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Essays in Finance: The Impact of Trust, Firm Efficiency, Investor Relations, and Operational Leanness on Financial Markets

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1 Introduction

How financial markets price stocks of companies has been studied extensively and is still today a vital research topic. Among finance scholars, widespread consensus has been reached that, assuming market efficiency, three sources theoretically determine a company's stock return. As Fama (1990) summarizes, stock return variation should stem from: "...(a) shocks to expected cash flows, (b) predictable return variation due to variation through time in the discount rates that price expected cash flows, and (c) shocks to discount rates" (p. 1089). In this respect, Vuolteenaho (2002) even highlights that shocks to expected cash flows mainly determine stock returns at the firm-level.

However, a large body of literature stresses that markets might not be perfectly efficient[1] (see e.g., Barber & Odean, 2001; DellaVigna & Pollet, 2009; De Long et al., 1990; Fang & Peress, 2009; Grossman & Stiglitz, 1980; Malkiel, 2003). Despite theory suggesting that stock returns should be mainly driven by these three sources, market and information frictions as well as investors' (irrational) behavior also appear to considerably influence various capital market outcomes and stock returns.

This dissertation consists of four essays, which were written independent of each other and are diverse in their topics, yet they all share this common ground and aim to contribute to a better understanding of financial markets and investor behavior. Chapters 2 to 4 thereby turn the focus on the recent COVID-19 crisis, which constituted an exogenous shock. Market participants faced enormous uncertainty about the companies' abilities to generate future cash flows due to the rapid spread of the disease and the restrictions imposed by the countries' governments. Consequently, financial markets worldwide collapsed. The US stock market, for instance, was on an all-time high shortly before the crisis and broke down by roughly 30%. Given this dramatic downturn, the COVID-19 crisis presents an opportunity to examine how market par-

[1] Fama (1990) finds that the combination of the variables mentioned above explains roughly 58% of the variance of annual stock returns. He concludes that it remains to the reader to decide on whether this is in line with the idea of market efficiency.

ticipants evaluate the importance of certain firm characteristics for the firm's ability to generate future cash flows and also how characteristics of countries and societies influence capital market outcomes. In this regard, Chapter 2 provides evidence that societal trust and trust in the country's government significantly reduced stock market volatility in reaction to COVID-19 case announcements during the crisis period. In our essay, we relate this result to trust alleviating uncertainty among investors about the country's ability to overcome the crisis. In Chapter 3, we show firms which use their resources more efficiently to experience higher returns during the crisis. We argue that the outperformance of efficient firms relates to these firms having less risky expected cash flows and thus a lower risk of default, which is consistent with the view in Frijns et al. (2012). Further, in Chapter 4, we study whether having better-quality investor relations (IR) helps to alleviate information frictions among market participants and is thus valuable for firms. The results suggest firms with better-quality IR to experience higher returns, to retain more incumbent institutional investors, and also to attract more new institutional investors during the crisis period.

In contrast to Chapters 2 to 4, Chapter 5 moves away from the topic of the COVID-19 crisis. This last chapter focuses on whether institutional investors view operational leanness as a competitive advantage resulting in higher expected cash flows. The results provide evidence that institutional investors generally appear to prefer lean firms since the reduction in operational slack is associated with a cost advantage. However, the results also suggest that institution types differ substantially in how they evaluate operational leanness because of market and information frictions.

While this introduction has already provided a short overview of how this dissertation is structured, how the individual essays relate to each other, and what the main findings are, the remainder will provide more detailed summaries of each essay and publication details.

1.1 Summaries of the Essays

Chapter 2 examines whether the level of trust within a society and in the countries' governments impacted stock market volatility during the COVID-19 crisis. Although the disease spread over the entire world within a few months, governments' (immediate) reactions differed substantially. While some governments imposed severe restrictions

including lockdown policies, other governments pursued a more lenient approach. These different political reactions sparked heated debates and uncertainty among the public as well as among investors about whether the governments took the right steps. In this respect, Fukuyama (2020) claims that trust and specifically trust in the country's executives is crucial to overcome the crisis, while Goldstein & Wiedemann (2021) as well as Mehari (2020) add that societal trust is also of vital importance. This is because citizens likely adhere to government guidelines if they trust their fellow citizens to adhere to these guidelines as well. Building on this argumentation, we test whether trust in the country's government and societal trust mitigated uncertainty among investors and led to lower stock market volatility during the crisis.

Using a sample of 47 national stock markets and primarily data on trust from the World Values Survey (WVS), our results provide evidence that high levels of societal trust and trust in the government dampened an increase in stock market volatility for an increase in COVID-19 case announcements. The results are robust in univariate and multivariate tests and also when we employ different proxies for trust. Hence, we conclude that trust alleviated uncertainty among investors during the crisis period.

Our study thereby contributes to the existing literature along two main dimensions. First, we extend the literature examining the reaction of (international) financial markets to the COVID-19 crisis (see e.g., Al-Awadhi et al., 2020; Albulescu, 2020a; Ding et al., 2021; Ramelli & Wagner, 2020; Takahashi & Yamada, 2020); and second, we deepen the understanding of how societal trust influences financial markets (see e.g., Adams, 2021; Georgarakos & Pasini, 2011; Lesmeister et al., 2018; Limbach et al., 2020).

Chapter 3 investigates the link between firm efficiency and stock returns during the COVID-19 crisis. While a firm's expected cash flows should theoretically determine a firm's stock price, two contrasting views supported by empirical evidence have evolved on how firm efficiency (i.e., the efficiency with which firms use their own resources) influences a firm's stock returns. One view is that (risk averse) investors require a higher rate of return for firms which use their resources inefficiently. This is because these firms are associated with riskier expected cash flows (Nguyen & Swanson, 2009). The opposite view is that efficient firms have a substantially lower risk of corporate default. Hence, these firms should be associated with better returns and a higher market valuation (Frijns et al., 2012).

In this essay, we shed further light on this relationship by employing a sample of

884 US firms and the exogenous shock of the COVID-19 crisis. Since the restrictions imposed by the US government led to uncertainty about the firms' abilities to generate future cash flows, we expect efficient firms to be more resilient during the crisis in comparison to inefficient firms. Following Frijns et al. (2012), the main argument is that these firms have a significantly lower risk of corporate default and should thus be associated with a higher market valuation.

To proxy for firm efficiency, we employ efficiency scores based on Statistical Frontier Analysis (SFA) and Data Envelopment Analysis (DEA). Our results using both scores are in line with our expectation and suggest that firms with efficiency scores in the top decile outperformed inefficient firms by almost ten percentage points (in terms of cumulative returns during the crisis period). Additionally, we find that an investor with a long-short portfolio of efficient and inefficient firms would have earned a significantly positive weekly return of 3.53% on average.

Altogether, the findings from this chapter not only extend the literature on how firm efficiency affects stock returns (Frijns et al., 2012; Nguyen & Swanson, 2009), but they also extend the literature on characteristics making firms more immune during periods of crisis and particularly during the COVID-19 crisis (see e.g., Ding et al., 2021; Fahlenbrach et al., 2020; Ramelli & Wagner, 2020).

Chapter 4 examines the impact of investor relations (IR) on stock returns during the COVID-19 crisis. Due to the breakdown of financial markets in the first quarter of 2020, many rumors surfaced in the news and online about the firms' abilities to overcome the crisis. Given that investors appear to have only limited information processing capabilities (see e.g., Hirshleifer & Teoh, 2003; Merton, 1987; Peng & Xiong, 2006), this might have overburdened them and led to information frictions, which in turn might have resulted in poor market valuations. This is where a firm's IR department comes into play as its key tasks are to assist investors in evaluating information and to convey the firm's strategy with the goal to mitigate uncertainty and information frictions, and thus to achieve a fairer valuation of the firm's securities. Based on this, we hypothesize that firms with better-quality IR outperformed firms with lower-quality IR during the crisis period when uncertainty among investors was particularly high.

Our results strongly support our hypothesis. Using a sample of almost 1,000 firms from 16 different European countries and IR rankings from Institutional Investor, we find that firms with strong IR experienced at least five percentage points higher

crisis returns. This result is robust to controlling for various firm and governance characteristics, industry and country fixed effects, and also persists when employing an entropy balanced sample. Especially the latter allows us to address potential endogeneity concerns. Using a difference-in-differences estimation and expanding window regressions, we further show that better-quality IR became even more valuable as the crisis unfolded. While the benefits of better-quality IR were weak at the beginning of the crisis, they grew substantially when stock markets declined severely.

In additional tests, we further find that only the private functions of a firm's IR activities (e.g., organizing meetings with senior management) are boosting firm value and that the benefits of (private) IR differ depending on the countries the firms are headquartered in. For example, good-quality IR appears to be particularly value-enhancing in countries with low levels of societal trust and where people find it difficult to deal with uncertainty.

While the aforementioned results strongly suggest that a firm's (private) IR functions are boosting firm value during the crisis, we also examine possible reasons for this return premium. Using various multivariate regressions, we find evidence of IR boosting firm value by enhancing credibility with shareholders and by diversifying its shareholder base. Firms with good-quality IR did not only retain more incumbent institutional investors but also managed to attract new institutional investors during the crisis period.

Collectively, the results from this chapter fill an important gap in the existing literature. Although some studies have shown firms with good-quality IR to have better capital market outcomes (see e.g., Brennan & Tamarowski, 2000; Brochet et al., 2020; Bushee & Miller, 2012; Chapman et al., 2019, 2021; Karolyi et al., 2020; Kirk & Vincent, 2014), this is the first study using an exogenous shock to provide evidence of a causal link between a firm's IR and its stock performance. Besides, our study is also the first to show that only a firm's private IR activities appear to be value-enhancing during times of crisis and that they help to enhance investor loyalty.

Chapter 5 studies the link between operational leanness and institutional ownership. As institutional investors have increased their share of US equity enormously over the last decades (Stambaugh, 2014), they are seen as the "...dominant force in financial markets" (Bennett et al., 2003, p. 1203). Their investments are typically large and strongly affect market outcomes (see e.g., Grinstein & Michaely, 2005). In the hope that institutional investors invest in the firm's stock and that this leads to an increase

in the share price, a common goal of managers is to attract institutional investors (see e.g., Allen et al., 2000; Chung & Zhang, 2011).

In this essay, we examine whether operational leanness attracts institutional investors. The rationale behind is that operational leanness, or in other words, minimizing operational slack constitutes a competitive advantage that ultimately results in higher stock returns (see e.g., Modi & Mishra, 2011). Considering that institutional investors are known for conducting extensive research and have sometimes access to more information than retail investors (Grinstein & Michaely, 2005), it is likely that they are attracted by operational leanness when making their investment decisions. However, a more nuanced view on the relation between operational leanness and firm performance has evolved in operations management research and is supported by empirical evidence (Eroglu & Hofer, 2011a, 2014; Modi & Mishra, 2011). While maintaining lean operations constitutes a competitive advantage owing to decreased costs and improved efficiency, going too lean comes with risks resulting in a decline in firm performance. It is thus questionable whether institutional investors are sceptical with respect to excessive levels of operational leanness.

