -148.56 | 147.74 |
| TobinsQ | 950 | 3.91 | 145.10 | -1,044.15 | 1,366.29 |
| InstOwn | 950 | 1.43 | 7.13 | -35.37 | 51.14 |
| Low | 950 | 0.59 | 5.13 | -32.84 | 41.94 |
| Medium | 950 | 0.74 | 4.80 | -16.53 | 26.98 |
| High | 950 | 0.11 | 2.58 | -17.29 | 17.69 |

Panel B: Level data

| Variable | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| RDtoSales | 1,073 | 1.81 | 14.93 | -38.85 | 92.61 |
| StratOwn | 1,073 | 18.15 | 17.54 | 0.00 | 86.54 |
| Leverage | 1,073 | 17.32 | 15.06 | 0.00 | 101.08 |
| OpInc | 1,073 | 2.11 | 21.66 | -156.25 | 58.73 |
| TobinsQ | 1,073 | 229.44 | 212.96 | 48.15 | 2,795.40 |
| InstOwn | 1,073 | 26.03 | 18.01 | 0.00 | 78.02 |
| Low | 1,073 | 12.52 | 12.08 | 0.00 | 58.32 |
| Medium | 1,073 | 10.67 | 8.56 | 0.00 | 52.74 |
| High | 1,073 | 2.79 | 3.58 | 0.00 | 28.78 |

### 4.2. Findings regarding overall institutional ownership

The R-squares of our regressions are adequate, meaning that our regressions explain a reasonable amount of the variation in the dependent variable R&D-to-Sales. The change regression has an overall R-squared of 0.047. The level regression has an overall R-squared of 0.213. The complete results can be observed in table 9.

Table 9
Regressions of change in, and level of, industry-adjusted R&D-to-Sales
With Firm and Year fixed effects

| Panel A: Change regression | | Panel B: Level regression | |
|---|---|---|---|
| | Δ Industry-adjusted R&D intensity (t, t – 1) | | Industry-adjusted R&D intensity (t) |
| Δ StratOwn | -0.00952 | StratOwn | -0.0404 |
| (t – 1, t – 2) | (0.0523) | (t – 1) | (0.0336) |
| Δ Leverage | -0.0350 | Leverage | -0.129*** |
| (t – 1, t – 2) | (0.0465) | (t – 1) | (0.0347) |
| Δ OpInc | 0.138*** | OpInc | -0.132*** |
| (t – 1, t – 2) | (0.0209) | (t – 1) | (0.0205) |
| Δ TobinsQ | 0.00225 | TobinsQ | -0.00758*** |
| (t – 1, t – 2) | (0.00250) | (t – 1) | (0.00182) |
| Δ InstOwn | 0.0622 | InstOwn | -0.0713** |
| (t – 1, t – 2) | (0.0498) | (t – 1) | (0.0306) |
| Intercept | -0.651* | Intercept | 8.655*** |
| | (0.344) | | (1.337) |
| R-squared: Within | 0.054 | R-squared: Within | 0.086 |
| R-squared: Between | 0.184 | R-squared: Between | 0.324 |
| R-squared: Overall | 0.047 | R-squared: Overall | 0.213 |
| Number of Firms | 108 | Number of Firms | 111 |
| Observations | 950 | Observations | 1,073 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The main variables in this study are the ones related to institutional ownership. From the change regression, it is not possible to draw any conclusions about the effects of change in total institutional ownership on the change in R&D-to-Sales. The results are not statistically significant, although the sign of the coefficient is positive.

The level regression on the other hand yields some interesting, as well as statistically significant, results. We find that the coefficient for the institutional ownership variable actually is negative and for a one percentage point higher institutional ownership in t-1, R&D-to-Sales is 0.0713 percentage points lower in t. According to these results, it seems that institutional investors actually discourage R&D intensity in their portfolio firms. These results are somewhat conflicting with our reference study Wahal and McConnell (2000), as they found a positive, although not statistically significant, relationship between institutional ownership and R&D intensity.

