Short-Termism in Swedish Corporate Investments: A Comparison of Publicly Listed and Private Firms

A Historical and Comparative Perspective

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Short-Termism in Swedish Corporate Investments: A Comparison of Publicly Listed and Private Firms. A Historical and Comparative Perspective.

Abstract:

This study examines Swedish firms' investment behaviors during the period 2001–2011. We examine the investment behaviors of stock market listed firms and private firms in Sweden to evaluate the impact of short-termism pressures on corporate decision-making. Using robust matching procedures, we treat private firms that are similar to publicly listed firms as a counterfactual to model how publicly listed firms might behave in the absence of short-term market pressures. Our results suggest that publicly listed firms do not exhibit lower investment levels or sensitivities compared to private firms. However, these findings should be interpreted with caution due to several methodological limitations, including challenges related to the matching procedure and potential selection bias, as well as the absence of randomized experimental settings. While these results contribute to the discourse on corporate governance and short-termism, they underscore the need for further research to isolate the effects of market pressures more conclusively.

Keywords:

Short-termism, investment behavior, publicly listed firms, private firms, Sweden, corporate governance, institutional ownership, historical analysis, financial markets (2001–2011)

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1. Introduction

The tension between long-term value creation and short-term performance pressures has become a central theme in modern finance, and this tension could be particularly pronounced in the Swedish stock market as it is one of the most accessible in Europe, with extensive participation from both institutional and retail investors Asgari (2024). While our study focuses on the period 2000–2011, the Swedish stock market's characteristics, such as its accessibility and active institutional ownership, have historical roots. Recent analyses (Asgari, (2024)) confirm that these traits have persisted, suggesting the market's stability as an interesting context for examining corporate investment behaviors. Furthermore, institutional investors accounted for approximately 51% of the market value of Swedish shares in 2007, a figure that has increased dramatically by 2017 (Euroclear, 2018). The presence of cornerstone investors in initial listed offerings (IPOs), particularly large pension funds, plays a critical role in ensuring stability and boosting investor confidence Asgari (2024). This environment encourages SMEs to list on the Swedish stock market, a trend that sets Sweden apart from other European countries struggling to attract new listings. We hypothesize that publicly listed firms in Sweden are more exposed to short-term capital market pressures than their private counterparts, leading to observable differences in their investment behavior. By comparing the investment strategies of publicly listed and private firms, we aim to assess the extent to which these pressures influence corporate decision-making. The robustness of Sweden's stock market, therefore, presents an ideal setting to study the impact of market pressure on corporate investment decisions. Despite its importance, there has been limited analysis specifically focusing on how these pressures influence corporate investment in Sweden, thus demonstrating a gap in the literature.

One of the main challenges in this study field lies in comparing how listed firms would behave in absence of market pressure. We address this issue in a similar manner to Asker, Farre-Mensa and Ljungqvist (2014) by comparing the investment behavior of listed firms with that of comparable private firms. We conduct this study by matching public[1] with private firms on a number of different criterias in order to maintain comparability. To ensure robustness of our findings we have made sure to compare different matching criterias and use a number of different investment measures. We have created two datasets, one for publicly traded firms and one for privately held firms. The full private-firm dataset contains over 48,000 firm-years of data and our public dataset contains over 2,300 firm-years of data. Both datasets span over the time period 2000-2011. We investigate whether public firms in Sweden are subject to the same pressures as in Asker et al. (2014) that can skew investment behavior towards immediate short-term results. Institutions as well as managers often evaluate their performance based on quarterly or annual benchmarks, which forces public firms to prioritize immediate returns over long-term value creation. Our paper builds on the same principles as Asker et al. (2014) which argue that public firms tend to underinvest compared to private firms in the US due to the pressures of short-termism.[2] Extending these insights to the Swedish market, where institutional ownership is widespread and retail investors have active participation, we will examine if the forces of short-term performance expectations are also present in Swedish public firms.

[1] In this thesis, the term "public firms" refers to companies that are publicly listed on a stock exchange, such as the Nasdaq Stockholm. This definition excludes the Swedish legal form "*publikt aktiebolag*" (abbreviated as "AB (publ)"), which may encompass firms that are not publicly traded. Similarly, "private firms" refers to companies not listed on any stock exchange, regardless of their legal form.
[2] Short-termism refers to the tendency of public-firm managers to prioritize short-term profits and share price performance over long-term value creation, often due to shareholder pressures and incentive structures tied to stock performance. This behavior distorts investment decisions, leading managers to underinvest in profitable long-term projects to meet short-term earnings targets (Asker et al. (2014)).

Short-termism can be linked to the Jensen and Meckling's (1976) theory principal-agent problem, where the interests of shareholders seeking long-term growth, may conflict with the interests of managers, incentivized to meet short-term performance targets to maintain their positions or achieve bonuses. We reason that since many public firms are owned by institutional investors they often act as intermediaries between the ultimate owners (individual investors) and the firm's management. This leads to an additional layer of agency problems. In contrast, private firms are often owner-managed or closely held and typically face less pressure to prioritize short-term results. However, as prior literature argues (Bhide (1993)), these characteristics can motivate owners to prioritize long-term value creation by decreasing transparency issues with management. Private firms, with illiquid ownership and more focused governance structures, are expected to be less vulnerable to the short-termist pressures seen in public firms. Other research such as Medina, De La Cruz and Tang (2022) suggest that ownership in public firms is becoming more concentrated in OECD member countries, especially by institutional investors. They suggest that there are concerns about short-termism in corporate investment decisions, particularly with institutional investors focusing on maximizing short-term shareholder returns. However, there is also a recognition that institutional investors, especially those with longer investment horizons, can encourage long-term value creation.

As Christensen, Kaufman and Shih (2008) argues, commonly used financial tools like discounted cash flow and net present value are often misused in a way that discourages innovation. The authors point out that the emphasis on metrics such as Earnings per Share in public firms fosters a focus on short-term gains. This approach leads to underinvestment in innovation, as managers prioritize meeting quarterly financial targets instead of investing in long-term projects. Furthermore, Christensen et al. (2008) reasoning further strengthens our hypothesis that public firms are more susceptible to principal-agent problems, where the separation of ownership and control leads to misaligned incentives. Public managers are often incentivized to prioritize actions that boost short-term share price rather than focus on the company's long-term health. We further believe that this takes place even if investors can observe the firm's actual investments as shown in Grenadier and Wang (2005).

Contrary to our initial hypotheses, our empirical findings suggest that short-term pressures have a different impact on the investment behavior of public and private firms in Sweden than anticipated. First, we show that public firms, on average, invest more than their private counterparts in our primary investment measure. Even when matched on size and industry, and controlling for profitability (ROA) and investment opportunities, the investment gap remains, although the results bring various degrees of statistical significance and magnitude. Secondly, our results show that public firms exhibit greater sensitivity to changes in investment opportunities compared to private firms. This contradicts Asker et al. (2014) findings conducted in the US market where they found strong support for short-term pressures, both in regards to investment levels and investment sensitivities.

Our findings are robust across various matching criteria and our primary measures of investment and investment opportunities. The findings are inconsistent with the argument that the agency problems inherent in public ownership, particularly the pressure to meet short-term financial benchmarks, can distort corporate investment strategies. However our findings align with the argument of (Bhide (1993)) that argues that concentrated ownership mitigates agency problems as owners can increase control and mitigate transparency issues. In the Swedish context, Medina et al. (2022) shows how institutional ownership has increased in OECD member states, a pattern reinforced by Ehne (2018) for the Swedish market.

Furthermore, recent studies on short-termism in Sweden concluded that there is no evidence of short-termism among public firms in Sweden (Carlsson-Wall, Eugster, Hjelström and Nilsson (2021)). In the light of these findings our empirical results support these notions.

This report makes two key contributions to the debate on short-termism and corporate governance in Sweden. Firstly, our results do not support the notion that short-termism exists in Swedish public firms during the time period 2001-2011, where we conclude that public firms neither have lower investment levels, nor investment sensitivities. Our results support Carlsson-Wall et al. (2021) which concluded the absence of short-term pressure on firms to deliver short-term results at the cost of long-term strategic investments.

Secondly, we contribute to the existing research by using a new methodological approach to the Swedish market, using the comparative framework from Asker et al. (2014) to examine investment behavior across public and private firms. Specifically, we employ statistical methods, such as matching procedures, to identify and compare similar private firms to their public counterparts. This enables us to assess how market pressure uniquely affects the investment behaviors of public firms. The matching approach ensures that the firms being compared are as similar as possible in terms of key characteristics, such as size, industry, and growth opportunities, thereby isolating the impact of public market pressures from other confounding factors. By doing so, we provide a clearer picture of how capital market pressures in Sweden don't lead to underinvestment in long-term projects and a preference for actions that boost short-term financial metrics.

The structure of this paper is as follows. In Section 1, we describe the ideal setting for conducting this research and we review the relevant literature on corporate investment and short-termism. Section 2 introduces a comprehensive dataset of Swedish firms compiled by the Swedish House of Finance (SHOF) Serrano database. Section 2 also explains the matching procedure and investment measures employed in the study. In Section 3, we present our main empirical findings, demonstrating that private firms invest less and exhibit lower responsiveness to shifts in investment opportunities compared to public firms. Section 4 discusses our results with relevant theories, the limitations and comparability of our study and recommendations for future research. Finally, Section 5 concludes the paper.

1.1 Ideal Setting

The ideal way to test our hypothesis would be by comparing the investment behaviors of public and private firms to identify the presence of short-termist pressures through a randomized experiment. In this scenario, firms would be randomly assigned to either remain private or go public, ensuring that there is no inherent difference between the firms in each group that could influence their investment decisions. This random assignment would allow us to confidently attribute any differences in investment behavior to the listing status of the firms, rather than any underlying characteristics. However, in practice, this type of random assignment is challenging, as the decision to go public or remain private is influenced by a firm's characteristics, market conditions, and strategic objectives.

Given this limitation, our approach relies on observational data to compare public and private firms, which introduces several challenges related to endogeneity and selection bias. Since firms self-select into being public or private, their investment behavior may be driven by factors that also influence their listing status, making it difficult to establish causality. For example, firms that choose to go public might be inherently more growth-oriented, or they may face different competitive pressures compared to firms that remain private. This selection bias can result in biased estimates if not properly addressed.

To mitigate these challenges in an ideal setting we would employ several methods. First, we would use exogenous instruments to account for the decision to go public. For instance, we would consider regulatory changes or market-wide shocks that influence the likelihood of going public but do not directly affect a firm's intrinsic investment opportunities. These instruments would allow us to create a quasi-experimental setting where the decision to go public is influenced by factors outside the firm's control, reducing the potential for bias. By leveraging these exogenous instruments, we would aim to isolate the effect of public listing on investment behavior, providing a more robust estimation of the impact of short-termism.

Additionally, it would be ideal to employ a difference-in-differences approach to compare the investment behavior of firms before and after an IPO. However, due to data limitations regarding a shortage of firms after cleaning the dataset, we were unable to fully conduct pre- and post-IPO analysis.

While our approach cannot fully replicate the ideal randomized experiment, we have employed a range of tools such as control variables, and adding more matching procedures to ensure robustness and check accuracy. These methods enable us to provide insights into the impact of public listing on investment behavior as well as acknowledging some limitations. By closely following the methodology of our main reference study, with deviations where necessary due to data availability and feasibility.

1.2 Literature review

Our study ties into different areas of literature, particularly on short-termism, corporate governance, and the impact of institutional ownership in investment decision-making. Given the geographic focus on the Swedish market, this research capitalizes on the unique opportunity Sweden presents for studying the effects of corporate investment under short-term pressures. The Swedish market is characterized by concentrated ownership, with institutional investors such as pension funds, insurance companies, and mutual funds often holding substantial equity stakes in public companies Euroclear (2018).

Jensen and Meckling's (1976) work also serves as an important foundation for understanding the relationship between ownership structure and managerial behavior. Their agency theory suggests that conflicts between shareholders (principals) and managers (agents) can lead to agency costs, which are further complicated by the presence of institutional owners. In the Swedish context, these issues are heightened by concentrated ownership, which might place both positive and negative pressures on managers. We argue that since many public firms are owned by institutional investors they often act as intermediaries between the ultimate owners (individual investors) and the firm’s management. This leads to an additional layer of agency problems.

This research also draws upon the framework proposed by Shleifer and Vishny (1990), which argues that the separation of ownership and control in public firms leads to agency problems, as managers may not always act in the best interests of shareholders. This concept is particularly relevant in Sweden, where institutional investors may have dual objectives of pursuing financial gains and ensuring long-term sustainability.

Ehne (2018) highlights the growing influence of institutional ownership in Sweden, particularly the role of state pension funds (AP funds) as significant shareholders. This concentration of ownership suggests that governance decisions may be influenced by institutional investors' needs. Although Ehne's findings do not definitively prove a direct impact on short-term financial focus, the substantial influence of these institutional investors could plausibly shape firms' financial priorities, potentially emphasizing either short-term financial metrics or fostering long-term value creation depending on the investors' strategic objectives.

Medina et al. (2022), provides insights into how increasing institutional ownership affects corporate governance, growth, and shareholder influence. Institutional investors significantly impact corporate decisions and they show that some institutional investors advocate for longer-term horizons and corporate responsibility. Pension funds, sovereign wealth funds, and ESG-focused asset managers provide a stabilizing influence by promoting sustainable returns. These investors mitigate short-termism by engaging in active ownership, supporting transparency, and fostering innovation. Their voting power often incentivizes firms to improve governance and pursue long-term value.

Recent research by Carlsson-Wall et al. (2021) challenges the prevailing narrative of financial short-termism in Sweden. Analyzing dividend policies of 786 Swedish firms between 2000 and 2019, the study found that 44% of companies did not pay dividends, and those that did were primarily in the mature phase of their life cycle. Firms with high payouts also demonstrated strong profitability and sustainability, suggesting efficient capital reallocation rather than harmful short-termism. The Nordic Corporate Governance model, emphasizing concentrated, long-term ownership, appears to mitigate short-term pressures. This contrasts with the Anglo-Saxon model focused on shareholder primacy. The study's findings align with this governance framework, indicating that Swedish public firms balance profitability with sustainable practices effectively. We contribute to this literature by studying the same research area but using a different methodology which gives new perspectives and explanations into the subject.