Using a sample of 15,105 firm-year observations of US manufacturing firms between 1998 and 2020, our results provide consistent evidence of a positive association between operational leanness and institutional ownership, both in terms of the fraction of shares held by institutional investors as well as the number of institutions holding shares of the firm. In our tests, we thereby proxy for operational leanness building on the measures provided by Eroglu & Hofer (2011a) and Bendig et al. (2017). Although we control for various firm and stock characteristics as well as for industry and year fixed effects in our baseline regressions, we also address endogeneity concerns using various approaches: (I) we run regressions where all independent variables are lagged by one period, (II) we run regressions where we include the lagged dependent variable, (III) we estimate two-stage least squares regressions where we instrument for operational leanness using the ratio of lean manufacturing firms to all manufacturing firms (excluding the focal firm) located in the same metropolitan statistical area (MSA) as the focal firm in that fiscal year, (IV) we run the same baseline regressions on an entropy balanced sample, and (V) we run regressions including additional control variables. In all of these tests, our finding remains.

However, we do not find consistent support for the notion that institutional investors

view excessive levels of operational leanness as detrimental. In contrast to the studies investigating the relation between operational leanness and firm performance or credit ratings (Bendig et al., 2017; Eroglu & Hofer, 2011a, 2014; Modi & Mishra, 2011), we do not find the association between operational leanness and institutional ownership to be of an inverted U-shape using our main measure. Only in our robustness test, where we employ a different measure for operational leanness, we find some support for an inverted U-shape.

In additional tests, we further find that (I) not all institution types put emphasis on operational leanness when making investment decisions and that (II) environmental dynamism affects the association between operational leanness and institutional ownership. Consistent with the literature (see e.g., Almazan et al., 2005; Cornett et al., 2007; Grinstein & Michaely, 2005), we relate the first finding to the fact that institution types differ substantially with regard to their preferences, the rules and restrictions they are subject to, and the human capital and resources they devote to gathering information and monitoring. In our tests, only investment companies and hedge funds appear to be attracted by operational leanness, whereas banks, insurances, and pension funds do not appear to put emphasis on operational leanness. Regarding the second aspect, we show in line with Eroglu & Hofer (2014) that institutional investors are much more attracted by operational leanness when firms operate in demand uncertain industries.

Overall, the results from this last chapter do not only contribute significantly to the existing literature but also have important practical implications. Previous work has shown institutional investors to favor firms with large market capitalizations, high market liquidity, low return volatility, and also those firms paying higher dividends (see e.g., Badrinath et al., 1996; Falkenstein, 1996; Grinstein & Michaely, 2005; Huang, 2020), having better-quality corporate disclosure (Bushee & Noe, 2000) and governance standards (Chung & Zhang, 2011; Ferreira & Matos, 2008; Leuz et al., 2009), and investor relations practices (Brochet et al., 2020; Bushee & Miller, 2012; Kirk & Vincent, 2014). Yet, our study is the first to show that operational leanness matters as well. Besides, our results imply that firms can attract institutional investors by implementing lean practices and that this is particularly true in demand uncertain industries. However, managers should keep in mind that they primarily attract investment companies and hedge funds by adopting lean practices.

1.2 Publication Details

Paper I (Chapter 2):

Trust and Stock Market Volatility during the COVID-19 Crisis

Authors:

Nils Engelhardt, Miguel Krause, Daniel Neukirchen, and Peter N. Posch

Abstract:

We investigate if trust affects global stock market volatility during the COVID-19 pandemic. Using a sample of 47 national stock markets, we find the stock markets' volatility to be significantly lower in high-trust countries (in reaction to COVID-19 case announcements). Both trust in fellow citizens as well as in the countries' governments are of significant importance.

Publication Details:

Finance Research Letters (2021), 38, 101873.
https://doi.org/10.1016/j.frl.2020.101873

Paper II (Chapter 3):

Firm Efficiency and Stock Returns during the COVID-19 Crisis

Authors:

Daniel Neukirchen, Nils Engelhardt, Miguel Krause, and Peter N. Posch

Abstract:

We investigate the relationship between firm efficiency and stock returns during the COVID-19 pandemic. We find that highly efficient firms experienced at least 9.44 percentage points higher cumulative returns during the market collapse. A long-short portfolio consisting of efficient and inefficient firms would have also yielded a significantly positive weekly return of 3.53% on average. Overall, our results show that firm efficiency has significant explanatory power for stock returns during the crisis period.

Publication Details:

Finance Research Letters (2021), 102037.
https://doi.org/10.1016/j.frl.2021.102037

Paper III (Chapter 4):

The Value of (Private) Investor Relations during the COVID-19 Crisis

Authors:

Daniel Neukirchen, Nils Engelhardt, Miguel Krause, and Peter N. Posch

Abstract:

We investigate the impact of investor relations (IR) and find firms with strong IR to experience between five and eight percentage points higher stock returns than those with weak IR during the COVID-19 crisis. Firms with better-quality IR are also associated with higher investor loyalty and attracted significantly more institutional investors over the crisis period. This suggests that a firm's IR contributes to value generation by enhancing credibility with shareholders and by diversifying its shareholder base. After decomposing IR into public and private transmission channels, we find the private IR function to be the main driver of our results.

Publication Details:

Working Paper. Revised and Resubmitted to the Journal of Banking & Finance.

Paper IV (Chapter 5):

Operational Leanness and Institutional Ownership

Authors:

Daniel Neukirchen, Gerrit Köchling, and Peter N. Posch

Abstract:

We examine the link between operational leanness and institutional ownership. Using a sample of 15,105 firm-year observations of US manufacturing firms from 1998 to 2020, we find firms with higher levels of operational leanness to attract significantly more institutional investors. In contrast to studies investigating the link between operational leanness and firm performance or credit ratings, our results do not provide consistent evidence that the relationship is of an inverted U-shape. We further show environmental dynamism to affect the relationship, and that institution types differ substantially in how they evaluate operational leanness. Overall, our results imply that institutional investors consider operational leanness as a competitive advantage when making investment decisions.

Publication Details:

Working Paper. Submitted to Management Science.

2 Trust and Stock Market Volatility during the COVID-19 Crisis

The following is based on Engelhardt et al. (2020b).

3 Firm Efficiency and Stock Returns during the COVID-19 Crisis

The following is based on Neukirchen et al. (2021a).

4 The Value of (Private) Investor Relations during the COVID-19 Crisis

The following is based on Neukirchen et al. (2021b).

5 Operational Leanness and Institutional Ownership

The following is based on Neukirchen et al. (2021c).

5.1 Introduction

Institutional investors are seen as the "... dominant force in financial markets" since they invest substantial amounts in each stock and largely affect market outcomes (Bennett et al., 2003, p. 1203). Attracting institutional investors is therefore a goal of many stock-listed firms hoping that a larger shareholder base leads to a higher share price, and thus a higher market valuation (Allen et al., 2000; Chung & Zhang, 2011).

Prior literature has shown institutional investors to particularly invest in larger firms[1], firms with high market liquidity, low return volatility, and those paying higher dividends (see e.g., Badrinath et al., 1996; Falkenstein, 1996; Grinstein & Michaely, 2005; Huang, 2020). Also, better-quality corporate disclosure (Bushee & Noe, 2000) and governance standards (Chung & Zhang, 2011; Ferreira & Matos, 2008; Leuz et al., 2009) as well as investor relations practices are means to attract institutional investors (Brochet et al., 2020; Bushee & Miller, 2012; Kirk & Vincent, 2014). Parrino et al. (2003) further outline that institutional investors decrease their holdings when they are disappointed with the firm's management.

In this paper, we examine whether institutional investors prefer firms with lean operations. Until recently, lean operation practices have been linked with excellence by both researchers and industry experts (Bendig et al., 2017). However, as Modi & Mishra (2011) and Bendig et al. (2017) point out, a more nuanced view on the association between operational leanness and firm performance has evolved in operations manage-

[1] In this context, Bennett et al. (2003) outline that institutional investors have shifted their preference towards stocks with smaller market capitalizations over time.

ment research. While operational leanness might result in a competitive advantage due to the lower costs and improved efficiency associated with it, it also comes with risks when firms are too lean. This is because excessive leanness might have an impact on the firms' ability to respond to environmental and competitive challenges. For instance, if firms run out of inventory, they might incur even higher costs (e.g., transportation and stockout costs) as if they had higher inventory levels beforehand (Eroglu & Hofer, 2011b).

The empirical evidence supports this nuanced view. Many recent studies show the association between operational leanness and firm performance to be of a concave shape (Eroglu & Hofer, 2011a,b, 2014; Modi & Mishra, 2011). There seems to be an optimal level of operational leanness after which the positive effect on firm performance diminishes. Given that institutional investors conduct extensive research before investing in firms and are sometimes privy to information unknown to individual investors (Grinstein & Michaely, 2005), it is likely that they also consider operational leanness as a potential competitive advantage when making their investment decisions. On this account, we ask the following questions: Do institutional investors favor firms with lean operations? And if so, do they view excessive levels of operational leanness as detrimental? And also, do different types of institutional investors differ in how they evaluate operational leanness and does environmental dynamism affect the relationship?

To answer these questions, we use a sample of 15,105 firm-year observations of US stock-listed manufacturing firms from 1998 to 2020. We define a measure for total operational leanness building on the work of Eroglu & Hofer (2011b) and Bendig et al. (2017), i.e., we employ the sum of the individual Empirical Leanness Indicator (ELI) scores for inventory and property, plant, and equipment (PPE) leanness. Using this measure for total operational leanness, we find leaner firms to attract significantly more institutional investors. The results are robust to different specifications including year and industry dummies and hold in tests addressing endogeneity concerns. In terms of economic significance, we show that lean firms are associated with a roughly three percentage points increase in the fraction of shares held by institutional investors.

In additional tests, we also examine whether the relationship is of an inverted U-shape, differs depending on institution type, or is influenced by environmental dynamism. In contrast to the studies investigating the impact of leanness on equity performance or credit ratings respectively, our results do not provide consistent evidence for an inverted

U-shape. While we find some evidence of diminishing returns using the percentage of shares owned by institutional investors as the outcome variable, we find a rather linear relationship in the regressions using the number of institutional investors holding shares of the firm as the outcome variable. We relate this result to the fact that, especially compared to credit rating analysts, institutional investors might be less risk-averse and view excessive leanness with less scepticism. However, when employing measures for operational leanness based on Modi & Mishra (2011) in our robustness checks, we find evidence of a concave relationship. In our other tests, we find only investment advisors and hedge funds to be particularly attracted by operational leanness. These two institution types are known for having skilled employees, devoting substantial resources to gathering information, and are typically not subject to prudent-man rules. Finally, we show that institutional investors put significantly more emphasis on operational leanness when firms operate in demand uncertain industries and to some extent when they operate in innovative industries.

We contribute to the literature along two main dimensions. First, we extend the literature examining firm characteristics that attract institutional investors (see e.g., Badrinath et al., 1996; Bennett et al., 2003; Brochet et al., 2020; Bushee & Miller, 2012; Chung & Zhang, 2011; Del Guercio, 1996; Falkenstein, 1996; Gompers & Metrick, 2001; Grinstein & Michaely, 2005; Kirk & Vincent, 2014; Leuz et al., 2009). While the literature has shown the above-mentioned characteristics to be important to institutional investors, this is the first paper showing that operational leanness also matters. Institutional investors appear to view operational leanness as a competitive advantage that may result in better future performance and higher returns. Second, our paper contributes to the literature on operational leanness. While equity performance (Eroglu & Hofer, 2011a,b, 2014; Modi & Mishra, 2011) and credit ratings (Bendig et al., 2017) have been examined in earlier studies, our study provides a deeper understanding of how operational leanness might also have an impact on the firm's ownership structure.