There could be an issue regarding endogeneity for the level regression, although it is partly accounted for through the time-lag of the independent variables. It is possible that institutional investors opt to buy firms with a relatively low R&D intensity. If one were to speculate, this could then be because institutional investors invest in more mature firms that are less R&D intensive.

### 4.3. Findings regarding portfolio turnover tertiles

The R-squares of our regressions for the tertiles of institutional ownership are similar to those for total institutional ownership. The change regression has an overall R-squared of 0.046, and the level regression has an overall R-squared of 0.223. The complete results can be observed in table 10.

Table 10
Fixed effects regressions of change in, and level of, industry-adjusted R&D-to-Sales
With Firm and Year fixed effects

| Panel A: Change regression | | Panel B: Level regression | |
|---|---|---|---|
| | Δ Industry-adjusted R&D intensity (t, t – 1) | | Industry-adjusted R&D intensity (t) |
| Δ StratOwn | -0.00848 | StratOwn | -0.0417 |
| (t – 1, t – 2) | (0.0525) | (t – 1) | (0.0336) |
| Δ Leverage | -0.0356 | Leverage | -0.131*** |
| (t – 1, t – 2) | (0.0466) | (t – 1) | (0.0347) |
| Δ OpInc | 0.138*** | OpInc | -0.130*** |
| (t – 1, t – 2) | (0.0209) | (t – 1) | (0.0206) |
| Δ TobinsQ | 0.00229 | TobinsQ | -0.00758*** |
| (t – 1, t – 2) | (0.00250) | (t – 1) | (0.00182) |
| Δ Low | 0.0552 | Low | -0.0328 |
| (t – 1, t – 2) | (0.0679) | (t – 1) | (0.0459) |
| Δ Medium | 0.0287 | Medium | -0.131** |
| (t – 1, t – 2) | (0.0745) | (t – 1) | (0.0556) |
| Δ High | 0.0711 | High | -0.0890 |
| (t – 1, t – 2) | (0.137) | (t – 1) | (0.110) |
| Intercept | -0.623* | Intercept | 8.910*** |
| | (0.346) | | (1.342) |
| R-squared: Within | 0.053 | R-squared: Within | 0.089 |
| R-squared: Between | 0.184 | R-squared: Between | 0.331 |
| R-squared: Overall | 0.046 | R-squared: Overall | 0.223 |
| Number of Firms | 108 | Number of Firms | 111 |
| Observations | 950 | Observations | 1,073 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results from the tertile regressions provide interesting results as well. The change regression has yielded far from statistically significant results, which also was the case for our reference

study, Wahal and McConnell (2000). Thus, it is more interesting to analyse the level regression, which gave Wahal and McConnell (2000) some interesting results as well. There the similarities in results end, as Wahal and McConnell (2000) even find a positive relationship between the highest portfolio turnover quintile and R&D-to-Sales, while our results yield a negative coefficient for all tertiles, although only the medium tertile is statistically significant.

The results for the medium turnover tertile state that a one percentage point higher institutional ownership in t-1 corresponds to a 0.131 percentage points lower R&D-to-Sales in t. This coefficient is almost twice that of the general institutional ownership, which has a negative coefficient of 0.0713. This indicates that there are some institutional investors in either the high or the low turnover tertile which are discouraging R&D intensity in their portfolio firms relatively less than the medium turnover tertile. Without statistically significant results, it is difficult to draw conclusions of relative effects between different tertiles.

### 4.4. Other findings

The variable of strategic ownership was believed to have an effect on the Swedish market as opposed to the U.S. The variable is not statistically significant in either the change or the level regressions. Although, both have a negative sign for the coefficient, which is in line with our expectations.