This paper extends the work by Asker et. al (2014), who investigated the effects of short-termism on corporate investment decisions by comparing the behavior of public and private firms in the U.S. market. Their study used a dataset on private U.S. firms and concluded that public firms tend to invest less and are less responsive to changes in investment opportunities. We aim to extend their analysis in the Swedish context, a market that has unique corporate governance structures, shareholder distribution, and high concentration of institutional ownership compared to the U.S. Our study seeks to determine whether similar pressures of short-termism exist in Sweden.

2. Sample and Data Description

For our dataset that contained both private and public firms, we utilized the Swedish House of Finance database called Serrano. In Sweden, all firms are obligated to disclose their financial statements on a yearly basis, with further reporting obligations for public firms. However, few datasets are available that contain financial information for private firms. Without access to such data, it would have been impossible to conduct this research. The Serrano database provided us with the ability to efficiently collect relevant financial statements data for all Swedish firms.

After downloading all data from the Serrano database, using the Unarchiver (7zip equivalent) all data was extracted (bokslut.dta, ftg.dta, and nyckeltal.dta). We used Stata to extract the relevant variables from the Serrano database, identifying firms by their unique organizational number. The organizational number allowed us to collect information on all Swedish firms in a standardized format. However, the Serrano database does not contain an explicit variable to indicate whether a firm is publicly listed or not. To overcome this limitation, we identified public firms using the organizational numbers and cross-referenced them with data from other sources. Specifically, we collected data from Refinitiv datastream. We filtered to contain only firms listed on the Stockholm Exchange and incorporated in Sweden, in order to obtain organizational numbers and other financial information, such as market value and deferred taxes. We filtered the data to include both "*Active*" and "*Dead*" statuses in Refinitive Datastream, ensuring we capture all public firms, including those still active and those that have delisted, to include observations up to the delisting date.

This process enabled us to create two separate datasets: one for private firms and another for public firms. We separated the dataset by cross-referencing the organizational numbers from the Serrano dataset with those found in the Refnitive datastream, thereby ensuring that all listed firms were accurately categorized as public firms. The Refinitiv datastream provided additional firm-level characteristics for public firms, allowing us to calculate Tobin's Q and other proxies for investment opportunities. During the study period (2000-2011), the database for all firms (Serrano file called bokslut.dta) covered 3,625,235 firms-years in Sweden, of which 3,482 belonged to public firms.

2.1 Sample Cleaning

The Serrano database contains data for all Swedish firms. To construct our sample, we first filtered the dataset to retain only observations within our study period (2000-2011). While Asker et al. (2014) used the time period 2001-2011 (2002-2011 after using lag variables to create investment measures). Our smaller sample size for public firms required us to use a longer time span, (2001-2011 after using lag variables to create investment measures) to increase the robustness of our results and ensure statistical power in our analysis.

For the sample construction for public firms we excluded all group companies to ensure that we had firm-level financial data (keeping all observations with a "*B*" value under *BSTYP* column in Serrano database). This is because we want to analyze investment behaviors and sensitivities at firm level, rather than at group level.

Asker et al. (2014) removes industry codes associated with financial firms (NAICS equivalent to SIC 6) and regulated utilities (SIC 49). These industries were excluded because their investment behaviors are highly influenced by industry-specific regulations and financial reporting requirements, which could introduce biases into comparisons with other sectors. We removed the corresponding Swedish equivalent "Standard för svensk näringsgrensindelning" (*SNI*) codes to avoid these biases in our sample. The SNI codes that we removed are the following: 68100, 68201, 68202, 68310, 64190, 64990, 64301, 64303, 64304, 64921, 64922, 64923, 65201, 65202, 35110, 35120, 35130, 35210, 35220, 36000.

Thirdly, we filtered the dataset to retain only companies with the legal form code (*JURFORM* in Serrano) 49, which corresponds to "Övriga Aktiebolag" (AB). Companies with missing or negative total assets were also excluded, as they would not contribute meaningfully to our analysis. Finally, to be part of the public dataset, the firms needed to have at least three years of consecutive data to construct panel data, be listed on the Stockholm exchange (as defined by Refinitiv Eikon) and be incorporated in Sweden. This left us with a public sample containing 2,366 firm-year observations, with 316 unique organisation numbers.

A major challenge in this analysis is the very large difference between the private and public samples. To ensure we don't retain any extreme values in the private data set, additional cleaning processes were made to ensure better comparability between our full samples. Firstly, we excluded all group companies to ensure that we had firm-level financial data (keeping all observations with a "*B*" value under *BSTYP* column in Serrano database). Again, this is because we want to analyze investment behaviors and sensitivities at firm level, rather than group level. This left us with a dataset of 3,487,007 private firm-years.

Secondly we filter on the Serrano variable "*STATUS*" to ensure all private firms were active by the end of the calendar year. If a firm was not active at the end of the calendar year they were removed from that calendar year. Furthermore if a firm has gone bankrupt (Serrano item *bol_konkurs*), liquidated (Serrano item *bol_q31dat*) or deregistered (Serrano item *bol_q52dat*) during the calendar year they were removed from that calendar year. This allowed us to exclude any sort of extreme values which may have caused any skewness to our database otherwise. This left us with a dataset of 3,103,895 private firm-years.

Thirdly, we filtered the dataset to retain only companies with the legal form code (*JURFORM* in Serrano) 49, which corresponds to "Övriga Aktiebolag" (AB). This was done to focus our analysis on comparable corporate entities, ensuring consistency across the sample. Companies with missing or negative total assets or sales were also excluded, as they would not contribute meaningfully to our analysis. At this stage we were left with 795,112 firm-year observations for our private sample.

To be able to estimate Tobin's Q and industry Q for private firms as explained under section 2.4, all private firms must have a corresponding year and industry Q to our public sample. To ensure this, we kept only observations in the private dataset with matching industry codes to those in the public. In addition to this, we further filtered the dataset by excluding certain companies based on their SNI code (industry classification), including real estate firms, investment trusts, mutual funds, closed-end funds, financial firms, and regulated utilities, as previously motivated. The following SNI codes where those that we decided to include based on both of these criterias: 7100, 9100, 9900, 10611, 11010, 11070, 15120, 17123, 18130, 19200, 21200, 24100, 25999, 26110, 26300, 26510, 26700, 27900, 28230, 28240, 28250, 28290, 29320, 30300, 31090, 32501, 33160, 33200, 42110, 42220, 43210, 46120, 46360, 46380, 46420, 46432, 46434, 46460, 46491, 46499, 46510, 46521, 46522, 46699, 46720, 46731, 46750, 47522, 47532, 47911, 49420, 50202, 52290, 56100, 58210, 58290, 59120, 61100, 61200, 62010, 62020, 63120, 64201, 64202, 64920, 64991, 64992, 64993, 66190, 66220, 68203, 68320, 69201, 70220, 70100, 71122, 71123, 71124, 71129, 71200, 72110, 72190, 72200, 74102, 74204, 74900, 78200, 79110, 82910, 90020, 92000, 93111, 93120, and 96090.

Additionally, we retained only those firms with at least three consecutive annual observations to facilitate the construction of lagged variables and ensure at least two years of complete panel data. This approach enabled us to exploit within-firm variation effectively, similar to the methodology used in the original study. This left us with 48,853 firm-year observations for 7,696 unique organisation numbers. See Figure 1 for the total number of firms entering and exiting our data set during the time period.

We followed the Fama-French (1997) industry classification, using 30 industry definitions to plot the industry distribution of our full public and private firms in Figure 2. While the cleaning process is necessary to minimize extreme values and ensure comparability, a major challenge is the small sample of public firms which can decrease the statistical significance in our findings. However, with a smaller sample size, we have throughout the time period managed to maintain a high level of representation of the Swedish stock market which strengthens our findings.

All continuous variables in our data set were winsorized at 0.75% in each tail to reduce the effect of potential outliers. Our main paper, Asker et al. (2014) similar to us, chooses to winsorize all continuous variables, but at 0.5% in each end. However, as suggested by Wooldridge (2013), the choice of winsorization levels should take into consideration the size and characteristics of the sample, often recommending higher levels for smaller samples to maintain robustness. Following this, with smaller sample sizes, we thus choose to increase the winsorization to 0.75% in each tail. Finally, all variables, numbers, and figures are expressed, when relevant, in 2005 purchasing power, calculated using data from the World Bank (2024).

2.2 Matching

We approach the matching procedure using the programming language R (match package). This is in order to control for observable differences between public and private firms, where we follow previous literature such as Saunders and Steffen (2011) and Michaely and Roberts (2012). The aim is to identify firms that are similar in observable characteristics likely to influence investments, while minimizing the pressure of specific functional-form assumptions on the data, while adhering to the matching process described in Asker et al. (2014).

The benchmark match is based on size and industry, following previous literature Gao, Harford, and Li (2013). Prior to matching, private firms are much smaller than public firms in regards to total asset size. Table 1, Panel A displays the mean (median) of private firms total assets are SEK 54 million (SEK 1,4 million), while the mean of total assets for public firms are SEK 2,888 million (SEK 288 million). The top graph in Figure 3 displays the density and log10 total asset distribution, illustrating limited overlap. Its key to control for size in our analysis as Gala and Julio (2010) found that investment increases with firm size. By matching on size, we essentially control for asset differences by creating a sample of smaller public firms and larger private firms. Investment has also been shown to differ between industries (Jorgenson (1971)). Figure 2 shows the industry distributions of our private and public firms, differing to a limited extent, however, still warranting an inclusion of industry as an additional criteria in the benchmark match.

In our panel data study, we employ a nearest-neighbor matching procedure (Imbens and Wooldridge (2009)), incorporating industry-year constraints and an asset-ratio-based caliper. We start by combining public and private firm datasets, using four-digit Swedish SNI “Standard för svensk näringsgrensindelning” (NACE equivalent) industry codes and total assets. Firms are matched within the same industry and year, ensuring that the ratio of their total assets follows the procedure outlined in Asker et al. (2014):

$$Max(TApublic,\ TAprivate)\ /\ min(TApublic,\ TAprivate)\ <\ 2).$$

If no suitable match is found in the current year, the unmatched public firm is revisited in subsequent years until a match is located.

The matching is performed using nearest-neighbor techniques, treating public firms as treated units and private firms as controls. Once a public-private pair is formed, it is retained in subsequent years for consistency. If a matched private firm exits the dataset, a new match is identified and "*spliced in*", preserving the panel structure. Replacement is allowed for private firms, ensuring flexibility in the matching process, and the reuse of public firms is tracked and constrained at 3 times to avoid overrepresentation. The process iterates through each industry and year, performing matching independently within each subset of the data. Matched pairs are filtered post-matching to enforce the asset ratio constraint. Matches from previous years are prioritized, and unmatched firms are considered for new matching opportunities.

The final benchmark matched sample includes 4,836 firm-years for the private and public samples respectively, containing 593 private firms and 244 public firms. Figure 3 bottom graph shows the size distribution of the benchmark matched samples, displaying a high level of similarity in distribution. By allowing resamplings of public firms, we increase our sample size which can lead to more robust statistical inference and improved comparability. However, we note that this comes with the risk of overrepresentation.

Two statistical tests of quality are conducted to evaluate match quality, see Table 7. The first is Hotelling's T^2 test, which rejects the null hypothesis that the means of total assets are equal across groups (p-value = 0.003). While this suggests a statistically significant difference in the means, the practical magnitude of this difference is small, as evidenced by the second measure. The second test is Rosenbaum and Rubin's (1985) SDIFF test. Rosenbaum and Rubin propose that a value larger than 20 raises concerns about the balance between matched groups. In our sample, the standardized difference (SDIFF) is 6.0, indicating that the groups are adequately balanced in practical terms. Overall, these findings suggest that despite minor differences in group means, the matched sample is sufficiently robust for further analysis.

We performed further matching procedures using additional criteria to control for other differences. To account for lifecycle effects, following Asker et al. (2014), we began with the benchmark matching procedure on size and industry but also included firm age. Asker et al. (2014) does not explicitly describe the matching procedure based on age, so following previous literature, we categorized firms based on years since incorporation: younger firms (0-5 years), growth stage (5-10 years), maturity stage (10-20 years), and established firms (20+ years). Categorizing firms by these age-based maturity stages provides a more economically relevant comparison by ensuring that matched firms have similar operational challenges. By grouping, we reduce over-filtering that occurs with strict age matching. This approach is consistent with several organizational growth models and firm life cycle theories, such as those proposed by Greiner (1972) which argue that firms in the same lifecycle stage share comparable behaviors and challenges, making them more suitable counterparts for analysis. The match resulted in 4,078 firm-year observations for private and public firms respectively, with 490 private firms and 234 public firms.

Further following Asker et al. (2014), we also matched on retained earnings to control for lifecycle effects. Again, we used the benchmark match approach based on industry and size but added retained earnings scaled by the beginning-of-year total assets. This measure ensures that financial health and profitability profiles are taken into account during the matching process. The retained earnings metric reflects a firm's ability to retain earnings relative to its asset base, thereby providing insight into the firm's stability and financial maturity. For this matching, we combined public and private firms and used multiple covariates to perform nearest-neighbor matching. The match resulted in 4,393 firm-year observations for private and public firms respectively, with 466 private firms and 235 public firms.

To control for economic effects pre- and post-financial crisis, we conducted two separate matches exactly like the benchmark procedure, but each dataset filtered to only include either pre- or post-financial crisis periods, consistent with Asker et al. (2014). The pre-crisis resulted in 2,005 firm-year observations for private and public firms respectively, with 368 private firms and 169 public firms. The post-crisis resulted in 1,545 firm-year observations for private and public firms respectively, with 353 private firms and 184 public firms.

Finally, to create a more comprehensive benchmark, we expanded our original matching approach by incorporating several key financial and operational metrics. Specifically, following Asker et al. (2014) we matched firms based on industry and asset size (benchmark match), and then added return on assets (ROA), leverage, sales growth, and cash holdings as additional matching variables, using the same method as the benchmark match. This multiple covariate matching allowed us to better control for differences in profitability, capital structure, growth potential, and liquidity between public and private firms. The match resulted in 2,679 firm-year observations for private and public firms respectively, with 304 private firms and 203 public firms.