The rest of our paper is structured as follows. In Section 5.2, we outline the theoretical background and develop our hypotheses. Section 5.3 describes the construction of our sample and the main variables. In Section 5.4, we explain our empirical methodology and present the results. In Section 5.5, we show the results from robustness tests and outline limitations. Finally, in Section 5.6, we discuss our findings and conclude.

5.2 Theoretical Background and Development of Hypotheses

5.2.1 Institutional Investors

The fraction of shares of US firms held by institutional investors (such as mutual funds, hedge funds, pension funds, endowment funds, banks, and insurance companies investing on the behalf of others) has increased enormously in the last decades. While institutional investors were holding roughly 50% of US equity in 1980, they were holding almost 80% in 2012 (Stambaugh, 2014). Attracting institutional investors has therefore become a common goal of many stock-listed companies (Allen et al., 2000; Chung & Zhang, 2011). The rationale behind this is that firms want to increase firm value due to the institutions' market power, monitoring abilities, and experience in takeovers (Allen et al., 2000).

Compared to individual investors, institutional investors invest substantial amounts in each stock, which strongly affects market outcomes (Grinstein & Michaely, 2005). Due to these substantial investments at stake, institutional investors conduct extensive research and also use corporate information unknown to individual investors in order to identify firms (Allen et al., 2000; Grinstein & Michaely, 2005; Michaely & Shaw, 1994), which are well-run and governed, possess a competitive advantage, and thus promise substantial returns. Also, institutional investors are associated with more monitoring (see e.g., Chung et al., 2002; Cornett et al., 2007; Kang et al., 2018) and shareholder activism in order to protect their investments (see e.g., Denes et al., 2017; Gillan & Starks, 2000; Smith, 1996). They use their power to put pressure on management to address aspects related to a firm's operational efficiency or corporate governance that should be changed from their point of view (McKinsey, 2016). However, as noted by Cornett et al. (2007), the level of monitoring that institutional investors exert is strongly dependent on the existing business relations with the firm, the type of the institution, and the fraction that the institution holds.

5.2.2 Operational Leanness, Firm Performance, and Institutional Ownership

Extant theoretical research in operations management has discussed whether reducing slack and following lean operation practices can create a competitive advantage for firms (for an overview, see e.g., Adler et al., 2009; Modi & Mishra, 2011). Whereas firms with low levels of slack are associated with resource efficiency and valuable skills stemming from the complex interplay between individual routines and the resulting path dependencies (Peng et al., 2008), high levels of slack are indicative of firms using their resources inefficiently and accumulating waste (Chase et al., 2006; Womack et al., 1990). Since this waste is costly, firms minimizing it should have more stable operations and perform significantly better (Deming, 1986; Womack et al., 1990). Thompson (1967) also claims slack to negatively influence information visibility of managers, i.e., reducing their capacity to identify issues in their operations. High amounts of inventory slack, for instance, may obscure the underlying reasons for possible quality issues (Chase et al., 2006). Consequently, Womack & Jones (2003) conclude that slack does not contribute to creating firm value.

While implementing lean operations practices might improve firm performance from a theoretical viewpoint, there are also strong arguments why excessive levels of leanness might be detrimental. This is because slack can act as a buffer against uncertainty (Womack et al., 1990) and might allow firms to respond quickly to environmental and competitive changes. Firms with no or relatively low levels of slack might be inflexible (Ryzin & Mahajan, 1999). Some scholars even highlight that firms with low levels of slack are more likely to experience supply chain disruptions (see e.g., Chopra & Sodhi, 2004; Ferrer et al., 2007) and that the stock market reactions to these disruptions are more negative compared to firms with more slack (Hendricks et al., 2009). Finally, Nohria & Gulati (1996) claim slack to be a source of innovation since it allows firms to develop new ideas.

As discussed earlier, recent empirical studies in operations management research have found, in line with these arguments, that reducing slack and having lean operations is associated with better firm performance and higher market valuations, but only until a certain turning point (Eroglu & Hofer, 2011b, 2014; Modi & Mishra, 2011). If firms become too lean, firm performance deteriorates. Considering that institutional

investors, similar to credit rating analysts (Bendig et al., 2017), are aware of this relationship, devote resources to extensive research before investing in a firm, and put emphasis on operational efficiency, it seems likely that they prefer comparatively lean firms. Institutional investors might expect these firms to enjoy a competitive advantage and yield higher returns; and thus they increase their holdings. Firms with excessive leanness should, however, experience a decrease in institutional ownership. Based on this argumentation, we formulate the following two hypotheses:

Hypothesis I: There is a positive association between operational leanness and institutional ownership.

Hypothesis II: The association between operational leanness and institutional ownership is of an inverted U-shape. Thus, there is an optimal level of operational leanness after which the positive effect diminishes.

5.2.3 Operational Leanness and Different Institution Types

As noted by Cornett et al. (2007), there are several reasons why "... not all institutional investors are equal" (p. 1772). First, institutions differ substantially regarding their investment strategies and preferences (Grinstein & Michaely, 2005). For instance, institutions subject to so-called "prudent-man" rules[2] are more likely to invest in stocks that pay stable dividends, show stable earnings records, and are associated with a higher level of external validation (Del Guercio, 1996). Institutions subject to these rules are typically banks and pension funds. Mutual funds and hedge funds, however, often face much weaker restrictions, which allow them to tilt their portfolios towards stocks that might offer other beneficial characteristics – such as operational leanness.

Second, different tax regulations imposed on certain types of institutions have an impact on their portfolio choices. Some institutions such as university endowment funds, non-profit-institutions, or pension funds are not obliged to pay taxes when they earn dividends (Grinstein & Michaely, 2005). It thus seems reasonable to assume that institutions profiting from these tax advantages are more likely to focus on stocks paying stable dividends.

[2]Prudent-man laws are regulations meant "... to protect beneficiaries by allowing them to seek damages from a fiduciary who fails to invest in their best interest" (Del Guercio, 1996, p.32).

Third and finally, Almazan et al. (2005) highlight that institutions differ regarding their human capital and the resources they devote to gathering information.[3] They claim investment advisors and hedge funds to have more skilled employees and to devote more resources to gathering information. In contrast, banks and insurance companies often devote fewer resources due to their potential business relations.

On this account, we expect different types of institutions to put more emphasis on operational leanness than others do. Specifically, we expect investment advisors and hedge funds, which conduct extensive research, have more skilled employees, and are not subject to prudent-man rules to be attracted by firms with lean operations. We sum it up in the following hypothesis:

Hypothesis III: The association between operational leanness and institutional ownership might differ depending on the institution type. Investment advisors and hedge funds are expected to put more emphasis on operational leanness than banks, pension funds, and insurance companies.

5.2.4 Operational Leanness, Institutional Ownership, and Environmental Dynamism

There are also good reasons to expect that environmental dynamism influences the relationship between operational leanness and institutional ownership. Environmental dynamism thereby refers to how uncertain and unpredictable a firm's environment is and to which extent it changes (Miller & Friesen, 1983). Previous research has shown that environmental dynamism, inter alia, affects managers' strategic decisions (see e.g., Hough & White, 2003; Garg et al., 2003; Mitchell et al., 2011; Priem et al., 1995), strategic change (Richard et al., 2019), the capital (Simerly & Li, 2000) and ownership structure (Li & Simerly, 1998), and other firm-level outcomes (see e.g., Schilke, 2014; Wang & Li, 2008). In the context of operations management research, Azadegan et al. (2013) and Eroglu & Hofer (2014) show environmental dynamism to affect the relation between leanness and firm performance. Considering that institutional investors are

[3]Grinstein & Michaely (2005) note that, irrespective of institutional investor type, institutions are considered to be better at gathering information and monitoring management compared to retail investors.

aware of the fact that the risks in a firm's environment and the decision to adopt lean practices influence the firm's performance, it seems likely that they increase or decrease their holdings accordingly. Thus, we expect the effect of operational leanness on institutional ownership to differ depending on environmental dynamism.

However, we follow Eroglu & Hofer (2014) and do not view environmental dynamism as a unidimensional but rather as a multi-dimensional construct. We therefore specifically focus on the innovative intensity, the level of demand uncertainty, and the competitive intensity in an industry.

Regarding the first dimension, Eroglu & Hofer (2014) argue that innovation makes adopting lean practices more complex because innovation is associated with uncertainty and shorter product life cycles. While firms in less innovative environments can rely on past experience concerning supply and customer demand (Crandall & Crandall, 2003), firms in innovative environments cannot. Consequently, these firms are likely associated with higher inventory levels and more operational slack (Eroglu & Hofer, 2014). Since slack is costly, institutional investors might expect firms operating in innovative industries and maintaining lean operations to enjoy an even stronger competitive advantage compared to their industry peers. They thus might prefer these firms. However, institutional investors might view excessive leanness as detrimental to firm performance because of the uncertainty in an innovative environment. We hypothesize:

Hypothesis IVa: The association between operational leanness and institutional ownership is stronger in innovative industries.

Hypothesis IVb: Excessive leanness results in a greater decrease in institutional ownership in innovative industries.

Same as in innovative industries, adopting lean practices, especially lean inventory practices, is also more complicated in industries with high demand uncertainty (Gavirneni & Isen, 2010). This is because demand uncertainty is generally seen as the key reason for carrying operational slack as it provides a buffer and offers the opportunity to adapt to changing conditions (Womack et al., 1990). As a result, firms that are able to generate sales in these industries with low levels of operational slack should incur lower costs and thus enjoy a greater competitive advantage compared to their industry

peers. Excessive leanness might, however, come with higher costs when firms cannot meet customer demand. Given that institutional investors are aware of this relationship, we expect them to put greater emphasis on operational leanness in industries with high demand uncertainty. Deviating from optimal levels of operational leanness might, however, result in a greater decrease in institutional ownership. We sum it up in the following hypotheses:

Hypothesis Va: The association between operational leanness and institutional ownership is stronger in demand uncertain industries.

Hypothesis Vb: Excessive leanness results in a greater decrease in institutional ownership in demand uncertain industries.

Finally, concerning competitive intensity, Nickell (1996) and Winston (1998) stress that firms in competitive industries have an incentive to be more productive and to carry less slack in order to earn profits. As a result, firms in competitive industries are expected to be generally leaner compared to firms in less competitive industries. But as profit margins are also lower in competitive industries, the costs of carrying more slack, and especially inventory slack, are lower than those in less competitive industries (Eroglu & Hofer, 2014). Hence, institutional investors might expect that being slightly leaner than industry peers does not constitute an important competitive advantage due to the relatively low costs associated with it. Also, institutional investors might view deviations from optimal levels as less severe. On this account, we hypothesize:

Hypothesis VIa: The association between operational leanness and institutional ownership is weaker in competitive industries.

Hypothesis VIb: Excessive leanness results in a smaller decrease in institutional ownership in competitive industries.