The total leverage ratio has a negative sign for the coefficient in both the change and the level regression, though the variable is only statistically significant in the level regression. This is in accordance with theory and our expectation saying that risky projects, like R&D, are primarily not financed with debt.

For operating income, the results give us statistically significant results for both the change and level regressions. The sign for the different regressions differ, with change having a positive sign for the coefficient, meaning that an increase in operating income to total assets from t-2 to t-1 led to an increase in R&D-to-Sales from t-1 to t, while the level regressions have a negative sign for the coefficient, meaning that with a higher level of operating income to total assets in t-1 a firm would have a lower R&D-to-Sales in t. A reasonable explanation for this difference is that when a firm increases its operating income to total assets, it gets more easily available funds to spend on R&D in accordance with the pecking order theory. When a firm in turn has

a high level of operating income to total assets, it is possible that it is a more mature firm focused on harvesting profits rather than growing through R&D investments. There is also a slight negative correlation between the level of operating income and Tobin's Q (see table 5, Panel: B), suggesting that firms with a higher operating income have less growth opportunities.

The change regressions have no statistical significance for the Tobin's Q variable, although the sign is positive. The results from the level regressions are not as expected, with a statistically significant negative sign for the coefficient. This relationship is hard to explain due to the lack of logic behind a highly valued firm, with a low amount of assets, not having a high R&D intensity. The results could be driven by the high volatility in share price in some of the sample firms.

### 4.5. Robustness test

We test the robustness of the results by running new regressions, where we replace R&D-to-Sales with R&D-to-Assets. There could be differences in results when using different metrics for R&D intensity, which would undermine our results. Thus, it is interesting to examine if the results hold up with another metric. We find that the results are robust as coefficient signs, coefficient levels and statistical significance are almost identical to the R&D-to-Sales regressions, for both the change and level regressions. It is also noteworthy that we do not need to adjust for outliers with the R&D-to-Assets measure, as all firm-year observations are reasonable. The reason for this is that while some firms do not report any economically significant level of sales, all seem to report an economically significant level of assets, which make the R&D-to-Assets metric more stable. This provides more strength to the results as our adjustments of outliers in our original sample appear to be appropriate. The complete results from the robustness test can be observed in appendix table 3 and 4.

# 5. Conclusion

## 5.1. Conclusion

The purpose of this study is to evaluate if institutional investors impose myopia on their portfolio firms, or if institutional investors could serve as an extra monitoring function in these firms. Furthermore, we aim to evaluate whether institutional investors with different investment strategies affect their portfolio firms in heterogeneous ways. In order to explain this, we examine the relationship between institutional ownership and R&D intensity in 111 listed Swedish firms during 2002–2016 and end up with some interesting conclusions. Firstly, several studies have been conducted on the total level of institutional ownership and its relationship with R&D intensity, and most have concluded that there is either a positive or a negative association between the two. The results of this study support the view that institutional investors generally discourage R&D intensity in their portfolio firms. These effects are then reaffirmed for the medium tertile when running the portfolio turnover tertiles level regression. The medium portfolio turnover institutional investors seem to discourage the R&D intensity in their portfolio firms to a larger degree than institutional investors overall. Due to lack of statistical significance for the low and high portfolio turnover tertiles, it is not possible to draw any final conclusions with certainty that it is higher portfolio turnover that exacerbates this trend. Thus, we find no support that institutional investors are heterogeneous in terms of imposed myopia.