2.3 Measures of Investment

There are various measurements of investment. Asker et al. (2014) primary investment measure is labeled "Gross Investment", which is the annual increase in gross fixed assets, i.e., gross property, plant, and equipment (Compustat data item ppegt or its Sageworks equivalent, GrossFixedAssets) scaled by beginning-of-year nominal total assets. The paper also employs other investment metrics such as net investment (by adjusting for depreciation), gross- and net investment in non-current assets, growth in total assets, and CAPEX with- and without R&D.

This study employs a comprehensive set of similar investment measures to capture the nuanced investment behaviors of public and private firms in Sweden. See Appendix A for all variable definitions. However, certain limitations in the database prevented us from utilizing specific measures, such as capital expenditures (Capex) and "Gross Investments." Notably, the database lacks a cash flow statement, which typically includes detailed items related to investing activities. Additionally, the Serrano database aggregates certain items from the balance sheet and income statement, making it challenging to distinguish between gross investments in property, plant, and equipment (PPE) and research and development (R&D), among others. Despite these constraints, we have developed a robust set of investment measures that align closely with those employed by Asker et al. (2014).

The primary measure of investment is annual increase in gross non-current assets scaled by beginning of the year total assets. Gross non-current assets represent the firm's capacity expansion, including investments in physical assets such as property, plant, and equipment, as well as long-term financial investments and leased assets. By scaling the annual increase in gross non-current assets by the beginning-of-year total assets, we derive our main measure of gross investment. This measure is particularly valuable because it reflects the firm's commitment to expanding its productive capacity, serving as a direct indicator of growth intentions and strategic long-term investment. By focusing on gross non-current assets, we can analyze firms' forward-looking investment decisions, demonstrating that firms allocate resources to enhance future productivity and competitiveness.

Net non-current assets scaled by the beginning of the year total assets are also employed to provide deeper insights into firm-level investment. Net non-current assets account for depreciation, which can be systematically scheduled based on asset type and expected useful life, offering a more refined perspective on changes in long-term assets after accounting for wear and tear.

Moreover, limited by our database, we employ two "net" investment measures. We use net investment in R&D and net investment in fixed assets, both scaled by beginning of the year total assets. Net investment in R&D effectively captures a firm's focus on innovation and long-term growth. Separately, net investment in fixed assets reflects the firm's commitment to maintaining and expanding its operational infrastructure. Together, these measures allow for a nuanced analysis of how firms allocate resources between innovation and tangible asset growth.

In addition, growth in total assets scaled by the beginning of the year total assets is utilized as a broader measure of investment activity. This measure captures the overall change in total assets, encompassing both tangible and intangible investments, as well as changes in working capital, thereby reflecting the firm's entire expansion strategy beyond physical capacity. Asset growth is a valuable investment metric as it considers all forms of investment, including intangibles such as intellectual property, brand equity, and goodwill.

The reason for using growth in gross non-current assets as our primary measure is that depreciation schedules can be inconsistent across firms, where we argue that gross investments better allows us to capture firms investment's. This investment measure also captures capital allocation decisions that align more closely with long-term growth and sustainability.

2.4 Measures of Investment Opportunities

To approximate investment opportunities, we use several measures throughout our analysis. The primary proxy employed in this thesis is sales growth, which is commonly used as an indicator of investment opportunities. This choice is supported by literature, including studies by Lehn and Pulsen (1989), Bloom, Bond, and van Reenen (2007), and Michaely and Roberts (2012).

In addition to sales growth, we also use Tobin's Q as a proxy for investment opportunities, widely supported in literature such as Hayashi (1982). Tobin's Q is typically calculated as the ratio of a firm's market value to its book value of assets:

$$Tobin's\ Q \ = \frac{Market\ Value + Preferred\ Stock + Long{-}term\ Debt + Short{-}term\ Debt - Deferred\ Taxes}{Total\ Assets\ (Beginning\ of\ the\ year)}$$

However, since private firms are not publicly listed, they lack observable market values. To estimate Tobin's Q for private firms, we follow the methodology suggested by Campello and Graham (2013). Specifically, we use an OLS regression in R (lm package), incorporating variables such as sales growth (G), return on assets (ROA), net profit/loss for the year (π), book leverage (L), and year and industry fixed effects. ROA is defined as adjusted operating profit or loss after financial income, scaled by beginning-of-year total assets. Using the resulting regression coefficients, we generate a predicted Tobin's Q for each firm, both public and private. See table 8 for the summarizing model of Tobin’s Q:

$$Tobin's\ Q = \alpha G_{it} + \beta ROA_{it} + \gamma\pi_{it} + \lambda L_{it} + \varphi_{j} + \eta_{t} + \varepsilon_{it}$$

For robustness, we use two versions of Tobin’s Q. The first is the predicted Tobin’s Q as described above. The second is an industry-level Tobin’s Q, calculated as the size-weighted average Q of all public firms in the same five-digit industry (SNI code) for each year:

$$Industry\ Q_{i,t} = \frac{\sum_{j \in Industry} (Tobin's\ Q_{i,t-1} \times Total\ Assets_{j,t-1})}{\sum_{j \in Industry_{i}} Total\ Assets_{j,t-1}}$$

This approach ensures that our analysis considers both firm-specific and broader industry-level perspectives on investment opportunities.

2.5 Firms characteristics

Table 1, Panel A demonstrates that, after matching on size and industry, private firms tend to be younger and exhibit higher return on assets (ROA), higher debt levels (leverage), and greater retained earnings and lower dividend payouts compared to public firms. These patterns align with findings from Asker et al. (2014) and reflect differences arising from the distinct ownership structures of public and private firms.

Consequently, these characteristics mentioned above are not aimed to be eliminated through our matching process. The goal of the matching process is not to remove all differences between public and private firms, but to make them comparable in ways that are expected to influence the outcome of interest which in this case is investment behavior. Matching on variables that are not related to the outcome can make the sample less representative of the overall population. In other words, while we could make matched firms very similar in many ways, doing so would reduce how well the sample represents the broader group of firms, which would weaken the generalizability of our findings.

3. Public vs. Private Firms' Investment Patterns

It is important to note that our approach uses private firms as a comparison, or a counterfactual to show how public firms might invest if they were not influenced by short-term pressures from the market. We present the results of our study to evaluate whether our findings align with our hypothesis. We begin by examining differences in investment levels.

3.1 Primary Investment Measure: Investment Levels

Our results indicate that public firms appear to invest more than their private counterparts. In Table 2, Panel A row 1, when observing the increase in gross non-current assets on an annual basis for the full sample, private firms show an average of 8%, while public firms invest an average of 5%. However, in the subsequent row, where we match private and public firms by size and industry (benchmark match), we see no difference in investment levels. Here, both private and public firms invest an average of 4%. Yet, Figure 4 indicates that public firms, on average out-invest private firms on average in 7 out of 11 years. During the four years when private firms out-invest public firms, there is a difference of larger magnitude, possibly explaining why their means are overall equal.

We ensured the robustness of these findings by applying additional matching procedures. When matching on age in addition to industry and size, public firms increase on average gross non-current assets by 4%, compared to private firms of 4%. Matching on size, industry, age, ROA, leverage, cash holdings and investment opportunities (sales growth), public firms invest more than private on average (5% compared to 4%). Finally, comparing investment levels pre and post the financial crisis, public firms increased gross non-current assets on average by 5% and 4% respectively, while private firms increased gross non-current assets by 5% and 3% respectively.

To summarize, using our primary investment measure, public firms invest more, or the same as private firms on average across all of our matched samples. Our findings also indicate that the difference in the median investment levels between private and public firms is much smaller compared to the mean difference (see Table 1, Panel A). This pattern is also consistent with the findings of Asker et al. (2014), who note that lumpiness is commonly observed when comparing investments between private and public firms, and which is why averages are more commonly used. We can therefore conclude that similar trends exist within the Swedish market as well.

Following the argument of Asker et al. (2014), we also investigated whether the observed investment behavior was driven by outliers in our private and public datasets. Table 2, Panel B reveals that in our benchmark match sample, public firms actually out-invest private firms above the median across all percentiles, except at the 95th percentile, where private firms out-invest public firms by 1.0%. These findings suggested that private firms' average investment levels are more driven by the right tail of distribution compared to public firms. This indicates that while the mean investment levels of private and public firms are similar, the distribution of private firms' investment is skewed by a small subset of firms with exceptionally high investments.

One possible explanation that could clarify our findings would be to understand if public firms in Sweden have access to better investment opportunities and therefore invest more than private firms. We tested this causation by estimating the following equation in R using the lm package, holding investment opportunities and profitability (ROA) constant:

$$\frac{I_{it}}{A_{it-1}} = \alpha PUBLIC_i + \beta\left(\frac{S_{it}-S_{it-1}}{S_{it-1}}\right) + \delta\left(\frac{Z_{it}}{A_{it-1}}\right) + \varphi_j + \eta_t + \varepsilon_{it}$$

Equation (1) where, i, t, and j represent firms, fiscal years and industry, respectively. The variable I denotes one of the investment measures introduced in Table 2, Panel A. A represents total assets, Z is operating income before depreciation and S stands for sales. *PUBLIC* is a dummy variable indicating whether the firm is listed on the stock market. To address unobserved industry-level heterogeneity, we include SNI codes (Standard för svensk näringsgrensindelning) for industry fixed effects and year effects to account for common trends. Standard errors are clustered at the firm level in the conventional way (see Table 3, Panel B). The ratio Z/A represents ROA (Return on Assets).

Table 3, Panel A presents the results of estimating equation (1). Column (1) displays the full sample, reporting at more than 1% significance that public firms invest 2.2% less than private. However, looking at matched samples, this pattern is no longer observed.

In our benchmark matched sample in Column (2), the public dummy has a positive coefficient, suggesting public firms invest more even after holding investment opportunities and ROA constant. However, as also reported, the magnitude is less than 0.001, and not statistically significant.

For additional robustness, Column (7) to (10) reports the estimates for our primary investment measure (gross investment in non-current assets) across the other matched samples. The pre and post crisis samples reveal that public firms invest less (0.9%) before the crisis, but more post crisis (1.2%), both statistically significant at 10% or less. When matching on age, public firms invest less, with a negative coefficient estimate, however, not statistically significant. Column (10) reports the matched sample on size, industry, ROA, sales growth, leverage and cash holdings suggest the contrary, where public firms invest 0.3% more, however also not statistically significant.

The analysis reveals mixed findings regarding the investment behavior of public and private firms. Coefficient estimates indicate both positive and negative effects for public firms, though the magnitudes are minor and have various degrees of statistical significance. Notably, public firms appear to have invested less than private firms during the pre-crisis period but more during the post-crisis period, with both findings significant at the 10% level or less. These results suggest that the relationship between public listing and investment behavior is context-dependent. Finally, the primary investment measurement with the benchmark sample, does suggest that public firms invest marginally more than private. The majority of the standard errors clustered at firm level reported in Table 3, Panel B, is of larger magnitude relative to the estimated coefficients reported in Table 3, Panel A, suggesting that the estimated relationships lack precision.

3.2 Primary Investment Measure: Investment Sensitivities

Our results from Table 2, Panel A and Table 3, Panel A shows that public firms on average invest more than private firms with the primary investment measure. This is consistent across the majority of our matched samples, even after controlling for profitability and investment opportunities.

Considering the fact many companies decide to go public because they want access to cheaper investment capital (Brau and Fawcett (2006)), it could be expected that public firms out-invest private. At the same time, public firms have higher payout ratios than their private counterparts (see Table 1, Panel A). This might suggest public firms prioritize dividend payouts before investing in NPV positive investments. However this myth was disproved by Carlsson-Wall et al. (2021) who showed that high dividend payouts do not necessarily imply short-termism or come at the expense of growth. In order to get a more granular view on differences between public and private investment behaviours, we examined how both types of firms responded to changes in investment opportunities.

Following Asker et al. (2014) approach to neoclassical Q theory, firms should increase investment as opportunities improve, until marginal Q equals one. The sensitivity of private firms remains largely unknown in Sweden, making a comparison between public and private firms interesting. Next, adhering to Q-theory literature, we estimate the following regression in R, using the plm package for panel data firm fixed effects:

$$\frac{I_{it}}{A_{it-1}} = \alpha\left(\frac{S_{it}-S_{it-1}}{S_{it-1}}\right) + \beta\left\{PUBLIC_i \times \left(\frac{S_{it}-S_{it-1}}{S_{it-1}}\right)\right\} + \delta\left(\frac{Z_{it}}{A_{it-1}}\right) + \phi\left\{PUBLIC_i \times \left(\frac{Z_{it}}{A_{it-1}}\right)\right\} + \mu_j + \eta_t + \varepsilon_{it}$$

The variable *I* denotes one of the investment measures. *A* represents total assets, *Z* is operating income before depreciation and *S* stands for sales. *PUBLIC* is a dummy variable indicating whether the firm is listed on the stock market. Equation (2) takes into account firm fixed effects (firm's organisation number), which means we control for characteristics that are specific to each firm and don't change over time. This helps us look at how changes within the same firm, like changes in investment opportunities, affect that firm's investment behavior. Fixed year effects are also included to account for common trends. Additionally, by adding an interaction with an indicator that identifies public firms, we can directly compare how public and private firms respond to changes in their investment opportunities. Standard errors are clustered at the firm level in the conventional way (see Table 4, Panel B). The ratio *Z/A* represents ROA (Return on Assets).

3.2.1 Baseline results: Investment Sensitivities

Table 4, Panel A reports on investment sensitivities across different investment measures and matched samples by estimating equation (2). Table 4, Panel B presents standard errors clustered at the firm level in the conventional way. ROA plays a complementary role in this analysis. Its inclusion ensures robustness and serves as an important control variable (as in equation (1)) but does not provide direct insights into the responsiveness of firms to external investment opportunities.

Column (1), displays that public firms in our benchmark match are more sensitive to changes in investment opportunities than private firms using sales growth as a proxy for investment opportunities. The coefficient estimate for private firms of (less) than 0.001 + 0.003 = 0.0031 coefficient estimate for public firms. This means that as investment opportunities increase, investments increase by 0.031%. The difference between these estimates is significant at < 1% level using a Wald test.