5.3 Data and Variables

To test our hypotheses, we merge data from several sources. We obtain accounting data from Compustat and stock data from the Center for Research in Security Prices (CRSP) for all manufacturing firms (SIC 2000-3999) listed on the three main US stock exchanges (i.e., NYSE, NASDAQ, NYSE American). Following previous studies (see e.g., Bendig et al., 2017; Eroglu & Hofer, 2011b), we exclude firms with negative inventory and sales levels. We then merge with ownership data from Thomson Reuters Eikon. Our final sample consists of 15,105 firm-year observations for the period from 1998 through 2020. The reason why we restrict our observation period to 1998 through 2020 is that ownership data is only available for a large number of firms since 1998.[4]

The main dependent variables in our regressions are *% Inst. Ownership* and *ln(# Inst. Ownership)*. In line with previous studies examining institutional ownership (see e.g., Allen et al., 2000; Chung & Zhang, 2011; Grinstein & Michaely, 2005; Gompers & Metrick, 2001), we define *% Inst. Ownership* for each firm-year as the ratio of the number of shares owned by institutional investors to the number of shares outstanding (multiplied by 100). The variable *ln(# Inst. Ownership)* is defined as the natural logarithm of the number of institutions holding shares of the firm.

Our main independent variable of interest is *Leanness*. We define *Leanness* as the sum of the firms' individual scores for inventory leanness (*Inv. ELI*) and PPE leanness (*PPE ELI*), which we obtain following the methodology proposed in Eroglu & Hofer (2011b) and Bendig et al. (2017). So for each four-digit SIC industry and year[5], we run regressions where we employ the natural logarithm of the firm's total inventory (or PPE respectively) as the dependent variable, while we use the natural logarithm of a firm's sales as the independent variable. The studentized residuals from these regressions multiplied by -1 are then used as the individual scores for inventory and PPE leanness for each firm-year. Higher scores indicate that firms are leaner compared to other firms in the same industry. While we also use the individual scores in our robustness checks, the rationale behind using the sum of these scores as our main independent variable is that we want to measure a firm's total operational leanness. Based on this total leanness score, we also define the variable *Leanness Dummy* that is one if the firm's

[4]We report the distribution of firms over time in Table D1 in the Appendix.
[5]We exclude four-digit SIC industries with less than five firms in the respective year.

Leanness score exceeds the industry-year median, and zero otherwise.

With respect to control variables, we follow the closely related study by Chung & Zhang (2011) and control for a variety of firm and stock characteristics. For instance, we control for the natural logarithm of the market capitalization (*ln(Market Cap)*) because firms with higher market values of equity are more likely to attract institutional investors (Gompers & Metrick, 2001). We also control for stock (*Return*) and operating performance (*ROA*) as well as for stock volatility (*Volatility*) since institutional investors have been shown to consider these aspects when making their investment decisions (see e.g., Badrinath et al., 1996; Falkenstein, 1996). Additionally, we include controls for firm characteristics such as the firm's *Tobin's Q*, *Leverage*, and *ln(Firm Age)*. In terms of further stock characteristics, we also control for the natural logarithm of the firm's average stock price (*ln(Price)*), the average bid-ask spread (*Bid Ask*), the average monthly turnover (*Turnover*), and the dividend yield (*Div. Yield*). Concerning the latter, Grinstein & Michaely (2005) particularly show that institutional investors avoid firms paying high cash dividends.

In Table 5.1, we provide descriptive statistics and correlations for the variables in our sample. We detail the construction of all variables in Table D2 in the Appendix. We further note that we winsorize all continuous variables at the 1st and 99th percentiles to account for outliers.

The descriptive statistics show that the mean (median) proportion of shares held by institutional investors is 59.95% (67.76%), while the mean (median) number of institutional investors holding shares of the firm is 279.41 (147.00). The mean *Leanness* score is -0.06. Furthermore, the average firm in our sample has a market capitalization of $7005.17 million, is 25.46 years old, has a Tobin's Q of 2.25, and a return on assets of 5.50%. The average stock price is $30.19.

As regards pairwise correlations, we find them to be relatively low. We therefore expect that multicollinearity does not affect our results.

Table 5.1: This table displays descriptive statistics in Panel A and pairwise correlations in Panel B for the variables in our sample.* indicates a level of statistical significance of 5% or less.

Panel A: Descriptive Statistics

	Obs.	Mean	Median	Std.	Min.	Max.
Dependent Variables:						
% Inst. Ownership	15105	59.9452	67.7645	29.3714	0.1200	99.2049
# Inst. Ownership	15105	279.4097	147.0000	379.6904	1.0000	1995.0000
Main Variable of Interest:						
Leanness	15105	-0.0629	-0.0887	1.4279	-3.6693	3.6150
Leanness Dummy	15105	0.4522	0.0000	0.4977	0.0000	1.0000
Control Variables:						
Market Cap	15105	7005.1695	638.5990	21193.2452	5.6088	146793.3000
Firm Age	15105	25.4637	21.0000	17.9156	1.0000	68.0000
Tobin's Q	15105	2.2516	1.6712	1.8573	0.5876	13.3569
ROA	15105	0.0550	0.1115	0.2395	-1.3509	0.3834
Leverage	15105	0.2034	0.1765	0.1929	0.0000	0.9707
Div. Yield	15105	0.0101	0.0000	0.0167	0.0000	0.0953
Return	15105	0.1597	0.0691	0.6186	-0.8172	3.0956
Volatility	15105	0.5154	0.4461	0.2757	0.1508	1.5602
Turnover	15105	8.5724	5.8902	10.0132	0.4008	70.8477
Bid Ask	15105	0.0092	0.0026	0.0145	0.0001	0.0826
Price	15105	30.1926	18.4456	35.4865	0.7726	205.2944

Panel B: Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) % Inst. Ownership	1.00*														
(2) ln(# Inst. Ownership)	0.73*	1.00*													
(3) Leanness	−0.06*	−0.18*	1.00*												
(4) Leanness Dummy	−0.05*	−0.15*	0.70*	1.00*											
(5) ln(Market Cap)	0.61*	0.94*	−0.21*	−0.17*	1.00*										
(6) Firm Age	0.20*	0.35*	−0.13*	−0.15*	0.33*	1.00*									
(7) Tobin's Q	0.01	0.14*	0.10*	0.11*	0.21*	−0.13*	1.00*								
(8) ROA	0.31*	0.32*	0.05*	−0.01	0.38*	0.28*	−0.22*	1.00*							
(9) Leverage	0.12*	0.16*	−0.11*	−0.10*	0.15*	0.03*	−0.05*	−0.07*	1.00*						
(10) Div. Yield	0.09*	0.22*	−0.07*	−0.11*	0.23*	0.31*	−0.15*	0.22*	0.07*	1.00*					
(11) Return	0.05*	0.06*	0.08*	0.06*	0.13*	0.00	0.28*	0.15*	−0.05*	−0.10*	1.00*				
(12) Volatility	−0.43*	−0.50*	0.08*	0.10*	−0.54*	−0.40*	0.06*	−0.46*	0.03*	−0.29*	0.01	1.00*			
(13) Turnover	0.09*	0.14*	0.00	0.01	0.08*	−0.15*	0.12*	−0.16*	0.06*	−0.14*	0.09*	0.39*	1.00*		
(14) Bid Ask	−0.59*	−0.70*	0.07*	0.06*	−0.61*	−0.15*	−0.13*	−0.18*	−0.03*	−0.10*	−0.05*	0.45*	−0.20*	1.00*	
(15) ln(Price)	0.62*	0.75*	−0.10*	−0.10*	0.79*	0.35*	0.15*	0.50*	0.04*	0.25*	0.07*	−0.60*	−0.01	−0.51*	1.00*

5.4 Results

5.4.1 Baseline Results

To test for Hypothesis I stating that operational leanness is positively associated with institutional ownership, we perform the following baseline ordinary least squares (OLS) panel regressions:

$$\begin{aligned} \%\ Inst.\ Ownership_{i,t} \ \ or \ \ ln(\#\ Inst.\ Ownership_{i,t}) = \beta_0 + \beta_1 \times Leanness_{i,t} \\ + \beta' \times X_{i,t} + Industry\ FE \\ + Year\ FE + \varepsilon_{i,t} \end{aligned} \tag{5.4.1}$$

where i denotes the firm and t the year. The dependent variable is either *% Inst. Ownership* or *ln(# Inst. Ownership)*, while the main independent variable is *Leanness*. We include a variety of controls related to firm and stock characteristics denoted by the vector X. Additionally, we include industry dummies based on the four-digit SIC industry codes[6] as well as year dummies. ε denotes the error term. In additional regressions, we use the dummy variable instead of our continuous variable to measure operational leanness.

Table 5.2 shows the results from these regressions where standard errors are clustered at the firm-level to account for heteroscedasticity. Panel A displays the results from the baseline specifications where all independent variables are contemporaneous with the dependent variable. Using our raw leanness score in column (1), we find leaner firms to be positively and statistically significantly associated with a higher fraction of shares owned by institutional investors. The coefficient indicates that a one standard deviation increase in operational leanness relates to a roughly 2.0 percentage points increase in the fraction of shares owned by institutional investors, which is an economically sizeable effect. In column (2), we employ our dummy variable *Leanness Dummy* and find firms with a *Leanness* score above the industry-year median to be associated with a 2.8 percentage points higher fraction of shares held by institutional investors. In columns

[6]We also re-estimate all specifications using industry dummies based on two-digit SIC industry codes as well as on the Fama-French 48-industry classification, but we find that this does not alter the results.

(3) and (4), we employ *ln(# Inst. Ownership)* as the dependent variable. Regardless of

Table 5.2: This table displays the regression results of measures of institutional ownership on operational leanness and a set of control variables. Panel A reports the results from pooled ordinary least squares (OLS) regressions and Panel B reports the results from generalized linear models and negative binomial regressions. For the ease of comparison, the reported coefficient estimates in columns (1) and (2) of Panel B are marginal effects. In Panel C all independent variables are lagged by one period $(t-1)$ and in Panel D the lagged dependent variable is included as a further control variable. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Panel A: OLS				
Dependent Variable:	*% Inst. Ownership*		*ln(# Inst. Ownership)*	
	(1)	(2)	(3)	(4)
Leanness	1.402***		0.027***	
	(4.680)		(4.220)	
Leanness Dummy		2.801***		0.058***
		(3.848)		(3.990)
ln(Market Cap)	3.033***	2.816***	0.513***	0.509***
	(6.946)	(6.561)	(67.897)	(69.368)
Firm Age	−0.789	−0.863	0.109***	0.108***
	(−1.153)	(−1.259)	(9.366)	(9.238)
Tobin's Q	−2.172***	−2.046***	−0.040***	−0.038***
	(−8.966)	(−8.447)	(−8.081)	(−7.787)
ROA	−0.653	0.015	−0.133***	−0.122***
	(−0.314)	(0.007)	(−2.964)	(−2.730)
Leverage	13.427***	13.066***	0.125***	0.119***
	(5.346)	(5.174)	(2.993)	(2.808)
Div. Yield	−157.318***	−158.680***	0.054	0.034
	(−6.018)	(−6.092)	(0.103)	(0.065)
Return	0.807**	0.864**	−0.085***	−0.084***
	(2.337)	(2.499)	(−11.639)	(−11.496)
Volatility	−7.780***	−7.800***	0.121***	0.120***
	(−4.340)	(−4.354)	(3.004)	(2.992)
Turnover	0.019	0.021	0.003***	0.003***
	(0.425)	(0.459)	(3.121)	(3.153)
Bid Ask	−508.710***	−517.304***	−18.635***	−18.790***
	(−13.156)	(−13.414)	(−21.843)	(−21.997)
ln(Price)	9.097***	9.156***	0.044***	0.045***
	(11.961)	(11.989)	(3.158)	(3.214)
Observations	15105	15105	15105	15105
Firms	1280	1280	1280	1280
Industry Fixed Effects	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
Adjusted R-Squared	0.586	0.584	0.922	0.922

Table is continued on the next page.