Secondly, our results provide some evidence that the myopic theory might be true for Swedish data. We cannot establish exactly why institutional investors would discourage R&D intensity, but there are several possible explanations. It could be that institutional investors have an excessive focus on short-term earnings and returns, and that they exercise pressure on the management to act myopically, with a following reduction in investments with long-term payoffs, such as R&D investments. Porter (1992) and Graham et al. (2005) find that institutional investors primarily care about the reported earnings figures. Graham et al. (2005) further find that managers seem to be willing to sacrifice future cash flows in order to meet the expectations from the capital market, and that the preferred manipulation method was to reduce discretionary expenditures. This could possibly be true in Sweden as well, but one cannot with assertiveness conclude that this is the case. Regardless, our results suggest that institutional investors are able to discourage R&D intensity in Swedish listed firms. Any eventual increase in presence of

institutional investors could therefore contribute to further reductions in R&D intensity. Hill et al. (1988) show that the U.S. lost competitiveness when its R&D investments declined during the 1970s. With R&D investments potentially linked to the competitiveness of Sweden, one should carefully follow the ownership structure in Swedish listed firms, as it potentially can influence the R&D intensity, which in turn could have a long-term damaging effect on Sweden.

Thirdly, there seem to be several differences between Sweden today and the U.S. during the period around 1990, which could explain why our results conflict with the earlier findings of Wahal and McConnell (2000). As pointed out earlier, the U.S. stock market was quite different during the late 1980s and early 1990s, as there was a high frequency of corporate takeovers, as well as a general R&D boom, which plausibly have affected the results of Wahal and McConnell (2000). Porter (1992) highlights that U.S. institutional investors with a short investment horizon were not able to affect the management of the firm during the beginning of the 1990s, as managers did not accommodate the demand of short-term investors. Given that Porter's (1992) statement is correct, this could potentially have driven the result of Wahal and McConnell (2000) in another direction than our study. While Wahal and McConnell (2000) find that institutional investors with a high portfolio turnover seem to encourage R&D investments, it could be that these investors de facto did not exercise any influence over the decisions made, and that the positive relationship was driven by other factors. Furthermore, this could suggest that institutional investors also were myopic during 1988–1994, but that institutional investors during this period had fewer opportunities to influence the decisions in the firms. Lekvall (2008) points out that the concept of nomination committees in Sweden differ significantly from the corresponding concept in the U.S. during the early 1990s. This could be a contributing factor to that institutional investors in our sample period have greater possibilities to influence the decisions in their portfolio firms. Thus, institutional investors in our sample could possibly affect R&D intensity to a greater extent than their counterparts could during the early 1990s in the U.S.

One can also note that our results differ from Brossard et al. (2013), which find that institutional investors in general encourage investments in R&D, and that institutional investors are heterogeneous, where the most "impatient" investors discourage R&D investments. However, it is important to note that Brossard et al. (2013) conduct their study solely on the most innovative firms in Europe according to the EU R&D Scoreboard, creating a discrepancy in the generalizability of their results in relation to ours.

The results from this study could contribute to policy discussion. We find a negative relationship between institutional ownership and R&D intensity in Sweden. Laverty (1996) claims that institutional investors are focused on short-term earnings, which leads to decisions by management to make cut-backs in order to meet the expectations of the capital market. This in turn is argued to be because the accounting principles generally state that certain long-term investments, such as R&D, need to be expensed immediately. If high R&D intensity in the private sector is desirable by policymakers, then revisiting the accounting principles for R&D might be of importance.

The results are applicable to policy discussion in yet another way. In combination with empirical evidence on a positive effect for a country from high private sector R&D intensity, it could be important for policy makers to consider our results. If R&D intensity in private firms would be considered important for Sweden, then with our results one could argue that it would be prosperous to design a corporate governance system in which institutional investors are given less influence over their portfolio firms.

If the results from Eberhart et al. (2004), which indicate that R&D expenditures have a positive effect on long-term operating performance, and Jones and Danbolt (2003), which indicate that abnormal returns could come of announcements of R&D projects, could be confirmed for Swedish data as well, then our results could come to use in stock picking. One would then want to avoid investing in firms with a large degree of institutional ownership, because they discourage a possibly value enhancing R&D intensity.

### 5.2. Limitations

There are some limitations to this study. Firstly, as with all use of databases, there is the risk of using inaccurate data, since databases generally provide secondary data. Our primary data sources, Thomson Reuters Eikon and FactSet, are two well-known and well-used databases, thus limiting the risk of inaccurate data.