We additionally estimate equation (2) using quantile regressions for each investment decile in Figure 5. The results show higher investment sensitivities among public firms only in the higher deciles (starting from between the 5th and 6th deciles). This suggests that larger firms (in larger deciles) exhibit greater investment sensitivity differences. However, the confidence interval lines demonstrate statistical uncertainty. While the sensitivity differences in higher deciles are more prominent, the confidence intervals for lower deciles suggest that sensitivity differences are minimal and not statistically significant in those ranges.

Column (2) investigates investment sensitivities for the benchmark sample between both pre and post financial crisis periods. The pre-crisis period confirms that public firms are more sensitive to changes in investment opportunities than private firms with both estimates significant at 10% or more. The same pattern is true for the post period as well, but to an even larger degree. Interestingly, public firms did not see reduced investment sensitivity during the crisis period, but rather increased it.

Again, the majority of the standard errors clustered at firm level reported in Table 4, Panel B, is of larger magnitude relative to the estimated coefficients reported in Table 4, Panel A, suggesting that the estimated relationships lack precision.

3.2.2 Sampling Bias and Methodological Adjustments in Investment Sensitivity Analysis

The results insofar suggest that public firms exhibit marginally higher investment levels compared to private, despite controlling for ROA and investment opportunities across the majority of our matched samples. Public firms also react better to changes in investment opportunities. Though with varying degrees of statistical significance and precision. To further investigate differences in investment between public and private firms, we review our sampling, measurement and methodological choices.

To investigate whether our model for investment sensitivities is more appropriate for public firms than private, we estimate the same model but only include matched private firms (Table 4, Panel A, column (3)). The results suggest the model might not be suitable for the matched private firms. With a non-statistically significant estimate of less than 0.001 for investment opportunities and a statistically significant negative estimate for ROA, the results suggest that as private firms become more profitable, they invest less.

To further explore the model setup in relation to private firms, we examine the full sample of private firms (column (4)). The results indicate that the matched sample of private firms only, is not very representative of the full sample of private firms. Column (4) displays contradicting estimates to column (3). The results of a 0.5% investment sensitivity for investment opportunities, significant at less than 1%, in addition to a positive ROA coefficient of 1.1%, also significant at less than 1%. This revelation positis that our replication of the matching procedure described in Asker et al. (2014) might have oversampled private firms with a lower magnitude of investment sensitivities.

Analyzing whether the benchmark sampling procedure has oversampled private firms with low investment sensitivities, we examine how investment sensitivities vary with firm size. Figure 6 plots the full sample of private firms, divided into 10 size deciles based on total assets. The results show consistent sensitivities above 0.04 across most deciles, except for the majority of larger deciles. Specifically, the 9th largest decile, exhibits lower sensitivities, only slightly above 0.02. In comparison, our benchmark matched sample shows a sensitivity coefficient of less than 0.001 (Table 4, Panel A, column (3)). This discrepancy suggests that the benchmark matching procedure may have oversampled private firms with lower investment sensitivities. This outcome is not surprising, as the matching procedure includes firm size (total assets) as a criterion. As discussed in Section 2.2, the matching procedure effectively creates a sample of larger private firms and smaller public firms. Given the observed trend in the full sample, where larger private firms exhibit lower investment sensitivities, this could explain the low sensitivities in the benchmark match.

In conclusion, while the benchmark match does not appear representative of the full private sample due to the size-based criteria in the matching procedure, this discrepancy does not necessarily imply that the matching process is flawed. Matching is designed to ensure comparability between public and private firms on observable characteristics, and differences in coefficients may reflect purposeful exclusion of heterogeneity in the full sample.

Moreover, our matching criterias in our benchmark match (industry and size) might end up comparing the worst performing private firms to our public firms. To further investigate this, we expand our matching criteria following Michaely and Roberts (2012) and match to include size, sales growth, ROA, book leverage, cash, and industry in column (7). This allows for a better comparison between firms with similar performance. Column (7) shows an investment sensitivity of similar magnitude for private firms as the full sample in column (4), significant at less than 1%. Although column (7) seemed to have improved representation of private firms, public firms still exhibit a higher sensitivity of 0.003+0.007=0.01% coefficient estimate for public firms.

Finally, to increase robustness and to analyze differences in investment proxies used for investment opportunities, we estimate the same equation (2) but using predicted Tobin's Q and industry Q. This leaves our results unchanged. Public firms continue to experience higher investment sensitivities.

3.3 Firm Characteristics and Matching Criteria

The previous section indicates that the differences in investment sensitivities we observe could be due to issues with the matching procedure, were we inadvertently oversample larger private firms with lower investment sensitivities. We now conduct further robustness tests to see if other matching criteria based on firm maturities provide further insights.

3.3.1 Differences in lifecycle

We aim to determine if differences in firm maturity or age can explain the variations in investment sensitivity and the possible oversampling we have observed. Our reasoning is based on Jovanovic and Rousseau's (2014) idea that younger firms might incur lower costs when adopting new technologies, which makes them more responsive to changes in investment opportunities. We thus control for potential lifecycle differences between our datasets to further investigate if they could account for the disparities in their investment sensitivities.

Thereby, following Asker et al. (2014) we employ two complementary approaches. First, we develop our size-and-industry matching criteria by incorporating the ratio of retained earnings to total assets (RE/TA). We note that firms with low RE/TA ratios are typically in the growth stage of their lifecycle, while firms with higher ratios are more mature. Second, we use firm age, categorized in different life cycles as a direct measure of maturity, assuming that older firms are likely to be further along in their lifecycle.

Table 5, Panel A reports the results. Column (1) displays the match on retained earnings in addition to size and industry. While private firms exhibit increased investment sensitivities compared to the benchmark matched sample, public firms continue to show higher sensitivities. However, when matching on age, public firms' advantage is no longer observable and private firms exhibit higher investment sensitivities.

The findings indicate that accounting for maturity narrows the gap in investment sensitivity between private and public firms. This shows the importance of considering lifecycle stages when analyzing investment behavior. The results suggest that maturity is a key determinant of investment sensitivity differences between private and public firms. By accounting for lifecycle stages using RE/TA and firm age, it becomes evident that maturity reduces the observed advantage of public firms in investment sensitivity and may even reveal a private firm advantage under certain conditions.

These results do however come with varying degrees of statistical significance and as consistent with previous models, the majority of the standard errors clustered at firm level reported in Table 5, Panel B, is of larger magnitude relative to the estimated coefficients reported in Table 5, Panel A, suggesting that the estimated relationships lack precision.

3.3.2 Robustness Analysis: Enhanced Matching and Investment Sensitivity

As concluded in section 3.2.2, we established a potential bias in our sampling procedure. As evident when comparing the results from Table 4, Panel A, column (4), which estimates Equation (2) for the full sample of private firms, to those in column (3), which focuses only on matched private firms. However, when matching on additional criterias, specifically industry, size, ROA, sales growth, leverage and cash holdings, the results (Table 4, Panel A column (7)) show higher representativeness of the full sample. This suggests our analysis might be sensitive to changes in the matching procedure. To increase the robustness of our study, we replicate Table 5, Panel A, but using the match sample on industry, size, ROA, sales growth, leverage and cash holdings, instead of the benchmark match, in Table 6, Panel A.

We estimate equation (2) the same as before. Table 6, Panel A, columns (3) to (8) presents the new findings of this robustness check. The results in column (3) show increased investment sensitivity estimates for private firms, significant at $< 1\%$. Despite this, our conclusion remains unchanged. Public firms show higher sensitivity of $0.003+0.007 = 0.01$, significant at $< 1\%$. These findings underscore the robustness of our analysis to variations in the matching procedure and support the validity of our main conclusion. However, the large standard errors clustered at firm level reported in Table 6, Panel B again suggests that the estimated relationships lack precision.

3.3.3 Other Investment Measures

Our main investment measure so far has been an annual increase in gross non-current assets, scaled by the beginning of the year total assets which has been used across various matched samples. Private and public firms might invest differently in other investment measures such as R&D, tangible fixed, total assets and net non-current assets (due to depreciation differences). To further increase robustness, we now investigate differences in investment levels and sensitivities across other investment measures.

Table 2, Panel A displays unconditional investment levels for the three other specified investment measures. Row (3) displays the average investment levels in net non-current assets for private firms is 1%, compared to 0% for public. Row (4) shows that in our benchmark match on size and industry, private firms grow on average 34% annually, while their public counterparts only grow 19% annually. The average for net investment into R&D and tangible fixed assets are both 0%.

Table 3, Panel A estimates equation (1), holding ROA and investment opportunities constant. Column (3) to (6) displays the estimate results for the other investment measures in our benchmark match sample on size and industry. While neither of the estimates show any statistical significance, the results show with a small magnitude, a positive coefficient estimate for the public dummy variable across all measures except for row (6) which displays that public firms grow 4% less in total assets.

Table 5, Panel A estimates equation (2) the same as before, where columns (4) to (7) displays the results for the other investment measurement in our benchmark matched sample. The trend of public firms showing higher levels of investment sensitivity persists. With varying degrees of statistical significance, public firms report positive coefficient estimates across all columns (4) to (6). However, again private firms show higher investment sensitivity in total assets growth with high statistical significance > 1%.

As discussed Table 6, Panel A extends Table 5, Panel A but includes a new matched sample. Specifically on, industry, size, ROA, sales growth, leverage and cash holdings for columns (3) to (8). The other investment measures reported in columns (4) to (7) are again consistent with previous findings. Across all specified columns, public firms exhibit higher investment sensitivities except for column (7), growth in total assets. This has high statistical significance across all coefficient estimates of < 5%.

In sum, unconditional investment levels reveal that private firms invest more in net non-current assets and experience significantly higher total asset growth annually, whereas R&D and tangible fixed asset investments remain comparably low for both groups. Table 3, Panel A reports a small magnitude positive coefficient estimate for the public dummy variable for investment into R&D. This is consistent with Brown, Fazzari, and Petersen (2009) who showed how an IPO often resulted in an increased spending in R&D, suggesting that IPOs are a commonly used source for R&D initiative. While public firms generally exhibit higher investment sensitivities across most measures, reflecting greater responsiveness to investment opportunities, private firms show a distinct advantage in total asset growth sensitivity, with high statistical significance.

3.4 Examining Leverage and Cash Holdings Effects

We also tested to see if the differences in investment behaviour between public and private firms can be explained by further observable differences after matching on size and industry. We hypothesize in a similar manner to Asker et al. (2014), that firms with less debt or more cash would be more susceptible towards investment opportunities. As seen in Table 1, Panel A, private firms have more leverage, i.e. debt than public firms, while both have the same amount of cash. However, as column (8) in table 5, Panel A displays, despite controlling for cash holding and leverage as additional regressors, the results remain unchanged, public firms are more sensitive to changes in investment opportunities. While not all coefficients are statistically significant, this further confirms the trend throughout our results where public firms are more sensitive to investment.

The additional robustness check conducted in Table 6, Panel A, column (8), when matching on industry, size, ROA, sales growth, leverage, and cash holdings confirms this. Despite private firms seeing increased investment sensitivities, public firms continue to outperform their private counterparts, with statistical significance. This consistent pattern across multiple specifications and robustness checks reinforces the validity of our conclusion: public firms are more sensitive to investment opportunities.

4. Discussion

The evidence in Section 3 does not support our initial hypotheses. We don't find conclusive evidence supporting short-termism among Swedish public companies between 2001-2011. While our results vary in statistical significance and precision, our findings do not support our hypothesis. As evident by our main results, using the primary investment measure of gross investments in non-current assets with the benchmark match sample, public firms exhibit higher investment levels. Despite holding ROA and investment opportunities constant, the trend continues with our benchmark sample. Public firms also experience higher investment sensitivity to changes in investment opportunities. These findings are robust across various matched samples. The results from section 3.3.3 "Other investment measures" are on the other hand rather inconclusive, but generally aligns with the main findings, across all measures except growth in total assets, where private firms consistently have outperformed public. In this section we will use theories and prior studies to investigate whether these results can be explained by academia and how they relate to previous findings. We will further discuss the limitations of our study to discuss how these could have affected the empirical results. Lastly we will give a recommendation regarding how the subject can be further studied and what insight we would see as valuable contributions to the research area.

4.1 Theoretical Implications for Investment Behaviour

Jensen and Meckling's (1976) agency theory suggests that the separation of ownership and control in public firms creates agency problems, where managers prioritize short-term gains over long-term value creation. The findings in our study challenge this framework in the Swedish context between 2001-2011. Although public firms may face significant shareholder and market pressures, our results reveal that they often invest more and exhibit greater sensitivity to investment opportunities compared to their private counterparts. This contradicts the conclusions of Asker et al. (2014), who found evidence of underinvestment among public firms in the US due to short-term pressures. A possible explanation lies in the unique corporate governance structures of Swedish firms, where institutional investors, such as state pension funds (Ehne, (2018)), exert considerable influence. As noted by Shleifer and Vishny (1990), concentrated ownership can reduce agency problems and foster investment in long-term projects. Our findings align with this argument, suggesting that public firms in Sweden might be under less pressure to meet quarterly earnings targets than their US counterparts. Institutional investors in Sweden may encourage strategic investments and innovation, as highlighted in research by Bhide (1993), which describes how owner-managed structures reduce information asymmetries and enable long-term decision-making. These investors, with their dual focus on financial returns and long-term sustainability, may help align managerial decisions with shareholder interests, mitigating agency problems. This finding is consistent with Medina et al. (2022), which argues that concentrated ownership structures can reduce short-termist tendencies by fostering closer oversight and longer-term planning.

This notion contrasts concerns raised in the literature (e.g., Christensen et al., 2008), where the use of metrics like Earnings Per Share (EPS) was shown to promote short-termism in public firms. However, the pecking order theory Myers & Majluf, (1984) posits that public firms' access to external financing allows them to pursue more aggressive investment strategies. Our findings, which show higher investment levels and greater sensitivity to investment opportunities among public firms, align with this theory. Unlike private firms, which rely on retained earnings and debt, public firms can leverage equity financing to fund growth-oriented projects, offering greater flexibility in seizing investment opportunities. This phenomena was particularly evident during periods of economic uncertainty, such as the 2008-2009 financial crisis as confirmed by our results, when public firms in Sweden continued to invest while private firms reduced their investment levels. Yet, public firms' continued investments during the crisis could have been driven by pre-existing liquidity, signaling needs, or strategic priorities rather than reliance solely on external equity financing.