Table 5.2 continued

Panel B: Fractional GLM & Negative Binomial Regressions

Dependent Variable:	*% Inst. Ownership*		*# Inst. Ownership*	
	(1)	(2)	(3)	(4)
Leanness	0.014***		0.019***	
	(4.870)		(4.001)	
Leanness Dummy		0.028***		0.042***
		(4.050)		(3.764)
Observations	15105	15105	15105	15105
Firms	1280	1280	1280	1280
Controls	yes	yes	yes	yes
Industry Fixed Effects	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
Pseudo R^2	0.172	0.171	0.931	0.930

Panel C: All independent variables are lagged $(t-1)$

Dependent Variable:	*% Inst. Ownership*		*# Inst. Ownership*	
	(1)	(2)	(3)	(4)
Leanness_{t-1}	1.531***		0.033***	
	(4.749)		(4.860)	
$\text{Leanness Dummy}_{t-1}$		2.534***		0.053***
		(3.218)		(3.329)
Observations	13221	13221	13221	13221
Firms	1166	1166	1166	1166
Controls	yes	yes	yes	yes
Industry Fixed Effects	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
Adjusted R^2	0.575	0.572	0.912	0.911

Panel D: Lagged dependent variable is included as a control variable

Dependent Variable:	*% Inst. Ownership*		*# Inst. Ownership*	
	(1)	(2)	(3)	(4)
Leanness	0.235***		0.011***	
	(3.993)		(4.741)	
Leanness Dummy		0.307*		0.022***
		(1.882)		(3.917)
$\%\text{ Inst. Ownership}_{t-1}$	0.873***	0.874***		
	(142.451)	(142.999)		
$\ln(\#\text{ Inst. Ownership})_{t-1}$			0.688***	0.688***
			(51.976)	(51.787)
Observations	14084	14084	14084	14084
Firms	1222	1222	1222	1222
Controls	yes	yes	yes	yes
Industry Fixed Effects	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
Adjusted R^2	0.917	0.917	0.974	0.974

whether we use the raw score or the dummy variable, the results show a positive and statistically significant relationship between operational leanness and the number of institutional investors. In terms of economic magnitude, the coefficient on our dummy variable implies lean firms to be associated with approximately 5.8% more institutional investors (column (4)).

Regarding control variables, the results are comparable to those found in Chung & Zhang (2011). We find firms with higher market capitalizations, higher leverage ratios, better stock performance, and higher stock prices to attract significantly more institutional investors. Firms with higher Tobin's Qs, higher dividend yields, higher stock volatility, and higher bid-ask spreads are, however, associated with less institutional ownership. The only noteworthy differences compared to the results in Chung & Zhang (2011) are that we do not find statistically significant relationships between firm age or operating performance respectively, and institutional ownership.

In Panel B, we repeat the analyses using different estimation methods that might be more appropriate to examine the relationship between operational leanness and institutional ownership. In columns (1) and (2), we thus use a fractional generalized linear model (GLM) to account for the fact that our dependent variable is a proportion with values ranging between 0 and 1.[7] But regardless of the different estimator, our previous findings remain unchanged. For instance, the coefficient in column (2) indicates that lean firms are associated with roughly 2.8 percentage points higher institutional ownership. The coefficients can be interpreted in a linear fashion since we report marginal effects for ease of comparison. In columns (3) and (4), we employ the firms' raw number of institutional investors and thus re-estimate the specifications using a negative binomial regression as we are dealing with count data.[8] Similar to the results in Panel A, we find leaner firms to attract more institutional investors.

To deal with concerns related to reverse causality, we also repeat the regressions from Panel A but with all independent variables lagged by one period. The results, which are very similar to those discussed earlier, are presented in Panel C.

In Panel D, we finally tabulate the results from regressions similar to Panel A, but where we additionally include the lagged dependent variables. By doing so, we attempt to further rule out concerns related to reverse causality as higher institutional ownership

[7] We divide *% Inst. Ownership* by 100 to carry out this analysis.
[8] We also estimate Poisson regressions and find similar results.

could cause firms to become leaner. This argument is especially viable considering that institutional ownership is also associated with more shareholder activism (see e.g., Denes et al., 2017; Gillan & Starks, 2000; Smith, 1996). So with an increase in their share of a particular firm, institutional investors might put pressure on management to adopt lean practices. However, while including the lagged dependent variables in these regressions helps to address this concern, it might lead to a downward bias on the remaining independent variables in terms of magnitude and statistical significance. As expected, we find the magnitude of the coefficients on *Leanness* and *Leanness Dummy* (and on the other independent variables not shown) to decrease, but they still remain positive and statistically significant.

Overall, these first results strongly support our hypothesis that firms with lean operations attract significantly more institutional investors. The results are robust to using the fraction of shares held by institutional investors as well as the number of institutional investors as the dependent variable and also to controlling for several firm and stock characteristics as well as industry and year-fixed effects. However, we acknowledge that we do not employ firm-fixed effects regressions because most of the variation in our dependent variables and in our main independent variables is in the cross-section and not in the time-series. For instance, the correlation between *Leanness* and its lagged value is roughly 90%, and the correlation between *% Inst. Ownership* and its lagged value is even higher at 95%. In the finance literature, there are a few papers proposing that in these cases utilizing firm-fixed effect regressions might be inappropriate and might bias the results towards finding no statistically significant relationship (see e.g., Coles et al., 2008; Tran & Turkiela, 2020; Zhou, 2001). Yet, the exclusion of firm-fixed effects might raise further concerns related to endogeneity and particularly to omitted variable bias. While we control for a variety of variables, there might be another firm-level, time-invariant variable influencing both our measure for operational leanness as well as institutional ownership that we do not account for in our baseline specifications. In the next section, we therefore aim to address these concerns using two identification strategies, namely an instrumental variables approach and entropy balancing. Both approaches have been used to mitigate endogeneity concerns in general, but especially the instrumental variables approach has been shown to mitigate concerns related to omitted variable bias (see e.g., Angrist & Krueger, 2001; Kennedy, 2008). Furthermore, we also control for several other independent variables in additional

regressions, which also helps to ensure that omitted variable bias is unlikely affecting our results.

5.4.2 Addressing Endogeneity

Instrumental Variables Approach

We first focus on the instrumental variables approach using the two-stage least squares estimator (2SLS). To instrument *Leanness*, we use the ratio of lean manufacturing firms to all manufacturing firms (excluding the focal firm) located in the same metropolitan statistical area (MSA) as the focal firm in that fiscal year.[9] The rationale behind using this particular instrument is that firms might be more likely to adopt lean practices when they are surrounded by firms that already adopted lean practices. In this regard, there are a few studies showing the geographic location of firms and also industry clusters to influence the firms' strategic decisions (see e.g., Alcacer & Chung, 2007; Bell, 2005). We thus expect to find a positive correlation between our instrument and our measure for operational leanness. The relevance condition is therefore likely to be met, but a good instrument must also meet the exclusion condition, i.e., the instrument only affects the outcome variable through the potentially endogenous variable and is thus uncorrelated with the error term. We argue that the geographical proximity to lean manufacturing firms likely determines the firm's decision to adopt lean practices, but it should unlikely be related to a particular firm's ownership structure other than through the firm's final decision to adopt lean practices.

In Table 5.3, we present the results from the 2SLS estimations with standard errors again clustered by firm. In column (1), we show the results from the first-stage regressions where the control variables are similar to those in our baseline regressions and where we also include year and industry dummies. As expected, we find our instrument to be positively and significantly associated with our measure for operational leanness. The F-statistic is 99.78, which is also well above the critical value of 10 indicating weak instruments (see e.g., Stock et al., 2002). The coefficient on *% Lean Firms in MSA* suggests that a one standard deviation increase is related to a 14.17 percentage points increase in the firm's operational leanness. More importantly, in columns (2) and (3), we present the results from the second-stage regressions. In both regressions,

[9]We identify lean firms using our dummy variable.

the coefficients on the instrumented measure for operational leanness are positive and statistically significant. Thus, the results are in line with those found earlier and help us rule out that our findings are driven by endogeneity, and particularly by omitted variable bias.

Table 5.3: This table displays the results from 2-stage least stages squares (2SLS) regressions. Column (1) reports the results from the first-stage regression. Columns (2) and (3) report the results from the second-stage regressions, where we instrument *Leanness* using the ratio of lean manufacturing firms to all manufacturing firms (excluding the focal firm) located in the same metropolitan statistical area (MSA) as the focal firm in that fiscal year. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Stage:	First Stage	Second Stage	
Dependent Variable:	*Leanness*	*% Inst. Ownership*	*ln(# Inst. Ownership)*
	(1)	(2)	(3)
% Lean Firms in MSA	0.787***		
	(4.752)		
$\text{Leanness}_{\text{Instrumented}}$		9.887***	0.233***
		(2.930)	(3.693)
ln(Market Cap)	−0.301***	6.034***	0.590***
	(−9.287)	(5.294)	(28.022)
Firm Age	−0.183***	0.034	0.129***
	(−3.925)	(0.036)	(7.637)
Tobin's Q	0.208***	−4.106***	−0.083***
	(11.464)	(−5.255)	(−5.742)
ROA	1.301***	−11.041**	−0.360***
	(8.647)	(−2.206)	(−3.701)
Leverage	−0.584***	16.261***	0.200***
	(−3.797)	(4.880)	(3.325)
Div. Yield	−3.407**	−118.218***	1.023*
	(−2.352)	(−3.845)	(1.889)
Return	0.042*	0.219	−0.096***
	(1.719)	(0.555)	(−11.481)
Volatility	0.104	−9.289***	0.116***
	(0.793)	(−4.554)	(2.658)
Turnover	−0.002	0.057	0.003***
	(−0.736)	(1.092)	(2.799)
Bid Ask	−10.554***	−423.218***	−15.456***
	(−3.837)	(−7.252)	(−12.905)
ln(Price)	0.063	7.312***	0.001
	(1.226)	(8.394)	(0.061)
Observations	11840	11840	11840
Firms	983	983	983
Industry Fixed Effects	yes	yes	yes
Year Fixed Effects	yes	yes	yes
Adjusted R-Squared	0.252	0.587	0.927

Entropy Balancing

Next, we employ entropy balancing because firms with lean operations might differ from those firms with less lean operations in such a way that these other characteristics are driving our results. Entropy balancing mitigates this concern since this data preprocessing method allows us to obtain a weighted sample, where certain balance conditions are imposed on the moments of the covariates (Hainmueller, 2012). Compared to propensity score matching, which is also commonly used in these contexts, entropy balancing has the further advantage that this method does not reduce the sample size. Hence, we believe the approach to be well-suited for our context. To carry out the entropy balancing technique, we use our *Leanness dummy* as defined before. The results are shown in Table 5.4.