One should be cautious when drawing general conclusions from the results of this study. The sample of firms is limited to Sweden, why there is a limited potential to say anything about the effect of institutional investors on firms in other countries. Another limitation is that our study

only focuses on R&D intensity, and not the actual productivity of R&D intensity. It could be that a reduction in R&D intensity is appropriate, given that the resources otherwise would be wasted on projects with low payoff. A high R&D intensity does not per se mean that a firm invests in profitable projects. Thus, institutional investors that reduce the R&D intensity might actually reduce wasteful spending by focusing on high productivity projects with high payoff. If so, this would be more in line with the monitoring theory.

To avoid any possible problems with share classes, this study uses the total ownership of capital in a firm, not the number of votes held by institutional investors. However, this is a limitation one needs to bear in mind when interpreting the results, since the power an investor has over a firm is more closely related to share of votes than share of capital.

There is another important caveat which is important to bear in mind when interpreting the results. Due to the endogeneity problem, we have not been able to establish a causal relationship with institutional ownership and R&D intensity, or if institutional investors simply buys firms that are less R&D intensive. Although, recent research from Aghion et al. (2013) and Brossard et al. (2013) finds no evidence for institutional investors investing in R&D intensive firms, rather these investors encourage R&D intensity in the firms. Extrapolating these findings to our results, one would believe the risk for endogeneity declines.

One known caveat concerning the data in our study is the portfolio turnover data. Due to lack of reported data, we have used only the latest reported portfolio turnover from Thomson Reuters Eikon for the institutional investors. It would have been preferable to have portfolio turnover data for each year in our sample to correct for changes in investment strategies by the institutional investors. As we are not able to account for any changes in investment strategy, our conclusions regarding the heterogeneity could be somewhat unreliable. However, to the best of our knowledge, there is no apparent evidence that institutional investors change investments strategies frequently.

### 5.3. Further research

This study focuses on the effect institutional ownership has on R&D intensity. Therefore, it might be interesting to see how other accounting measures are affected by institutional ownership. Previous research has been conducted in order to disentangle how institutional

investors affect the capital structure and dividend policy of a firm (Chaganti and Damanpour, 1991; Short et al., 2002), but there are still areas in close connection to our research field to which the research could be extended.

Research has indicated a sort of "home-bias" from institutional investors, meaning that institutional investors to a greater extent invest in their home country (French and Poterba, 1991; Coval and Moskowitz, 1999). It would thus be interesting to find out if there is any difference in effect on R&D intensity between domestic and foreign institutional investors.

Our results indicate that institutional investors actually are able to influence the decisions made in firms. Hence, it might be of interest to conduct further studies on which certain methods institutional investors exert in order to influence the direction of the firm, and if it is possible to find any relationship with the practiced methods of influence and the final results.

Furthermore, it would be interesting with elaborations of the studies we have referenced to in this study. Some of them have been conducted with foreign data, old data or both combined, and it would be interesting to get results from modern and Swedish data. It would also increase the practical use of this study, because it is best used in combinations with other results.

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## Appendix

Appendix Exhibit 1
Criteria for recognition of an intangible assets arising from development (IAS 38)

| |
|---|
| (a) the technical feasibility of completing the intangible asset so that it will be available for use or sale.<br>(b) its intention to complete the intangible asset and use or sell it.<br>(c) its ability to use or sell the intangible asset.<br>(d) how the intangible asset will generate probable future economic benefits. Among other things, the entity can demonstrate the existence of a market for the output of the intangible asset or the intangible asset itself or, if it is to be used internally, the usefulness of the intangible asset.<br>(e) the availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset.<br>(f) its ability to measure reliably the expenditure attributable to the intangible asset during its development. |