Our empirical findings also align with Campello and Graham's (2013) work, which champions the importance of financing constraints in shaping firms' investment behavior. Public firms' ability to attract external funding and cheaper investment capital (Brau and Fawcett (2006)), allows them to respond flexibly to changes in investment opportunities, as reflected in our findings. Additionally, Carlsson-Wall et al. (2021) found in a recent study no material indications of financial short-termism among Swedish companies. The paper also showed that many firms that distribute significant dividends also maintain robust profitability and perform well in sustainability metrics which support the fact that the Swedish corporate governance model can mitigate short-term pressures.

In summary, our results contradicted what we initially hypothesized. Our findings also oppose the strong evidence presented in the main paper, Asker et. Al (2024) who found support for short-termism in the US market, despite similar methodology and investment measures in the Swedish market. Our findings are not necessarily inconsistent or invalid in their own context. Firstly, we applied the methodology to a new environment with a completely different economic landscape. Secondly, as discussed, there are many plausible explanations supported by established theories and studies that might mitigate short-term pressures in Sweden. Finally, our findings align with recent research on short-term pressures in the Swedish market.

4.2 Limitations and Comparability of Findings

Firstly, our results are not consistent with the idea of short-termism pressure affecting investment behavior in the Swedish market. The results from our empirical analysis in section 3 fails to establish if these differences are caused by unobservable differences or by whether a firm is public or not. Asker et al. (2014) attempts to address this by showing that their results are robust to the within-firm variation in listing status and uses an instrumental variable approach. However, due to lack of observations, we fail to replicate this analysis. Moreover, despite Asker et al (2014) addressing these concerns, the empirical strategies are still flawed, where the ideal setting would be a test that assigns a firm's listing status randomly.

Secondly, as revealed in section 3, another limitation became apparent with our methodology. The matching algorithm in the benchmark match used total assets to control for firm differences. As was later shown in our empirical analysis, the matching procedure seemed to have oversampled private firms with low investment sensitivities. The largest private firms in the dataset have lower investment sensitivities, causing the benchmark sample to inadvertently choose private firms unrepresentative of the full sample. Despite robustness efforts through the creation of 6 different matched samples, the representation of the full sample appeared lower across most matches despite improvement. In other words, the matching procedure appeared sensitive to different matching criterias despite following the methodology outlined in Asker et al. (2014). However, matching is designed to ensure comparability between public and private firms on observable characteristics, and the findings in itself valuable, where we compare public firms with their private counterparts.

Thirdly, the relatively small stock market in Sweden presents challenges in generating a large sample of public firms, especially after filtering and cleaning the data. While resampling public firms in the matching procedure increases the sample size, it introduces both advantages and risks. Resampling allows for more robust statistical analysis by addressing the limitations of a small dataset, enabling comparisons with private firms and improving the reliability of estimates. However, repeated use of the same observations may inflate certain variables, such as investment measures, leading to skewed results or overrepresentation of specific firms' characteristics.

Fourthly, Asker et al. (2014), used the Sageworks dataset, constructed by Sageworks Inc. In contrast to the Serrano database, containing data on all Swedish firms, the Sagework dataset contains data on selected private U.S. firms, with accounting data sourced from numerous accounting firms that input data for their private clients. This inherent selection process from Asker et al. (2014) clearly biases certain private firms, possibly decreasing comparability between our studies.

Fifth, our results differ from Asker et al. (2014) who found evidence for the hypotheses in the US market. One key difference between our private samples is we choose to only include the Swedish legal form "AB", Aktiebolag while the Asker et al. (2014) private data set contained three different legal forms for private firms. Sole proprietors, LLCs, and partnerships. This could be an explanation for our contradicting findings. Generally, the legal form AB tends to be a larger firm where agency problems might increase, thus removing observable differences between private and public companies. We made this concise choice to increase comparability in our study. Surprisingly, Asker et al. (2014) also found that investment sensitivities do not vary between legal forms in their private sample. This result is interesting since sole proprietors are by definition owner-managed. Moreover, LLCs, and partnerships, correlate strongly with concentrated ownership and little separation between ownership and control, hence little occasion for an agency problem to arise. This posits that our choice to only compare companies of the same legal form might not be the main cause for the contradicting findings.

Sixth, another limitation in our study was our ability to construct investment measures. As discussed in section 2.3, certain financial statement items were unavailable, or bundled. This implies we could not replicate the methodology using the same investment measures. Instead we used similar measures capturing different nuances, which also limits comparability to Asker et al. (2014).

Finally, while our empirical analysis covers the same time period as Asker et al. (2014), with the inclusion of data from 2001, our study extends its focus on the Swedish market rather than the U.S. market. Unlike Asker et al. (2014), who conducted an analysis to assess whether their results were specific to particular decades, we did not examine whether our findings are unique to the 2000–2010 period. This limits our ability to determine if our results are influenced by specific macroeconomic shocks, financial crises, or other time-bound factors.

4.3 Recommendations for Future Research

Future studies could extend our work and we recommend the use of quasi-experimental methods, such as instrumental variable approaches. This is to better isolate causal relationships between firm listing status and investment behaviors. Randomized control tests are challenging in this context, but improved observational techniques could advance our understanding of this research area. Future studies could also consider utilizing differences in regulations or market shocks as exogenous variables to address the endogeneity issues inherent in observational data. For instance, future researchers might leverage regulatory changes that affect only a subset of firms, such as changes in listing requirements or changes in corporate governance regulations. Such events can create a setting similar to random assignment, where the affected firms can be compared to unaffected firms, thus allowing for more robust causal inference.

The observed sensitivity of the analysis to changes in the matching criteria highlights the importance of carefully selecting matching variables to ensure representativeness. Future research could explore additional firm characteristics or alternative matching methods to further refine these estimates and account for potential unobserved heterogeneity.

5. Conclusion

This study explores whether short-termism influences the investment decisions of public firms by comparing the investment behaviors of public and private firms in Sweden, matched primarily by size and industry. While the results indicate that public firms exhibit higher investment levels and responsiveness to investment opportunities compared to private firms, these findings should be interpreted with prudence.

Our study reports data that show increased investment levels in public firms compared to private. Public firms are also more responsive to changes in investment opportunities. These findings contradict the general assumption of public firms suffering from short-termism and market pressure resulting in lower investment levels and a lower sensitivity to changes in investment opportunities. However it strengthens the conclusion made in domestic research which suggests that Swedish public firms may not be as prone to short-termism. Our results also highlight the resilience of public firms, which may be attributed to their ability to access external financing and the influence of concentrated institutional ownership in Sweden. Our study has several limitations that restrict the generalizability of our conclusions. The matching procedure, while robust, cannot fully eliminate potential biases arising from unobservable characteristics, and our reliance on observational data precludes definitive causal inferences.

This work contributes to the research agenda exploring the decision to go public, showing that in the Swedish context, public firms appear better positioned to avoid both short-term pressures and capitalize on long-term growth opportunities. Given the high number of firms going public in Sweden, these findings may offer important insights in explaining why and understanding the benefits of what mitigate this short-term pressures experienced in the US market.

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Appendix A. Variable Definitions.

Total_assets **(Total assets)** is Serrano's item "*TILLGSU*". It is reported in million SEK of 2005 purchasing power, deflated using the annual GDP deflator (World Bank 2024).

Sales_Growth (Sales growth) is net sales recognized (Serrano item *NTOMS*), calculated by: $\left(\frac{S_{it}-S_{it-1}}{S_{it-1}}\right)$, where, S, is net sales recognized.

Industry_Q (Industry Q) is an industry-level Tobin's Q, calculated as the size-weighted average Tobin's Q of all public firms in the same five-digit industry (SNI code) for each year:

$$Industry\ Q_{i,t} = \frac{\sum_{j \in Industry} (Tobin's\ Q_{i,t-1} \times Total\ Assets_{j,t-1})}{\sum_{j \in Industry_i} Total\ Assets_{j,t-1}}$$

Predicted_Q **and (Tobin's Q).** Firstly, Tobin's Q is calculated for all public firms. It is the sum of the market value (Refinitiv datastreamitem *MV*) multiplied by 1,000,000, total non-current liabilities (Serrano item *LSKSU*) and current liabilities to credit institutions (Serrano item *KSKKRIN*) subtracted by deferred tax (Refinitiv datastream item *DT*) multiplied by 1,000, all divided by the beginning of the year total assets (Serrano item *TILLGSU*).

$$Tobin's\ Q = \frac{Market\ Value + Preferred\ Stock + Long-term\ Debt + Short-term\ Debt - Deferred\ Taxes}{Total\ Assets\ (Beginning\ of\ the\ year)}$$

Secondly, to estimate Tobin's Q (to get *Predicted_Q*) for private and public firms, we regressed Tobin's Q for each public firm on sales growth (*G*), return on assets (*ROA*), net profit/loss for the year (π), book leverage (L), and year and industry fixed effects. ROA is defined as adjusted operating profit or loss after financial income, scaled by beginning-of-year total assets. Using the resulting regression coefficients, we generate a predicted Tobin's Q for each firm:

$$Tobin's\ Q = \alpha G_{it} + \beta ROA_{it} + \gamma \pi_{it} + \lambda L_{it} + \varphi_j + \eta_t + \varepsilon_{it}$$

ROA **(Return on Assets)** is the Serrano data item *AVKTOTKAP*, defined as adjusted operating profit / loss after financial income divided by total assets.

BALRES/TA, or RE/TA **(Retained Earnings)** is calculated as accumulated profit or loss, i.e. this is where profit or loss generated in previous years is recorded. (Serrano item *BALRES*) divided by total assets (Serrano item *TILLGSU*).

DIV/TA **(Dividend Amount)** is calculated as the dividend amount (Serrano item *UTDBEL*) divided by previous year total assets (Serrano item *TILLGSU*).

Leverage (Book Leverage) is the sum of total non-current liabilities (Serrano item *LSKSU*) and current liabilities to credit institutions (Serrano item *KSKKRIN*), divided by total assets (Serrano item *TILLGSU*).

KABASU.1 **(Cash/liquid Assets)** is calculated as the beginning of the year liquid assets (Serrano item *br07_kplackaba*) divided by beginning of the year total assets (Serrano item *TILLGSU*).

Age is calculated as the difference between the year component of the financial statement end date (Serrano item *BSLSLUT*) and the year component of the business register date (Serrano *STARTI*).

Gross_Nca, or Gross Inv. **(Gross investment in Non-current Assets (NCA))** has a longer calculation. The Serrano database firms have two different accounting types, nature of expense method (type *K* in Serrano) and cost of sales method (type *F* in Serrano). For accounting type *F*, *AVSKRIV* is the sum of *AVSKSALV* (depreciation of cost of goods sold), *AVSKFS* (depreciation of Selling expenses), *AVSKADM* (depreciation of administrative expenses), *AVSKFOU* (depreciation of capitalized expenditure R&D), *AVSKOV2* (depreciation of other operating expenses), and *AVSKOSPC* (unspecified depreciations). For firms with accounting type *K*, the variable *AVSKRIV* represents depreciation and amortization. However, for firms with accounting type *F*, *AVSKRIV* contains *NA* values, while depreciation data is recorded in other specified variables. Conversely, for accounting type *K*, these other specified variables contain *NA* values. To construct a measure of gross investment in non-current assets across both accounting types, we addressed the missing values by replacing all *NA* entries with 0. By incorporating all relevant variables into our calculation, as seen below (code from R), we successfully created a unified measure that captures gross investment for firms with both accounting types.

Gross_Invest_Nca *= ((MATANLSU + IMANLSU) - (lag(MATANLSU) + lag(IMANLSU)) - (AVSKRIV + lag(AVSKRIV)) - (AVSKSALV + lag(AVSKSALV)) - (AVSKFSG + lag(AVSKFSG)) - (AVSKADM + lag(AVSKADM)) - (AVSKFOU + lag(AVSKFOU)) - (AVSKOV2 + lag(AVSKOV2)) - (AVSKOSPC + lag(AVSKOSPC))) / lag(TILLGSU)*

Net_Nca, or Net Inv. Nca **(Net Investment in Non-current Assets)** is the sum of tangible fixed assets (Serrano item *MATANLSU*) and total intangible fixed assets (Serrano item *IMANLSU*) subtracted by the sum of previous year *MATANSLU* and *IMANSLU*, divided by beginning of the year total assets (*TILLGSU*):

$$\frac{\left(MATANLSU_{it}+IMANLSU_{it-1}\right)-\left(MATANLSU_{it-1}+IMANLSU_{it-1}\right)}{TILLGSU_{it-1}}$$

Asset_G, or Growth TA **(Growth in total assets)** is the change in total assets scaled by beginning-of-year total assets (Serrano item *TILLGSU*). $\left(\frac{A_{it}-A_{it-1}}{A_{it-1}}\right)$, where A, is total assets.

Net_Invest_RnD, or Net Inv. R&D **(Net Investment in R&D)** is the sum of the difference between research and development costs (Serrano item *FOUKO*) and the difference between capitalized R&D expenditure (*FOUBAUTG*) between two periods, divided by total assets (Serrano item *TILLGSU*).

Calculated as: $\frac{\left(FOUKO_{it}-FOUKO_{it-1}\right)+\left(FOUBAUTG_{it}-FOUBAUTG_{it-1}\right)}{TILLGSU_{it-1}}$

Net_Invest_Fixed, or Net Inv. Fixed **(Net Investment in Tangible Fixed Assets)** is the difference between total tangible fixed assets (Serrano item *MATANLSU*) between two periods, divided by the lagged total assets (*TILLGSU*). $\left(\frac{MATANLSU_{it}-MATANLSU_{it-1}}{TILLGSU_{it-1}}\right)$

Appendix B. Figures and Tables.

Figure 1. Full Samples: Distribution by Year.
This graph illustrates the full sample of public and private firms after our cleaning and filtering processes. The public sample contains 2,366 firm-year observations, with 316 unique organisation numbers, and the private sample contains 48,853 firm-year observations, with 7,696 unique organisation numbers. The figure also reports the number of firms entering and exiting the sample per year.