Table 5.4: This table displays the covariate balance for an entropy balanced sample where the treatment variable is *Leanness Dummy* (Panel A) and the results from weighted linear regressions (Panel B). Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Panel A: Covariate balance for the entropy balanced sample

	Pre-Match			Post-Match		
	Treatment	Control	Diff.	Treatment	Control	Diff.
ln(Market Cap)	6.119	6.905	−0.786***	6.119	6.122	−0.003
ln(Firm Age)	2.881	3.115	−0.234***	2.881	2.882	−0.001
Tobin's Q	2.480	2.063	0.417***	2.480	2.480	0.000
ROA	0.051	0.058	−0.007*	0.051	0.051	0.000
Leverage	0.182	0.221	−0.039***	0.182	0.182	0.000
Div. Yield	0.008	0.012	−0.004***	0.008	0.008	0.000
Return	0.200	0.127	0.073***	0.200	0.200	0.000
Volatility	0.545	0.491	0.054***	0.545	0.545	0.000
Turnover	8.718	8.453	0.265	8.718	8.717	0.000
Bid Ask	0.010	0.009	0.001***	0.010	0.010	0.000
ln(Price)	2.756	2.985	−0.229***	2.756	2.757	−0.001

Table is continued on the next page.

Table 5.4 continued

Panel B: OLS using the entropy balanced sample

Dependent Variable:	*% Inst. Ownership*	*ln(# Inst. Ownership)*
	(1)	(2)
Leanness Dummy	2.532***	0.045***
	(3.350)	(3.200)
ln(Market Cap)	4.217***	0.512***
	(8.290)	(56.830)
Firm Age	−0.718	0.109***
	(−0.970)	(8.540)
Tobin's Q	−2.177***	−0.043***
	(−8.530)	(−7.250)
ROA	−2.166	−0.135***
	(−0.920)	(−2.840)
Leverage	11.990***	0.122***
	(4.650)	(2.870)
Div. Yield	−137.600***	0.033
	(−4.910)	(0.060)
Return	0.898**	−0.071***
	(2.160)	(−8.100)
Volatility	−7.159***	0.112**
	(−3.840)	(2.510)
Turnover	0.021	0.004***
	(0.450)	(3.760)
Bid Ask	−464.300***	−17.170***
	(−11.790)	(−19.500)
ln(Price)	8.695***	0.049***
	(10.190)	(3.170)
Observations	15093	15093
Firms	1280	1280
Industry Fixed Effects	yes	yes
Year Fixed Effects	yes	yes
Adjusted R-Squared	0.591	0.897

In Panel A of Table 5.4, we show that firms with lean operations indeed differ from those with less lean operations. For instance, firms with lean operations have substantially lower market capitalizations, are younger, have higher Tobin's Qs, lower leverage ratios, better stock returns, and significantly lower stock prices. After implementing entropy balancing, these differences vanish. The approach thus allows us to establish a causal link between operational leanness and institutional ownership.

In Panel B, we report the same baseline regressions (as in columns (2) and (4) of Panel A of Table 5.2) using the weighted sample. In line with the findings from the previous sections, we find leaner firms to attract significantly more institutional investors. Across both columns, the coefficients on our variable of interest remain positive and significant at the 1% level.

Additional Control Variables

To further rule out concerns related to omitted variable bias, we additionally control for several other variables, which might explain a firm's ownership structure. For instance, following Brochet et al. (2020), we control for further firm characteristics such as the fraction of intangible assets, the fraction of capital expenditures, and the fraction of research and development expenditures to total assets. We also control for the fraction of PPE expenditures to total assets. Moreover, we follow O'Brien & Bhushan (1990) and Chung & Zhang (2011) and control for the number of analysts following the firms, which we obtain from the Institutional Brokers' Estimate System (I/B/E/S) via Thomson Reuters Eikon. The rationale behind this is that both papers highlight a positive association between the number of analysts following the firm and institutional ownership. We also include a control variable for institutional herding since there are a few studies stressing institutional investors to follow each other and to buy and sell the same stocks (see e.g., Cai et al., 2019; Choi & Skiba, 2015; Lakonishok et al., 1992; Nofsinger & Sias, 1999; Sias, 2004). To measure institutional herding, we adopt the methodology of Chung & Zhang (2011) and use the number of net buyers divided by the sum of net buyers and net sellers as a proxy. As Chung & Zhang (2011) also highlight institutional investors to be attracted by good governance, we finally include controls for the firm's environmental, social, and governance performance based on the Refinitiv ESG scores, which we obtain from Thomson Reuters Eikon.

We present the results from the regressions where we utilize *% Inst. Ownership* as the dependent variable and include these additional controls in Table 5.5. We note that the number of observations drops significantly when including the ESG scores due to data limitations.

The results show that including these additional controls does not have an impact on our main finding. The coefficients on *Leanness* (columns (1) & (3)) and *Leanness Dummy* (columns (2) & (4)) remain positive and statistically significant. Thus, our results are unlikely driven by omitted variable bias.

Table 5.5: This table displays regression results of measures of institutional ownership on operational leanness and an extended set of control variables. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Dependent Variable:	*% Inst. Ownership*			
	(1)	(2)	(3)	(4)
Leanness	0.968***		1.119*	
	(2.874)		(1.940)	
Leanness Dummy		1.686**		2.543*
		(2.122)		(1.846)
ln(Market Cap)	−0.574	−0.805	−4.737***	−5.029***
	(−0.986)	(−1.419)	(−4.902)	(−5.606)
Firm Age	−0.095	−0.124	0.412	0.422
	(−0.133)	(−0.174)	(0.406)	(0.413)
Tobin's Q	−1.822***	−1.716***	−1.397***	−1.282***
	(−6.775)	(−6.404)	(−3.022)	(−2.840)
ROA	4.932*	5.971**	8.098	8.176
	(1.853)	(2.299)	(1.543)	(1.544)
Leverage	7.787***	7.505***	10.431***	10.073***
	(2.933)	(2.836)	(2.802)	(2.699)
Div. Yield	−144.081***	−143.838***	−133.458***	−133.818***
	(−5.426)	(−5.432)	(−3.802)	(−3.834)
Return	2.213***	2.262***	2.660***	2.733***
	(5.855)	(5.992)	(2.811)	(2.910)
Volatility	−6.991***	−6.968***	−16.340***	−16.491***
	(−3.702)	(−3.688)	(−4.202)	(−4.233)
Turnover	−0.042	−0.041	0.026	0.023
	(−0.974)	(−0.946)	(0.336)	(0.292)
Bid Ask	−497.870***	−502.342***	−1780.449***	−1788.085***
	(−11.693)	(−11.807)	(−6.317)	(−6.368)
ln(Price)	9.446***	9.480***	6.221***	6.318***
	(12.734)	(12.746)	(5.847)	(6.001)
Additional Controls:				
Intangibles	9.652***	9.919***	8.973**	9.107**
	(3.291)	(3.392)	(2.240)	(2.281)
Capex	−29.785***	−30.696***	4.361	2.070
	(−2.690)	(−2.771)	(0.222)	(0.105)
R&D	9.463*	10.795**	−2.119	−1.954
	(1.717)	(1.977)	(−0.221)	(−0.204)
PPE	3.309	2.488	0.832	0.120
	(1.507)	(1.174)	(0.181)	(0.027)
Inst. Herding	2.313	2.401*	−9.478*	−9.544*
	(1.595)	(1.650)	(−1.697)	(−1.703)
ln(Analysts)	7.497***	7.576***	6.738***	6.861***
	(8.274)	(8.364)	(4.443)	(4.572)
Environmental Score			−0.018	−0.019
			(−0.513)	(−0.546)
Social Score			0.005	0.006
			(0.141)	(0.165)
Governance Score			0.046*	0.047*
			(1.826)	(1.863)
Observations	13333	13333	3128	3128
Firms	1205	1205	699	699
Industry Fixed Effects	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
Adjusted R-Squared	0.597	0.596	0.441	0.441

5.4.3 Quadratic Relationship

After having shown that operational leanness attracts institutional investors in a linear fashion, we investigate our second hypothesis stating that the relationship might be of an inverted U-shape. There might be an optimal level of operational leanness after which the positive effect diminishes. Several recent studies investigating the relationship between operational leanness and firm performance or credit ratings respectively find firms with excessive leanness to perform worse (Bendig et al., 2017; Eroglu & Hofer, 2011a,b, 2014; Modi & Mishra, 2011). The argument is that firms with very lean operations might be unable to respond to organizational or market changes (Bendig et al., 2017). As credit rating analysts account for this turning point when evaluating the firms' creditworthiness (Bendig et al., 2017), it seems likely that institutional investors, who generally conduct a lot of research about the firms they invest in, are also aware of this relationship. To investigate this, we rerun our baseline specifications but include the squared term of our measure for operational leanness. The results are shown in Table 5.6.

Surprisingly, we do not find consistent evidence for an inverted U-shape. While the coefficients on *Leanness* remain positive and statistically significant in both columns, the coefficients on the squared term are statistically insignificant. In column (1), the coefficient on the squared term is negative with a t-value of -1.121. In column (2), the coefficient is, however, even positive. This shows that operational leanness appears to attract institutional investors in a rather linear way (at least regarding the number of institutional investors).[10]

To examine whether the relationship between operational leanness and institutional ownership is entirely linear or whether there is some evidence for diminishing returns, we also perform regressions including dummy variables for each industry-year octile of operational leanness. The results are displayed in Table 5.7. In column (1), the coefficients on our dummy variables indicate that the relationship between operational leanness and the fraction of shares held by institutional investors shows some evidence of diminishing returns. While higher levels of operational leanness are generally associated with a higher fraction of shares held by institutional investors compared to lower levels, firms in the eighth octile exhibit slightly lower institutional ownership compared to those

[10] In unreported regressions, we also include the cubic term and find similar results.

in the seventh octile. Institutional investors thus appear to view at least extremely high levels of operational leanness with some scepticism. In column (2), where we employ the number of institutional investors holding shares of the firm as the dependent variable, we find the relationship to be rather linear. Firms with higher levels of operational leanness attract significantly more institutional investors.