Appendix Exhibit 2
FactSet definition of R&D expenditures

| |
|---|
| Represents expenditures on research and development, specifically intended for the development of concepts or ideas for new products or services by which the company can increase revenues and includes the full cycle of testing before the same products or services are launched commercially. Research and development expenses are commonly reported by manufacturing, technological, pharmaceutical and healthcare companies.<br><br>It includes:<br>• Amortization of previously capitalized research and development costs<br>• Design and development expense<br>It excludes:<br>• Business development expenses, relating to mergers and acquisitions<br>• Customer-sponsored research<br>• Government-sponsored research<br>• Engineering costs, when engineering revenue is collected as part of Net Sales and when treated by the company as separate from Research & Development<br>• Exploration and Development expenses for oil, gas, coal, drilling and mining companies<br>• Market Research Expenses/Survey Expenses<br>• Research and Education expenses for the development of personnel/staff |

Appendix Table 1

Unadjusted sample - Fixed effects regressions of change in, and level of, industry-adjusted R&D-to-Sales

With Firm and Year fixed effects

| Panel A: Change regression | | Panel B: Level regression | |
|---|---|---|---|
| | Δ Industry-adjusted R&D intensity (t, t – 1) | | Industry-adjusted R&D intensity (t) |
| Δ StratOwn | -305.2*** | StratOwn | 14.16 |
| (t – 1, t – 2) | (80.29) | (t – 1) | (69.86) |
| Δ Leverage | -7.056 | Leverage | -31.58 |
| (t – 1, t – 2) | (75.68) | (t – 1) | (70.34) |
| Δ OpInc | 30.52 | OpInc | 68.13** |
| (t – 1, t – 2) | (27.10) | (t – 1) | (29.52) |
| Δ TobinsQ | -7.123** | TobinsQ | -0.542 |
| (t – 1, t – 2) | (3.146) | (t – 1) | (3.569) |
| Δ InstOwn | -111.2 | InstOwn | -25.97 |
| (t – 1, t – 2) | (82.87) | (t – 1) | (64.67) |
| Intercept | 937.0* | Intercept | 2,203 |
| | (565.9) | | (2,725) |
| R-squared: Within | 0.026 | R-squared: Within | 0.006 |
| R-squared: Between | 0.050 | R-squared: Between | 0.083 |
| R-squared: Overall | 0.005 | R-squared: Overall | 0.003 |
| Observations | 997 | Observations | 1,129 |
| Number of Firms | 109 | Number of Firms | 115 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 2

Unadjusted sample - Fixed effects regressions of change in, and level of, industry-adjusted R&D-to-Sales

With Firm and Year fixed effects

| Panel A: Change regression | | Panel B: Level regression | |
|---|---|---|---|
| | Δ Industry-adjusted R&D intensity (t, t – 1) | | Industry-adjusted R&D intensity (t) |
| Δ StratOwn | -318.4*** | StratOwn | 12.97 |
| (t – 1, t – 2) | (79.93) | (t – 1) | (69.96) |
| Δ Leverage | -4.721 | Leverage | -32.92 |
| (t – 1, t – 2) | (75.22) | (t – 1) | (70.57) |
| Δ OpInc | 30.24 | OpInc | 69.29** |
| (t – 1, t – 2) | (26.95) | (t – 1) | (29.62) |
| Δ TobinsQ | -7.351** | TobinsQ | -0.483 |
| (t – 1, t – 2) | (3.127) | (t – 1) | (3.576) |
| Δ Low | -48.29 | Low | 15 |
| (t – 1, t – 2) | (111.9) | (t – 1) | (95.88) |
| Δ Medium | 7.571 | Medium | -72.45 |
| (t – 1, t – 2) | (123.4) | (t – 1) | (118.7) |
| Δ High | -865.1*** | High | -65.82 |
| (t – 1, t – 2) | (225.6) | (t – 1) | (234.8) |
| Intercept | 899.7 | Intercept | 2,320 |
| | (563.3) | | (2,740) |
| R-squared: Within | 0.040 | R-squared: Within | 0.006 |
| R-squared: Between | 0.032 | R-squared: Between | 0.082 |
| R-squared: Overall | 0.013 | R-squared: Overall | 0.003 |
| Observations | 997 | Observations | 1,129 |
| Number of Firms | 109 | Number of Firms | 115 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 3