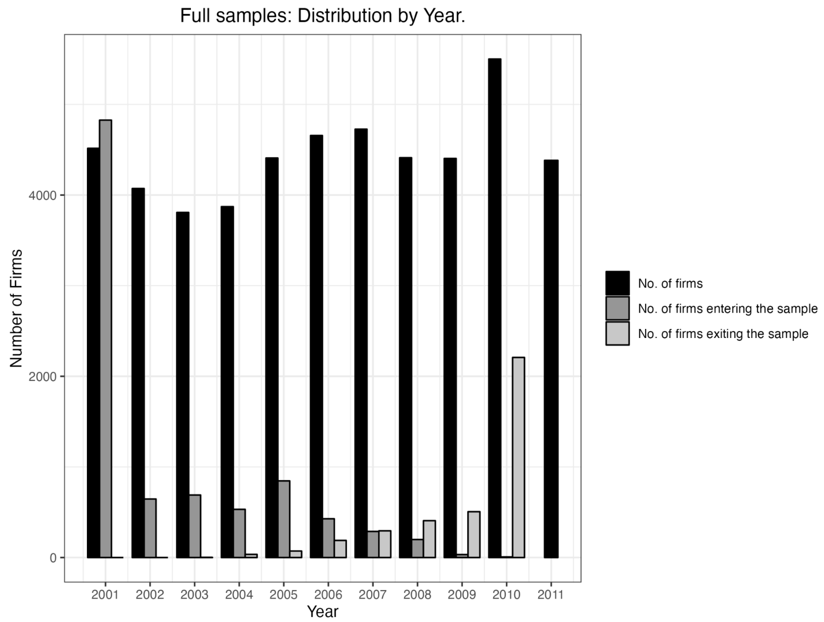
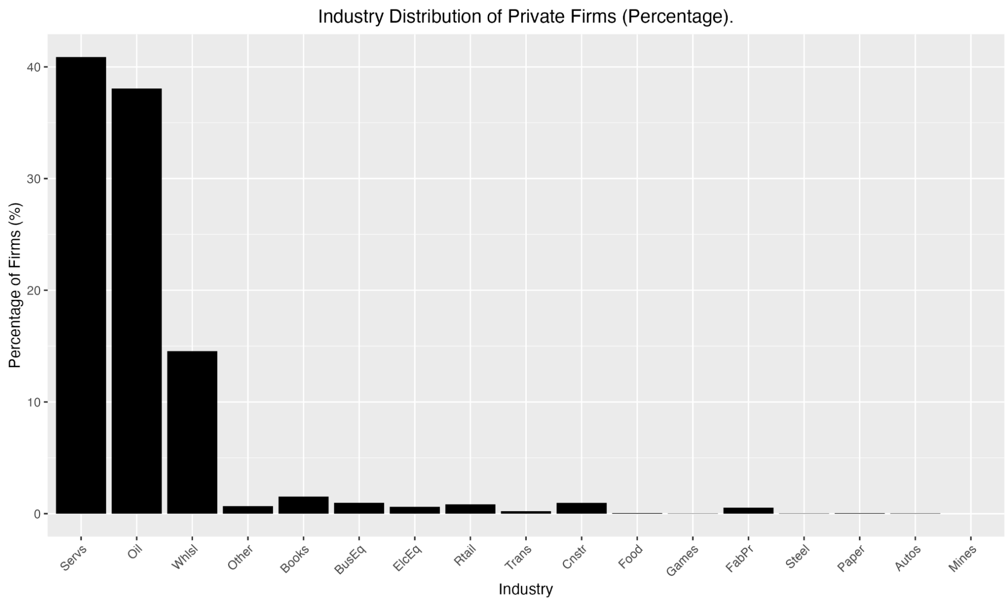


Figure 2. Industry Distribution of Private and Public firms.
The top and bottom graphs show the industry distribution (in percentage) for the full sample of private and public firms respectively according to the Fama-French (1997) 30 industry definitions, excluding utilities and financial firms.



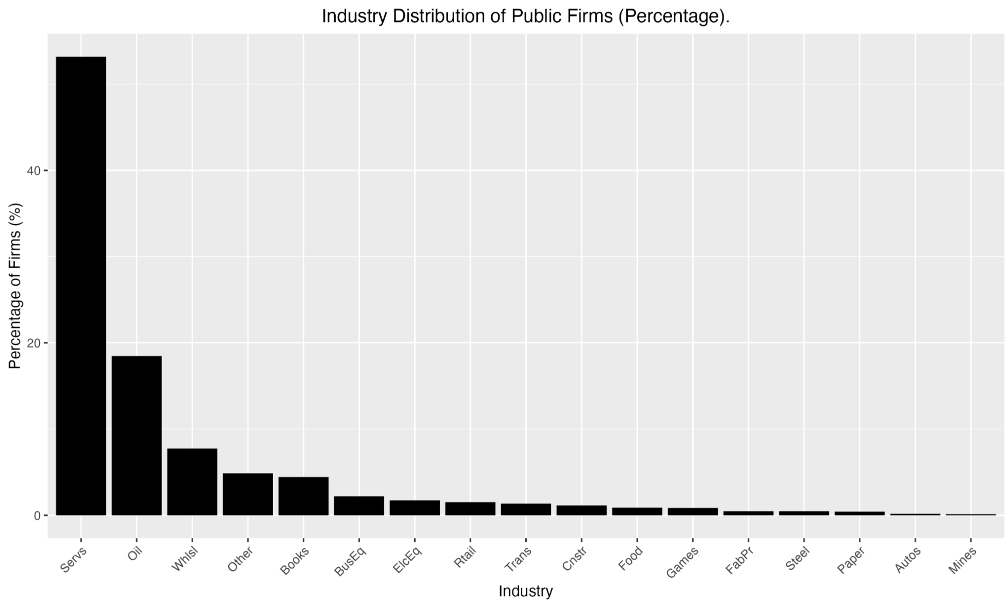
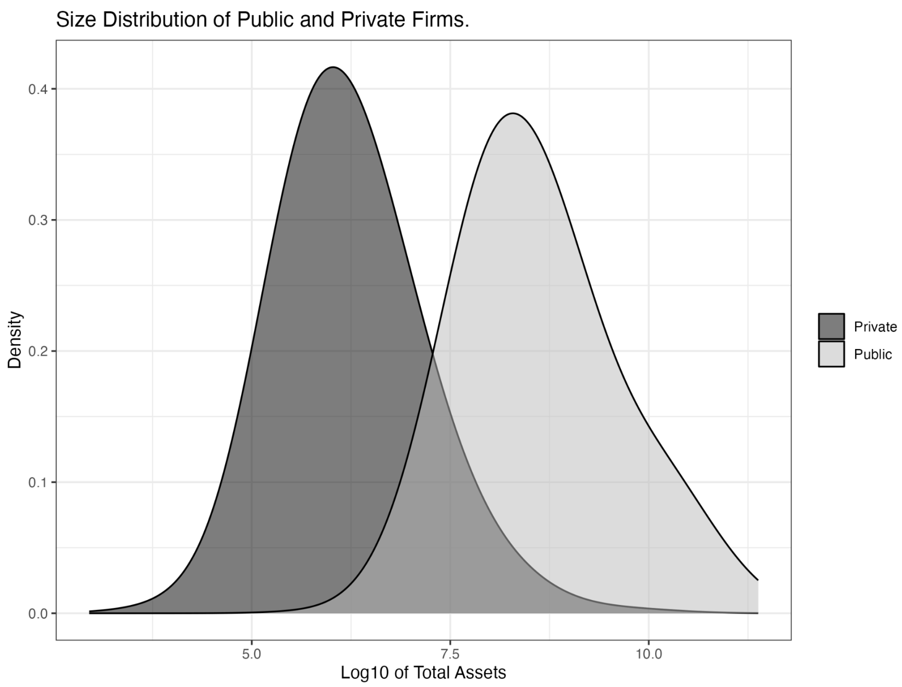


Figure 3. Size Distribution of Matched and Full Private and Public samples.
The top graph displays the size distribution (log10) of private and public firms in our full samples. The bottom graphs illustrated the size distribution (log10) of the benchmark match on industry and size for private and public firms.. The plot displays kernel density estimates of the logarithm (base 10) of total assets, measured in SEK millions, using a Gaussian kernel density with a bandwidth of 0.5.



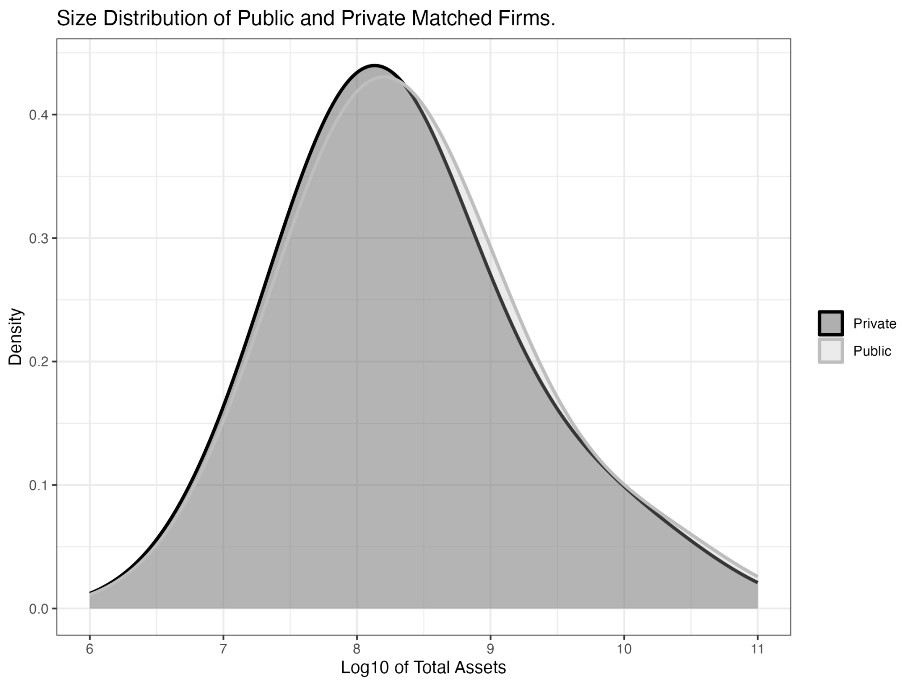


Figure 4. Private and Public Investment levels 2001-2011.
The figure illustrates the average annual change in Gross Non-Current Assets, scaled by the beginning of the year total assets in the benchmark matched sample on size and industry.

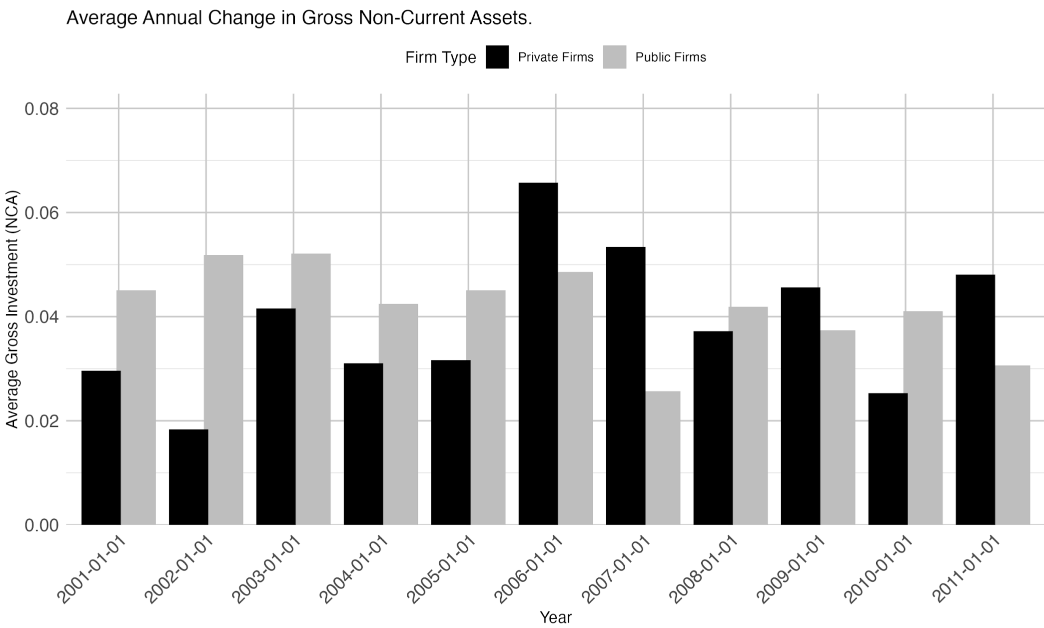


Figure 5. Quantile Regression of Investment Sensitivity.
The figure shows the coefficient estimates of the difference in investment sensitivities between public and private firms. This is the interaction term "Investment Opportunities × Public Dummy Variable" in the benchmark match on size and industry. These coefficients are from estimating equation (2) without firm-fixed effects, which is not compatible with quantile regressions. Standard errors are gathered by bootstrapping 500 repetitions each time and the dashed lines represent 95% confidence intervals.