Table 5.6: This table displays regression results of measures of institutional ownership on operational leanness, its squared term, and a set of control variables. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Dependent Variable:	*% Inst. Ownership*	*ln(# Inst. Ownership)*
	(1)	(2)
Leanness	1.405***	0.025***
	(4.702)	(4.289)
Leanness^2	−0.144	0.001
	(−1.121)	(0.233)
ln(Market Cap)	3.072***	0.509***
	(6.971)	(69.762)
Firm Age	−0.829	0.108***
	(−1.210)	(9.608)
Tobin's Q	−2.165***	−0.040***
	(−8.977)	(−8.556)
ROA	−0.555	−0.125***
	(−0.268)	(−3.030)
Leverage	13.340***	0.123***
	(5.305)	(3.079)
Div. Yield	−157.293***	0.033
	(−6.016)	(0.066)
Return	0.792**	−0.086***
	(2.297)	(−12.474)
Volatility	−7.700***	0.132***
	(−4.290)	(3.550)
Turnover	0.020	0.003***
	(0.439)	(3.438)
Bid Ask	−508.621***	−16.580***
	(−13.162)	(−21.571)
ln(Price)	9.051***	0.044***
	(11.856)	(3.247)
Observations	15105	15105
Firms	1280	1280
Industry Fixed Effects	yes	yes
Year Fixed Effects	yes	yes
Adjusted R-Squared	0.586	0.927

Table 5.7: This table displays regression results of measures of institutional ownership on dummy variables of operational leanness and a set of control variables. The quantile dummy variables equal one if the firm's *Leanness* is in the corresponding industry-year octile, and zero otherwise. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Dependent Variable:	*% Inst. Ownership*	*ln(# Inst. Ownership)*
	(1)	(2)
Leanness Dummy Q2	0.386	0.023
	(0.391)	(1.311)
Leanness Dummy Q3	2.728***	0.033*
	(2.599)	(1.647)
Leanness Dummy Q4	3.048***	0.037*
	(2.813)	(1.851)
Leanness Dummy Q5	3.242**	0.057**
	(2.493)	(2.284)
Leanness Dummy Q6	3.745***	0.052**
	(3.425)	(2.400)
Leanness Dummy Q7	4.988***	0.091***
	(3.987)	(3.824)
Leanness Dummy Q8	4.585***	0.093***
	(4.254)	(4.433)
ln(Market Cap)	2.959***	0.507***
	(6.811)	(71.335)
Firm Age	−0.834	0.108***
	(−1.219)	(9.635)
Tobin's Q	−2.098***	−0.039***
	(−8.657)	(−8.418)
ROA	−0.274	−0.120***
	(−0.133)	(−2.929)
Leverage	13.174***	0.120***
	(5.237)	(2.990)
Div. Yield	−156.461***	0.068
	(−6.007)	(0.136)
Return	0.827**	−0.086***
	(2.391)	(−12.429)
Volatility	−7.722***	0.132***
	(−4.315)	(3.554)
Turnover	0.020	0.003***
	(0.451)	(3.458)
Bid Ask	−513.410***	−16.654***
	(−13.336)	(−21.692)
ln(Price)	9.086***	0.044***
	(11.887)	(3.261)
Observations	15105	15105
Firms	1280	1280
Industry Fixed Effects	yes	yes
Year Fixed Effects	yes	yes
Adjusted R-Squared	0.585	0.927

Overall, we do not find consistent evidence in support of Hypothesis II. Our tests rather allow us to conclude that the relationship might be not entirely linear regarding the fraction of shares held by institutional investors. In contrast to credit rating analysts, institutional investors do not appear to view very high levels of operational leanness with so much scepticism. We relate this to the fact that creditors are more risk-averse compared to institutional investors, especially concerning operational risks that might affect the long-term stability of the firm (Rego et al., 2009).

5.4.4 Additional Tests

In this next section, we run two additional tests to further disentangle the relationship between operational leanness and institutional ownership. First, we investigate how different institution types evaluate operational leanness. Second, we examine whether environmental dynamism affects the relation between operational leanness and institutional ownership.

Differences Based on Institutional Investor Type

As mentioned earlier, institutions differ substantially regarding their preferences, the rules and restrictions they are subject to, and the human capital and resources they devote to gathering information and monitoring. On this account, we state in our third hypothesis that these differences have an impact on whether different institution types tilt their portfolios towards lean firms.

We examine this by running the same regressions as in Table 5.2, but using the fraction of shares held by certain institution types and the number of these institution types as the dependent variables. We differentiate between banks, pension funds, insurance companies, investment advisors, and hedge funds. The results are displayed in Table 5.8.

Panel A reports the regression results where the fraction of shares held by certain institution types is the dependent variable. The results support our hypothesis that some institution types put more emphasis on operational leanness than others. In line with our expectations, we find investment advisors and hedge funds to be attracted by operational leanness. The coefficients in columns (4) and (5) are positive and highly statistically significant. These institutions are known for devoting substantial resources

to gathering information and are usually not subject to prudent-man rules. In contrast, banks, pension funds, and insurance companies, which are typically subject to these rules, do not appear to put emphasis on operational leanness. The coefficients in columns (1) to (3) are not statistically significant at conventional levels (and even negative).

Table 5.8: This table displays regression results of measures of the specific type of institutional ownership (banks, pension funds, insurances, advisors, and hedge funds) on operational leanness and a set of control variables. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Panel A: % Inst. Ownership					
Investor Type:	*Banks*	*Pension*	*Insurance*	*Advisor*	*Hedge Fund*
	(1)	(2)	(3)	(4)	(5)
Leanness	−0.027	−0.001	0.009	0.319**	0.407***
	(−1.373)	(−0.047)	(0.368)	(2.150)	(5.097)
ln(Market Cap)	0.224***	0.337***	0.192***	1.412***	−0.327***
	(6.030)	(12.205)	(4.437)	(6.506)	(−3.510)
Firm Age	0.140***	0.218***	0.075	0.673**	−1.027***
	(2.779)	(4.744)	(1.585)	(2.005)	(−5.622)
Tobin's Q	−0.007	−0.104***	−0.010	−0.403***	−0.256***
	(−0.512)	(−6.440)	(−0.606)	(−3.450)	(−4.577)
ROA	−0.048	−0.195	−0.413**	0.592	0.176
	(−0.405)	(−1.321)	(−2.382)	(0.604)	(0.319)
Leverage	0.467***	0.210	−0.227**	3.349***	3.267***
	(2.852)	(1.318)	(−1.976)	(2.857)	(5.247)
Div. Yield	2.187	−6.405***	−0.297	−70.476***	−34.507***
	(1.201)	(−4.466)	(−0.190)	(−5.463)	(−4.818)
Return	−0.117***	−0.159***	−0.088***	−0.429**	0.979***
	(−4.437)	(−6.125)	(−3.124)	(−2.485)	(9.082)
Volatility	0.000	−0.475***	−0.036	−4.068***	−2.185***
	(0.001)	(−2.812)	(−0.182)	(−4.390)	(−3.824)
Turnover	0.003	0.019***	−0.011***	0.026	0.021**
	(1.033)	(5.115)	(−2.710)	(1.263)	(2.009)
Bid Ask	4.820	−13.488***	5.748	−197.794***	−59.263***
	(1.324)	(−3.506)	(1.155)	(−10.588)	(−4.837)
ln(Price)	0.035	0.255***	−0.065	4.597***	−0.446**
	(0.763)	(5.300)	(−1.300)	(11.720)	(−2.555)
Observations	11246	13478	10006	14991	14043
Firms	1068	1197	1040	1276	1270
Industry Fixed Effects	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes
Adjusted R-Squared	0.232	0.435	0.200	0.520	0.186

Table is continued on the next page.

Table 5.8 continued

Panel B: ln(# Inst. Ownership)

Investor Type:	*Banks*	*Pension*	*Insurance*	*Advisor*	*Hedge Fund*
	(1)	(2)	(3)	(4)	(5)
Leanness	0.000	0.023***	0.012**	0.015**	0.034***
	(0.035)	(3.636)	(2.049)	(2.473)	(6.385)
ln(Market Cap)	0.578***	0.348***	0.399***	0.559***	0.391***
	(69.646)	(34.995)	(48.573)	(77.045)	(52.840)
Firm Age	0.138***	0.127***	0.076***	0.126***	−0.023*
	(9.039)	(8.849)	(6.025)	(10.638)	(−1.815)
Tobin's Q	−0.028***	−0.039***	−0.025***	−0.034***	−0.042***
	(−5.732)	(−8.200)	(−5.325)	(−7.189)	(−10.465)
ROA	−0.202***	−0.052	−0.172***	−0.096**	0.004
	(−4.455)	(−1.237)	(−3.933)	(−2.345)	(0.091)
Leverage	0.034	0.093*	−0.027	0.097**	0.225***
	(0.702)	(1.945)	(−0.642)	(2.342)	(6.108)
Div. Yield	1.979***	−0.691	2.320***	0.403	−2.826***
	(3.587)	(−1.019)	(4.915)	(0.778)	(−5.566)
Return	−0.162***	−0.119***	−0.095***	−0.113***	−0.007
	(−18.272)	(−14.394)	(−11.274)	(−14.589)	(−0.925)
Volatility	0.057	0.065	0.310***	0.123***	0.134***
	(1.206)	(1.538)	(7.040)	(3.194)	(3.252)
Turnover	0.006***	0.005***	−0.003***	0.004***	0.009***
	(5.506)	(4.301)	(−3.004)	(5.068)	(8.635)
Bid Ask	9.332***	−9.137***	8.971***	−11.866***	−5.888***
	(9.115)	(−8.762)	(6.702)	(−16.416)	(−7.462)
ln(Price)	0.003	0.144***	−0.045***	0.038***	−0.060***
	(0.193)	(8.940)	(−3.364)	(2.760)	(−4.053)
Observations	11246	13478	10006	14991	14043
Firms	1068	1197	1040	1276	1270
Industry Fixed Effects	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes
Adjusted R-Squared	0.896	0.836	0.774	0.929	0.803

The results regarding investment advisors and hedge funds are similar when using the natural logarithm of the number of these institution types holding shares of the firm as the dependent variable in Panel B. Also, banks do not appear to prefer firms with lean operations. The only exceptions we find are that lean firms attract significantly more pension funds and insurance companies.

In untabulated results, we also re-estimate these specifications using the different estimators, the lagged values of all independent variables, and additionally include the lagged dependent variables. The results, however, do not differ from those discussed above. We therefore conclude that the results are generally consistent with Hypothesis III. Operational leanness only appears to be viewed as a potential competitive advantage

by institutions known to conduct extensive research and not subject to prudent-man rules.

Impact of Environmental Dynamism on the Association Between Operational Leanness and Institutional Ownership

We finally turn to examining whether environmental dynamism affects the relationship between operational leanness and institutional ownership. As outlined before, we follow Eroglu & Hofer (2014) and focus on the following three dimensions: innovative intensity, demand uncertainty, and competitive intensity. We generally expect the relationship between operational leanness and institutional ownership to be more pronounced in innovative and demand uncertain industries (Hypothesis IVa & Va) but to be weaker in competitive industries (Hypothesis VIa). To test this, we employ two approaches. First, we split the sample based on dummy variables indicating whether a firm operates in such an industry and rerun our baseline regressions using these subsamples. Second, we employ these dummy variables and perform regressions where we include an interaction term between our measure for operational leanness and the respective industry characteristic.

Our measures for each industry characteristic are based on Eroglu & Hofer (2014) and defined as follows. Innovative intensity in an industry is determined by the proportion of total industry R&D expenditures to total industry revenues for each year. Our measure for demand uncertainty is the mean squared error of the residuals of an unobserved components model of aggregated quarterly industry revenues that is determined by a level component, trend component, seasonal component, and an irregular component. Finally, we measure an industry's competitive intensity as the proportion of the top-4 largest industry revenues to total industry revenues for each year. The dummy variable for each industry characteristic equals one if the industry in which the company operates is in the top-quartile for the respective year, and zero otherwise.

We present the results from the sample splits in Table 5.9. Panel A again displays the results from regressions where we use *% Inst. Ownership* as the dependent variable, while we show the results using *ln(# Inst. Ownership)* in Panel B. Across both panels, we find support for our hypotheses. While the coefficients on *Leanness* are positive and statistically significant in all subsamples, they differ substantially in terms of

their magnitudes. Institutional investors appear to be significantly more attracted by operational leanness in innovative and demand uncertain industries. For instance, the coefficients on *Leanness* in the respective subsamples are roughly twice as high in Panel A. In contrast, institutional investors appear to put less emphasis on operational leanness when firms operate in competitive industries. It is further important to note that the differences between the coefficients of the different subsamples are also statistically significant and remain when calculating standardized regression coefficients.