Robustness test - Fixed effects regressions of change in, and level of, industry-adjusted R&D-to-Assets

With Firm and Year fixed effects

| Panel A: Change regression | | Panel B: Level regression | |
|---|---|---|---|
| | Δ Industry-adjusted R&D intensity (t, t – 1) | | Industry-adjusted R&D intensity (t) |
| Δ StratOwn | -0.0174 | StratOwn | 0.00989 |
| (t – 1, t – 2) | (0.0438) | (t – 1) | (0.0287) |
| Δ Leverage | -0.0245 | Leverage | -0.128*** |
| (t – 1, t – 2) | (0.0413) | (t – 1) | (0.0289) |
| Δ OpInc | 0.119*** | OpInc | -0.0414*** |
| (t – 1, t – 2) | (0.0148) | (t – 1) | (0.0121) |
| Δ TobinsQ | -0.00667*** | TobinsQ | -0.00346** |
| (t – 1, t – 2) | (0.00172) | (t – 1) | (0.00146) |
| Δ InstOwn | 0.0175 | InstOwn | -0.0760*** |
| (t – 1, t – 2) | (0.0452) | (t – 1) | -(0.0265) |
| Intercept | -0.734** | Intercept | 14.00*** |
| | (0.309) | | (1.118) |
| R-squared: Within | 0.087 | R-squared: Within | 0.044 |
| R-squared: Between | 0.022 | R-squared: Between | 0.258 |
| R-squared: Overall | 0.081 | R-squared: Overall | 0.179 |
| Observations | 997 | Observations | 1,129 |
| Number of Firms | 109 | Number of Firms | 115 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 4

Robustness test - Fixed effects regressions of change in, and level of, industry-adjusted R&D-to-Assets

With Firm and Year fixed effects

| Panel A: Change regression | | Panel B: Level regression | |
|---|---|---|---|
| | Δ Industry-adjusted R&D intensity (t, t – 1) | | Industry-adjusted R&D intensity (t) |
| Δ StratOwn | -0.0144 | StratOwn | 0.00934 |
| (t – 1, t – 2) | (0.0439) | (t – 1) | (0.0287) |
| Δ Leverage | -0.0254 | Leverage | -0.130*** |
| (t – 1, t – 2) | (0.0413) | (t – 1) | (0.0289) |
| Δ OpInc | 0.118*** | OpInc | -0.0404*** |
| (t – 1, t – 2) | (0.0148) | (t – 1) | (0.0121) |
| Δ TobinsQ | -0.00662*** | TobinsQ | -0.00346** |
| (t – 1, t – 2) | (0.00172) | (t – 1) | (0.00147) |
| Δ Low | 0.0697 | Low | -0.0489 |
| (t – 1, t – 2) | (0.0614) | (t – 1) | (0.0393) |
| Δ Medium | -0.0624 | Medium | -0.121** |
| (t – 1, t – 2) | (0.0678) | (t – 1) | (0.0487) |
| Δ High | 0.0319 | High | -0.0593 |
| (t – 1, t – 2) | (0.124) | (t – 1) | (0.0963) |
| Intercept | -0.714** | Intercept | 14.12*** |
| | (0.309) | | (1.124) |
| R-squared: Within | 0.090 | R-squared: Within | 0.045 |
| R-squared: Between | 0.012 | R-squared: Between | 0.269 |
| R-squared: Overall | 0.084 | R-squared: Overall | 0.187 |
| Observations | 997 | Observations | 1,129 |
| Number of Firms | 109 | Number of Firms | 115 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1