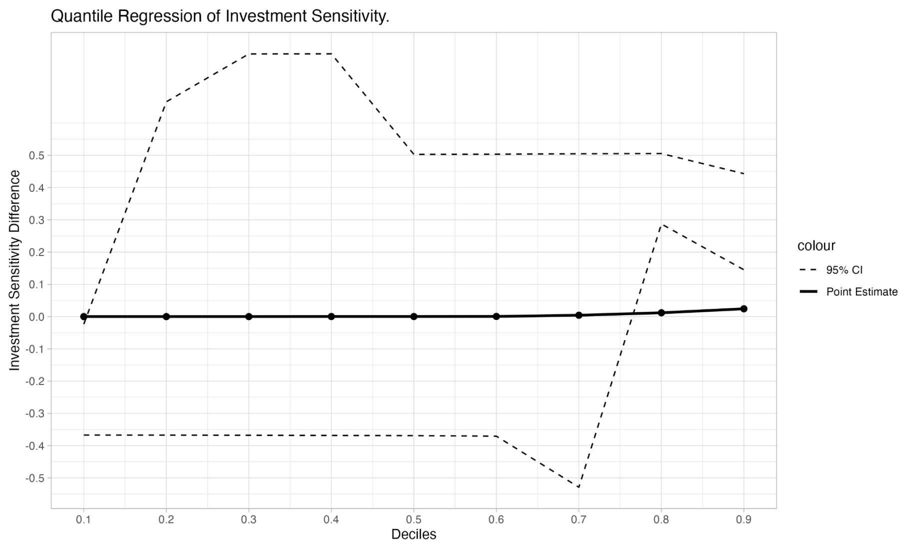


Figure 6. Private Firms Investment Sensitivities by Size Deciles 2001-2011.
The figure displays the coefficient estimate on investment opportunities for each size decile where the regression allows for interaction between investment opportunities and size decile. The figure includes the full private sample between 2001-2011. Otherwise, the regression is specified exactly as in Table 4, Panel A, column 4, (equation (2)). The 10th decile is the largest decile.

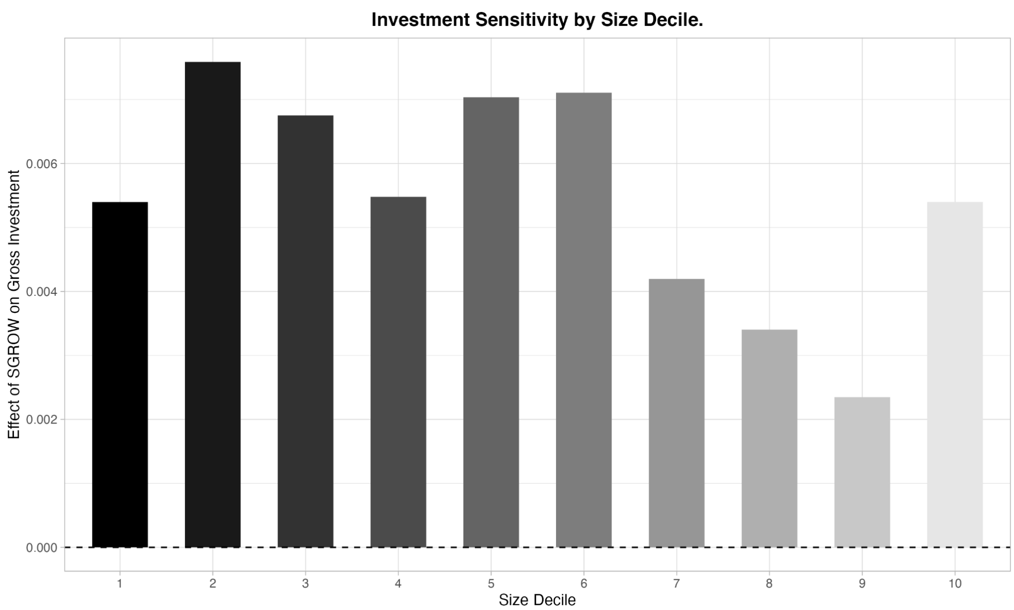


Table 1, Panel A. Descriptive Statistics.

Table 1, Panel A presents descriptive statistics for the full samples of public and private firms, and the benchmark match on size and industry over the period 2001-2011. See section 2.0 for description of how we construct the full samples and section 2.2 for details on the matching procedure. The table reports means, medians, and standard deviations of the key variables used in our empirical analysis, as well as pairwise differences in means and medians. For variable definitions and details of their construction, see Appendix A. All variables (except age, Industry Q, and predicted Q) are winsorized 0.75% in each tail to reduce the impact of outliers.

Table 1, Panel A. Descriptive Statistics.

Comparison of Public and Private Firms.

		Full Samples			Matched Samples		
	Statistic	Private	Public	Diff. in mean/medians	Private	Public	Diff. mean/medians
Total_assets	mean	54.4137	2,888.8466	−2,834.4329	1,550.4646	1,761.3809	−210.9163
Total_assets	median	1.3485	288.0980	−286.7495	178.3933	194.5950	−16.2017
Total_assets	sd	680.9646	6,007.5009	NA	4,129.2499	4,583.0826	NA
Sales_growth	mean	1.1110	0.7133	0.3977	1.1046	0.7020	0.4026
Sales_growth	median	0.0000	0.0534	−0.0534	0.0445	0.0556	−0.0111
Sales_growth	sd	5.6034	4.3007	NA	5.6422	4.2294	NA
Industry_Q	mean	2.4669	2.4420	0.0249	2.4869	2.4942	−0.0073
Industry_Q	median	1.7861	1.9899	−0.2038	1.9899	1.9899	0.0000
Industry_Q	sd	2.2322	1.9794	NA	1.9867	1.9062	NA
Predicted_Q	mean	2.6151	2.8852	−0.2701	2.6756	2.9661	−0.2904
Predicted_Q	median	2.5322	2.6646	−0.1324	2.4381	2.7554	−0.3173
Predicted_Q	sd	1.5639	1.4251	NA	1.3731	1.3455	NA
ROA	mean	0.0384	−0.0430	0.0814	0.0557	−0.0628	0.1186
ROA	median	0.0470	0.0230	0.0240	0.0430	0.0150	0.0280
ROA	sd	0.3626	0.3371	NA	0.2354	0.3678	NA
BALRES_TA	mean	−0.0780	0.0532	−0.1311	0.2650	0.0149	0.2501
BALRES_TA	median	0.1123	0.1461	−0.0338	0.2041	0.1320	0.0721
BALRES_TA	sd	1.5413	1.0155	NA	0.3251	1.1038	NA
DIV_TA	mean	0.0339	0.0403	−0.0064	0.0419	0.0434	−0.0016
DIV_TA	median	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
DIV_TA	sd	0.1013	0.0826	NA	0.1098	0.0895	NA
Leverage	mean	0.1922	0.1540	0.0381	0.1890	0.1423	0.0467
Leverage	median	0.0000	0.0576	−0.0576	0.0758	0.0409	0.0349
Leverage	sd	0.3896	0.2048	NA	0.2431	0.1997	NA
Cash_holdings	mean	0.0002	0.0001	0.0000	0.0001	0.0001	0.0000
Cash_holdings	median	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cash_holdings	sd	0.0003	0.0002	NA	0.0002	0.0002	NA
Age	mean	15.6795	27.9827	−12.3031	24.1282	27.6524	−3.5242
Age	median	13.0000	18.0000	−5.0000	18.0000	19.0000	−1.0000
Age	sd	12.2886	26.0673	NA	19.6432	25.7857	NA

Table 1, Panel B. T-test and Pearson χ2 test for Variable Distributions.
Table 1, Panel B shows with ***,**, and * indicating a difference that is significant in a t-test (for means) or a Pearson χ2 test (for medians) at the 1%, 5%, and 10% level, respectively for each variable presented in Table 1, Panel A.

Table 1, Panel B. Descriptive Statistics.

T-test (for means) or a Pearson χ2 test (for medians).

	Full Samples		Matched Samples	
	T-test	**Pearson χ2**	**T-test**	**Pearson χ2**
Total_Assets	4.8e-37***	0.0e+00***	0.003***	0.011**
Sales_growth	0.116	5.1e-13***	0.043**	0.214
Industry_Q	0.577	3.2e-08***	0.744	0.016**
Predicted_Q	6.2e-19***	4.9e-07***	3.6e-27***	1.0e-23***
ROA	2.7e-15***	6.7e-17***	3.7e-52***	1.7e-32***
BALRES_TA	0.449	7.3e-06***	7.7e-07***	7.8e-31***
DIV_TA	0.482	8.2e-117***	0.304	7.9e-08***
Leverage	3.4e-10***	2.7e-116***	1.9e-30***	5.9e-12***
Cash_holdings	1.8e-20***	1.8e-57***	2.0e-25***	2.4e-23***
Age	1.1e-104***	4.7e-77***	1.0e-15***	3.9e-04***

Table 2. Unconditional Investment Levels.

Panel A displays and compares unconditional investment levels of public and private firms. For further details on the matching procedure, see section 2.2. Rows 1, 2, and 7 through 10, the investment measure is gross non-current assets (annual change in gross non-current assets, scaled by beginning of the year total assets). Rows 3, 4, 5, 6, reports the investment measures net investment in non-current assets, growth in total assets, net investments in R&D, and net investment in fixed assets, respectively, all scaled by the beginning-of-the year total assets. Row 1 reports on the full sample, rows 2-6 reports on the matched sample on size and industry code (Sni071), row 7 reports size, industry code and age, row 8 reports on size, industry code, leverage, cash holdings, sales growth and ROA, and row 9-10 reports size and industry code pre and post the financial crisis respectively. For variable definitions and details of their construction, see Appendix A. Each investment measure is winsorized 0.75% in each tail to reduce the impact of outliers. The unit of one observation is a firm-year.

Panel A. Means, Medians, and Standard Deviations.

Table 2. Unconditional Investment Levels.

Panel A. Means, Medians, and Standard Deviations.

		Private Firms					Public Firms					Public - Private Firms			
	Investment Measure	Mean	Median	SD	No. of obs.	No. of firms	Mean	Median	SD	No. of obs.	No. of firms	Mean Difference	Median Difference	t-test p-value	χ² test p-value
Full Sample	Gross_Nca	0.080	0.020	0.240	48,853	7,696	0.050	0.010	0.120	2,366	316	−0.030	−0.011	5.8e-09***	8.0e-30***
Sni071, size	Gross_Nca	0.040	0.000	0.130	4,836	593	0.040	0.010	0.110	4,836	244	0.002	0.004	0.081*	3.5e-16***
Sni071, size	Net_Nca	0.010	0.000	0.110	4,836	593	0.000	0.000	0.080	4,836	244	−0.005	0.000	0.056*	0.555
Sni071, size	Asset_G	0.340	0.040	1.470	4,836	593	0.190	0.030	0.700	4,836	244	−0.143	−0.010	0.012**	0.017**
Sni071, size	Net_Invest_RnD	0.000	0.000	0.020	4,836	593	0.000	0.000	0.030	4,836	244	0.000	0.000	0.183	1.3e-24***
Sni071, Size	Net_Invest_Fixed	0.000	0.000	0.050	4,836	593	0.000	0.000	0.020	4,836	244	0.000	0.000	0.069*	0.034**
Sni071, size, age	Gross_Nca	0.040	0.000	0.120	4,078	490	0.040	0.010	0.110	4,078	234	0.002	0.003	0.507	4.4e-13***
Sni071, size, lev, cash, sales growth, ROA	Gross_Nca	0.040	0.000	0.130	2,679	304	0.050	0.010	0.110	2,679	203	0.002	0.005	0.738	2.9e-09***
Sni071, size; 2002-07	Gross_Nca	0.050	0.000	0.160	2,005	368	0.050	0.010	0.120	2,005	169	−0.002	0.007	0.069*	1.4e-10***
Sni071, size; 2008-11	Gross_Nca	0.030	0.000	0.110	1,545	353	0.040	0.010	0.110	1,545	184	0.012	0.004	0.872	2.0e-06***

Panel B. Investment Percentiles.
Panel B compares gross investment in non-current assets for public and private firms in the benchmark matched sample on size and industry at the 25th, 50th, 60th, 70th, 80th, 90th, and 95th. For variable definitions and details of their construction, see Appendix A. Each investment measure is winsorized 0.75% in each tail to reduce the impact of outliers.

Panel B. Investment Percentiles - Matched Sample.

Investment measure: Gross investments (NCA)

Percentile	25th	50th	60th	70th	80th	90th	95th
Public	0.000	0.006	0.013	0.025	0.049	0.115	0.190
Private	0.000	0.003	0.008	0.017	0.038	0.105	0.199
Difference	0.000	0.004	0.006	0.008	0.011	0.010	−0.010

Table 3, Panel A. Conditional Investment Levels.
This table presents the results of estimating equation (1), which estimates differences in investment levels between public and private firms holding investment opportunities (Sales Growth) and profitability (ROA) constant. Explicitly, the table compares conditional investment levels in the full samples column (1), our benchmark match size-and-industry code (Sni071) in column (2) to (6), and the benchmark match pre and post the financial crisis in column (7) to (8) respectively. Column (9) is matched on size, industry code and age, and column (10) is matched on size, industry code, ROA, sales growth, leverage and cash holdings. For details on the matching approach see section 2.2. Each column in Table 3, Panel A uses the same sample and investment measure as the corresponding row in Table 2, Panel A. For variable definitions and details of their construction, see Appendix A. Each regression includes industry (5 digit SNI codes) and year fixed effects (not reported). We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively. All continuous variables are winsorized 0.75% in each tail to reduce the impact of outliers. The unit of one observation is a firm-year.

Table 3, Panel A. Conditional Investment Levels.

This table reports the results of estimating investment equation (1).

		Full Sample	Matched Sample on Sni071 & Size							Matched Sample - Other Specifications	
	stat	Gross Inv. Nca (1)	Gross Inv. Nca (2)	Net Inv. Nca (3)	Net Inv. R&D (4)	Net Inv. Fixed (5)	Growth TA (6)	Gross Inv. Nca. Pre crisis (7)	Gross Inv. Nca. Post crisis (8)	Gross Inv. Nca. Sni071, size, age (9)	Gross Inv. Nca. Sni071, size, ROA, sales gr., lev., cash (10)
ROA	estimate	-0.019***	-0.036***	0.014***	0.005***	0.006***	0.499***	-0.069***	-0.008	-0.039***	-0.075***
Public	estimate	-0.022***	0.000	-0.000	0.000	0.001	-0.040	-0.009*	0.012***	-0.000	0.003
Inv. opps.	estimate	0.005***	0.002***	0.002***	-0.000**	0.001***	0.026***	0.002***	0.006***	0.002***	0.008***
R^2	NA	3.2%	14.3%	7.6%	6.7%	5.3%	7.2%	14.7%	15.8%	12.6%	18.3%
F-test: all coeff. = 0	NA	16.8***	24.3***	12.0***	10.4***	8.1***	11.2***	13.4***	10.1***	19.1***	19.6***
No. obs.	NA	51,219	9,672	9,672	9,672	9,672	9,672	4,010	3,090	8,156	5,358
No. firms	NA	8,012	837	837	837	837	837	537	537	724	507

Table 3, Panel B. Heteroskedastic-consistent standard errors.
Heteroskedasticity-consistent standard errors clustered at the firm level are shown below, corresponding to coefficient estimates in Table 3, Panel A.

Table 3, Panel B.

This table reports heteroskedasticity-consistent standard errors clustered at the firm level.

	Full Sample	Matched Sample on Sni071 & Size							Matched Sample - Other Specifications	
	Gross Inv. Nca (1)	Gross Inv. Nca (2)	Net Inv. Nca (3)	Net Inv. R&D (4)	Net Inv. Fixed (5)	Growth TA (6)	Gross Inv. Nca. Pre crisis (7)	Gross Inv. Nca. Post crisis (8)	Gross Inv. Nca. Sni071, size, age (9)	Gross Inv. Nca. Sni071, size, ROA, sales gr., lev., cash (10)
Public	*(0.005)*	*(0.005)*	*(0.003)*	*(0.001)*	*(0.002)*	*(0.047)*	*(0.005)*	*(0.007)*	*(0.009)*	*(0.008)*
Inv. opps.	*(0.000)*	*(0.001)*	*(0.001)*	*(0.000)*	*(0.000)*	*(0.009)*	*(0.001)*	*(0.002)*	*(0.001)*	*(0.003)*
ROA	*(0.004)*	*(0.014)*	*(0.006)*	*(0.004)*	*(0.003)*	*(0.098)*	*(0.016)*	*(0.023)*	*(0.023)*	*(0.013)*

Table 4, Panel A. Sensitivity to investment opportunities.
This table reports the results of estimating investment equation (2), which exploits within-firm variation to analyze differences in the sensitivity of investment spending to investment opportunities. The dependent variable is gross investment in non-current assets scaled by beginning-of-year total assets. We use three different measures of investment opportunities: Sales growth, (columns 1-4 and 7), Industry *Q* (column 5), and predicted *Q* (column 6). For variable definitions and details of their construction, see Appendix A. For details of the matching procedure, see Section 2.2. All regressions include firm fixed effects. Each regression also includes year effects (not reported). We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively. All continuous variables are winsorized 0.75% in each tail to reduce the impact of outliers, except industry *Q* (which is a size-weighted average) and predicted *Q* (which is itself constructed from winsorized data).

Table 4, Panel A. Sensitivity To Investment Opportunities.
Dependent variable: Gross investment / lagged total assets.

		Proxy for inv. opps:						
		Sales Growth				Industry Q	Predicted Q	Sales Growth
	stat	Sni071, size (1)	Sni071, size (2)	Matched Private Firms Only (3)	All Private Firms (4)	Sni071, size (5)	Sni071, size (6)	Sni071, size, ROA, sales gr., lev., cash (7)
Inv. opps.	estimate	0.000		0.000	0.005***	-0.003***	-0.003***	0.003***
x. Public	estimate	0.003***				0.007***	0.007***	0.007***
Inv. opps. Pre. Crisis	estimate		0.001*					
x. Public	estimate		0.003***					
Inv. opps. Post. Crisis	estimate		-0.001					
x. Public	estimate		0.004***					
ROA	estimate	-0.016**	-0.015*	-0.018**	0.011***	-0.015*	-0.015*	-0.003
x. Public	estimate	-0.019**	-0.020**			-0.021**	-0.021**	-0.067***
R^2	NA	2.9%	3.0%	1.6%	2.1%	2.2%	2.2%	8.0%
F-test: all coeff. = 0	NA	17.5***	16.8***	5.8***	74.6***	12.8***	12.8***	30.3***
No. obs.	NA	9,672	9,672	4,836	48,853	9,672	9,672	5,358
No. firms	NA	837	837	593	7,696	837	837	507

Table 4, Panel B. Heteroskedastic-consistent standard errors.
Heteroskedasticity-consistent standard errors are shown below, corresponding to coefficient estimates in Table 4, Panel A. They are clustered at the firm level in all columns.

Table 4, Panel B.

This table reports heteroskedasticity-consistent standard errors clustered at the firm level.

		Proxy for inv. opps:						
		Sales Growth				Industry Q	Predicted Q	Sales Growth
	stat	Sni071, size (1)	Sni071, size (2)	Matched Private Firms Only (3)	All Private Firms (4)	Sni071, size (5)	Sni071, size (6)	Sni071, size, ROA, sales gr., lev., cash (7)
Inv. opps.	clustered_se	(0.001)		(0.001)	(0.000)	(0.002)	(0.002)	(0.003)
x. Public	clustered_se	(0.002)				(0.003)	(0.003)	(0.005)
Inv. opps. Pre. Crisis	clustered_se		(0.001)					
x. Public	clustered_se		(0.002)					
Inv. opps. Post. Crisis	clustered_se		(0.002)					
x. Public	clustered_se		(0.003)					
ROA	clustered_se	(0.017)	(0.016)	(0.017)	(0.004)	(0.017)	(0.017)	(0.029)
x. Public	clustered_se	(0.026)	(0.026)			(0.026)	(0.026)	(0.054)

Table 5, Panel A. Economic Differences Between Public and Private Firms.
As in Table 4, we use sales growth to proxy for investment opportunities and exploit within-firm variation using the plm package (in R) with firm and year fixed effects. Columns 1 and 2 investigate lifecycle effects using gross investments into non-current assets, scaled by the beginning of the year total assets. In column 1, we control for lifecycle-stage by matching on size and retained earnings (RE/TA) in addition to size and industry code (Sni071). Column 2 controls for lifecycle differences by matching on firm age in addition to size and industry. Columns (3) to (8) displays the benchmark match on size and industry. Column 3 models the annual change in non-current assets, row 4 shows the same measure net of depreciation, columns (5) to (6) shows net investments in R&D and tangible fixed assets respectively. Column (7) uses growth in total assets as the dependent variable. In column (8), we test whether the baseline results presented in Table 4, column 1 are robust to observed heterogeneity in cash holdings and book leverage. For variable definitions and details of their construction, see Appendix A. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively. All continuous variables are winsorized 0.75% in each tail to reduce the impact of outliers. The unit of one observation is a firm-year.

Table 5, Panel A. Economic Differences Between Public and Private Firms.

		Dependent variable: Gross investment / lagged total assets.							
		Lifecycle effects		Matched on Sni071, Size					
	stat	Sni071, size, RE/TA (1)	Sni071, size, age (2)	Gross Inv. Nca (3)	Net Inv. Nca (4)	Net Inv. R&D (5)	Net Inv. Fixed (6)	Growth TA (7)	Additional Controls (8)
Inv. opps.	estimate	0.001	0.001***	0.000	0.000	-0.000***	0.000***	0.008**	0.000
x. Public	estimate	0.003***	0.000	0.003***	0.003***	0.000	0.000	-0.014***	0.003***
ROA	estimate	-0.039***	0.008	-0.016**	-0.007	0.007***	0.004	0.422***	-0.013
x. Public	estimate	0.008	-0.051***	-0.019**	0.027***	0.000	0.001	0.518***	-0.020**
Cash_holdings	estimate								8.819
Leverage	estimate								0.029***
R^2 (within)	NA	2.7%	3.5%	2.9%	2.1%	1.1%	1.0%	6.2%	3.1%
F-test: all coeff. = 0	NA	15.0***	18.0***	17.5***	12.3***	6.2***	5.9***	38.6***	16.4***
No. obs.	NA	8,786	8,156	9,672	9,672	9,672	9,672	9,672	9,672
No. firms	NA	701	724	837	837	837	837	837	837

Table 5, Panel B. Heteroskedastic-consistent standard errors.
Heteroskedasticity-consistent standard errors are shown below, corresponding to coefficient estimates in Table 5, Panel A.. They are clustered at the firm level in all columns.

Table 5, Panel B.

This table reports heteroskedasticity-consistent standard errors clustered at the firm level.

		Dependent variable: Gross investment / lagged total assets.							
		Lifecycle effects		Matched on Sni071, Size					
	stat	Sni071, size, RE/TA (1)	Sni071, size, age (2)	Gross Inv. Nca (3)	Net Inv. Nca (4)	Net Inv. R&D (5)	Net Inv. Fixed (6)	Growth TA (7)	Additional Controls (8)
Inv. opps.	clustered_se	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.010)	(0.001)
x. Public	clustered_se	(0.002)	(0.002)	(0.002)	(0.002)	(0.000)	(0.000)	(0.012)	(0.002)
ROA	clustered_se	(0.025)	(0.026)	(0.017)	(0.015)	(0.005)	(0.007)	(0.164)	(0.017)
x. Public	clustered_se	(0.035)	(0.034)	(0.026)	(0.018)	(0.009)	(0.008)	(0.228)	(0.026)
Cash_holdings	clustered_se								(21.133)
Leverage	clustered_se								(0.019)

Table 6, Panel A. Economic Differences Between Public and Private Firms.
Table 6, Panel A, is extending Table 5, Panel A. It is thus similar in all aspects except for columns (3) to (8) which is not the benchmark match, but rather matched on size, industry code (Sni071), ROA, sales growth, leverage and cash holdings. See Table 5, Panel A for further breakdown of the table. Table 6, Panel A is referred to, and further discussed in detail under section 3.2.2 and section 3.3.2. For variable definitions and details of their construction, see Appendix A. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively. All continuous variables are winsorized 0.75% in each tail to reduce the impact of outliers. The unit of one observation is a firm-year.

Table 6, Panel A. Economic Differences Between Public and Private Firms.

		Dependent variable: Gross investment / lagged total assets							
		Lifecycle effects		Matched on Sni071, size, ROA, Sales Growth, Leverage, Cash					
	stat	Sni071, size, RE/TA (1)	Sni071, size, age (2)	Gross Inv. Nca (3)	Net Inv. Nca (4)	Net Inv. R&D (5)	Net Inv. Fixed (6)	Growth TA (7)	Additional Controls (8)
Inv. opps.	estimate	0.001	0.001***	0.003***	0.003***	-0.001***	0.001***	0.057***	0.003***
x. Public	estimate	0.003***	0.000	0.007***	0.007***	0.001***	0.001**	-0.044***	0.007***
ROA	estimate	-0.039***	0.008	-0.003	0.041***	0.009**	0.032***	0.614***	0.008
x. Public	estimate	0.008	-0.051***	-0.067***	-0.011	-0.009*	-0.028***	0.096	-0.074***
Cash_holdings	estimate								40.215***
Leverage	estimate								0.066***
R^2 (within)	NA	2.7%	3.5%	8.0%	6.6%	1.2%	3.0%	6.6%	8.8%
F-test: all coeff. = 0	NA	15.0***	18.0***	30.3***	24.7***	4.1***	10.9***	24.5***	29.3***
No. obs.	NA	8,786	8,156	5,358	5,358	5,358	5,358	5,358	5,358
No. firms	NA	701	724	507	507	507	507	507	507

Table 6, Panel B. Heteroskedastic-consistent standard errors.
Heteroskedasticity-consistent standard errors are shown below, corresponding to coefficient estimates in Table 6, Panel A. They are clustered at the firm level in all columns.

Table 6, Panel B.

This table reports heteroskedasticity-consistent standard errors clustered at the firm level.

		Dependent variable: Gross investment / lagged total assets.							
		Lifecycle effects		Matched on Sni071, size, ROA, Sales Growth, Leverage, Cash					
	stat	Sni071, size, RE/TA (1)	Sni071, size, age (2)	Gross Inv. Nca (3)	Net Inv. Nca (4)	Net Inv. R&D (5)	Net Inv. Fixed (6)	Growth TA (7)	Additional Controls (8)
Inv. opps.	clustered_se	(0.001)	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)	(0.037)	(0.003)
x. Public	clustered_se	(0.002)	(0.002)	(0.005)	(0.005)	(0.001)	(0.002)	(0.039)	(0.005)
ROA	clustered_se	(0.025)	(0.026)	(0.029)	(0.044)	(0.010)	(0.025)	(0.270)	(0.031)
x. Public	clustered_se	(0.035)	(0.034)	(0.054)	(0.052)	(0.019)	(0.026)	(0.333)	(0.056)
Cash_holdings	clustered_se								(36.509)
Leverage	clustered_se								(0.028)

Table 7. Quality Test on Benchmark Match.
Table 7 reports statistics on the quality of the benchmark match on size and industry (See section section 2.2). The first is Hotelling's T2 test, which rejects the null hypothesis that the means of total assets are equal across groups (p-value = 0.003). While this suggests a statistically significant difference in the means, the practical magnitude of this difference is small, as evidenced by the second measure. The second test is Rosenbaum and Rubin's (1985) SDIFF test. Rosenbaum and Rubin propose that a value above 20 raises concerns about the balance between matched groups. In our sample, the standardized difference (SDIFF) is 6.0, indicating that the groups are adequately balanced in practical terms.

Hotelling's T^2 and SDIFF Test Results.
Summary of Test Statistics.

		Degrees of Freedom			
Test	Statistic	DF1	DF2	P-Value	SDIFF (%)
Hotelling's T^2 Test	8.713	1	9670	0.003	NA
Standardized Difference (SDIFF)	NA	NA	NA	NA	6.003

Table 8. Tobin's Q regression.
To estimate Tobin's Q for private firms, we follow the methodology suggested by Campello and Graham (2013). Specifically, we use an OLS regression in R (lm package), incorporating variables such as sales growth (G), return on assets (ROA), net profit/loss for the year (), book leverage (L), and year and industry fixed effects. ROA is defined as adjusted operating profit or loss after financial income, scaled by beginning-of-year total assets. The 8 below shows the coefficient estimates and $R.^2$ See section 2.4 for further information.

Tobin's Q Model Results.
Selected Coefficients and R-squared Value.

Parameter	Value
Coefficient SGROW	0.029
Coefficient ROA	1.329
Coefficient RESAR	0.000
Coefficient Leverage	−1.381
R-squared value	0.177

Appendix C. AI Disclaimer.

Disclaimer: *In the preparation of this academic paper, we utilized ChatGPT, an AI tool developed by OpenAI, to assist with code development and grammar. These tools were primarily employed to support the coding processes. All substantive ideas, analyses, and conclusions presented in this work are the product of the authors.*