Table 5.9: This table displays the results from regressions using sample splits based on environmental dynamism variables (innovative intensity, demand uncertainty, and competitive intensity). Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Panel A: % Inst. Ownership						
Environment:	*Innovative Intensity*		*Demand Uncertainty*		*Competitive Intensity*	
	= 0	= 1	= 0	= 1	= 0	= 1
Leanness	1.282***	1.994***	1.098***	2.451***	1.412***	1.363***
	(3.640)	(3.807)	(3.499)	(3.568)	(3.961)	(2.958)
ln(Market Cap)	2.864***	3.431***	4.116***	1.010	2.810***	3.500***
	(5.452)	(4.470)	(8.048)	(1.281)	(5.604)	(4.835)
Firm Age	−0.857	−0.338	−1.441*	2.190	−0.453	−2.338*
	(−1.059)	(−0.278)	(−1.927)	(1.529)	(−0.584)	(−1.959)
Tobin's Q	−2.612***	−1.897***	−2.387***	−1.742***	−1.878***	−3.637***
	(−7.866)	(−5.427)	(−9.093)	(−3.567)	(−7.014)	(−6.753)
ROA	−0.760	−1.482	1.365	−8.683*	−0.234	−0.786
	(−0.274)	(−0.493)	(0.626)	(−1.702)	(−0.100)	(−0.194)
Leverage	13.864***	13.296***	13.304***	13.398***	13.269***	12.802***
	(4.082)	(3.660)	(4.733)	(2.751)	(4.637)	(2.880)
Div. Yield	−159.653***	−216.303***	−159.488***	−142.617**	−133.489***	−223.459***
	(−5.443)	(−3.746)	(−5.521)	(−2.516)	(−4.289)	(−6.209)
Return	0.487	1.606***	0.357	1.621**	0.870**	0.661
	(1.128)	(2.736)	(0.899)	(2.455)	(2.178)	(1.025)
Volatility	−7.128***	−7.970**	−6.420***	−11.193***	−7.530***	−7.456**
	(−3.205)	(−2.486)	(−3.100)	(−3.227)	(−3.671)	(−2.183)
Turnover	0.059	−0.058	0.050	−0.013	0.015	0.047
	(1.050)	(−0.809)	(0.988)	(−0.161)	(0.294)	(0.608)
Bid Ask	−518.277***	−515.190***	−472.927***	−557.451***	−538.210***	−470.280***
	(−11.392)	(−7.324)	(−11.081)	(−7.304)	(−11.021)	(−8.457)
ln(Price)	9.125***	9.769***	8.523***	10.256***	9.131***	9.382***
	(9.805)	(7.190)	(9.939)	(7.077)	(10.431)	(7.070)
Observations	11052	3943	11229	3876	11252	3853
Firms	963	487	1002	367	1101	520
Industry Fixed Effects	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Adjusted R-Squared	0.593	0.571	0.628	0.473	0.552	0.688

Table is continued on the next page.

Table 5.2 continued

Panel B: ln(# Inst. Ownership)

Environment:	*Innovative Intensity*		*Demand Uncertainty*		*Competitive Intensity*	
	= 0	= 1	= 0	= 1	= 0	= 1
Leanness	0.024***	0.025**	0.021***	0.037***	0.026***	0.022**
	(3.700)	(2.001)	(3.391)	(2.827)	(3.752)	(2.426)
ln(Market Cap)	0.507***	0.512***	0.527***	0.484***	0.505***	0.520***
	(59.102)	(38.284)	(58.659)	(41.604)	(62.674)	(42.237)
Firm Age	0.107***	0.118***	0.110***	0.115***	0.106***	0.118***
	(7.909)	(6.279)	(8.809)	(5.097)	(8.580)	(5.515)
Tobin's Q	−0.036***	−0.042***	−0.041***	−0.038***	−0.038***	−0.047***
	(−5.944)	(−5.713)	(−7.048)	(−6.831)	(−7.293)	(−5.200)
ROA	−0.100*	−0.126**	−0.107**	−0.190***	−0.116***	−0.139
	(−1.690)	(−2.195)	(−2.219)	(−2.619)	(−2.590)	(−1.589)
Leverage	0.141***	0.081	0.131***	0.092	0.138***	0.066
	(2.839)	(1.221)	(3.093)	(1.084)	(3.049)	(0.907)
Div. Yield	−0.029	−0.257	−0.084	0.388	1.003*	−2.817***
	(−0.051)	(−0.308)	(−0.143)	(0.424)	(1.857)	(−3.255)
Return	−0.090***	−0.082***	−0.088***	−0.084***	−0.083***	−0.089***
	(−10.034)	(−6.932)	(−10.461)	(−7.350)	(−10.704)	(−6.245)
Volatility	0.143***	0.161**	0.145***	0.089	0.149***	0.081
	(3.084)	(2.545)	(3.231)	(1.368)	(3.761)	(0.931)
Turnover	0.004***	0.002	0.004***	0.003*	0.003***	0.004***
	(3.344)	(1.333)	(3.379)	(1.786)	(2.871)	(2.581)
Bid Ask	−16.641***	−16.932***	−16.592***	−15.099***	−16.812***	−16.064***
	(−18.852)	(−11.151)	(−18.841)	(−11.445)	(−17.788)	(−13.583)
ln(Price)	0.052***	0.026	0.030*	0.058**	0.046***	0.039
	(3.368)	(0.980)	(1.949)	(2.300)	(3.068)	(1.538)
Observations	11052	3943	11229	3876	11252	3853
Firms	963	487	1002	367	1101	520
Industry Fixed Effects	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Adjusted R-Squared	0.928	0.927	0.925	0.932	0.922	0.941

In Table 5.10, we display the results from the second approach where we rerun our baseline regressions but include interactions between operational leanness and the different industry characteristics. The results shown below provide some support for our hypotheses. While the coefficients on the interaction terms show the expected signs, the interaction is only statistically significant at conventional levels regarding demand uncertainty (columns (2) & (4)). We thus conclude that institutional investors particularly focus on operational leanness when firms operate in demand uncertain industries.

Table 5.10: This table displays the results from regressions examining the effect of environmental dynamism (innovative intensity, demand uncertainty, and competitive intensity) on the relation between institutional ownership and operational leanness. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Dependent Variable:	*% Inst. Ownership*			*ln(# Inst. Ownership)*		
	(1)	(2)	(3)	(4)	(5)	(6)
Leanness	1.255***	0.884***	1.466***	0.025***	0.017***	0.026***
	(3.619)	(2.780)	(4.277)	(3.828)	(2.770)	(3.919)
Innov. Intensity	0.140			−0.022		
	(0.122)			(−0.864)		
Leanness x Innov. Int.	0.579			0.003		
	(1.046)			(0.226)		
Demand Unc.		0.549			0.033	
		(0.369)			(1.090)	
Leanness x Demand Unc.		2.027***			0.031**	
		(3.106)			(2.539)	
Comp. Intensity			1.349*			−0.011
			(1.723)			(−0.687)
Leanness x Comp. Int.			−0.267			−0.004
			(−0.503)			(−0.380)
ln(Market Cap)	3.079***	3.165***	3.039***	0.510***	0.511***	0.509***
	(6.997)	(7.116)	(6.938)	(69.986)	(69.802)	(70.976)
Firm Age	−0.737	−0.697	−0.804	0.109***	0.109***	0.108***
	(−1.074)	(−1.020)	(−1.175)	(9.654)	(9.745)	(9.634)
Tobin's Q	−2.185***	−2.189***	−2.177***	−0.040***	−0.040***	−0.040***
	(−9.029)	(−9.031)	(−8.975)	(−8.529)	(−8.601)	(−8.544)
ROA	−0.580	−0.713	−0.673	−0.124***	−0.125***	−0.124***
	(−0.280)	(−0.341)	(−0.324)	(−3.025)	(−3.049)	(−3.009)
Leverage	13.602***	13.316***	13.425***	0.124***	0.121***	0.122***
	(5.392)	(5.340)	(5.342)	(3.108)	(3.053)	(3.074)
Div. Yield	−165.379***	−157.659***	−157.213***	−0.019	0.026	0.032
	(−6.235)	(−6.029)	(−6.010)	(−0.038)	(0.052)	(0.063)
Return	0.789**	0.767**	0.800**	−0.087***	−0.087***	−0.086***
	(2.286)	(2.222)	(2.313)	(−12.489)	(−12.551)	(−12.497)
Volatility	−7.754***	−7.621***	−7.746***	0.135***	0.134***	0.132***
	(−4.308)	(−4.237)	(−4.319)	(3.600)	(3.593)	(3.535)
Turnover	0.015	0.017	0.019	0.003***	0.003***	0.003***
	(0.335)	(0.392)	(0.425)	(3.419)	(3.439)	(3.442)
Bid Ask	−508.744***	−502.793***	−509.476***	−16.593***	−16.490***	−16.573***
	(−13.155)	(−13.054)	(−13.175)	(−21.525)	(−21.454)	(−21.572)
ln(Price)	9.067***	8.934***	9.111***	0.043***	0.041***	0.043***
	(11.914)	(11.797)	(11.979)	(3.192)	(3.058)	(3.234)
Observations	15105	14995	15105	15105	14995	15105
Firms	1280	1280	1280	1280	1280	1280
Industry Fixed Effects	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Adjusted R-Squared	0.586	0.588	0.586	0.927	0.928	0.927

Although we have shown no consistent evidence that the relationship between operational leanness and institutional ownership is of an inverted U-shape in Section

5.4.3, we repeat the analyses including the squared term of our leanness measure. We thereby specifically test our Hypotheses IVb, Vb, and VIb stating that institutional investors might view excessive levels of operational leanness as more or less problematic depending on the environment the firm operates in. The results shown in Table D3 and Table D4 in the Appendix, however, do not support our hypotheses. Similar to our previous findings, we do not consistently find institutional investors to tilt their portfolios away from firms with excessive leanness.

5.5 Robustness Tests and Limitations

We perform two additional robustness tests to ensure the validity of our results. First, we employ a different measure for total operational leanness based on the resource efficiency scores proposed in Modi & Mishra (2011). Similar to the methodology used earlier, we take the sum of the two individual scores for inventory resource efficiency and production resource efficiency as a measure for total operational leanness (*Leanness Eff.*).[11] Using this score instead of our original measure, we run the same baseline regressions as well as those regressions including the squared term.

As a second robustness check, we employ the individual scores for inventory leanness and PPE leanness as well as those for inventory resource efficiency and production resource efficiency and re-estimate the regressions. This test also allows us to understand whether institutional investors put more emphasis on either efficient inventory or production management. We show the results from both robustness checks in Table 5.11.

In Panel A, we tabulate the results from the linear models. Similar to the findings using our original measure, we find a significantly positive coefficient on *Leanness Eff.* in columns (1) and (4). In columns (2) and (5), we find that both scores, *PPE ELI* and *Inv. ELI*, are positively and statistically significantly associated with institutional ownership, but the coefficients are significantly larger for *PPE ELI*. When employing the individual scores based on Modi & Mishra (2011), we find only *PPE Eff.* to be

[11] We also define the variable *Leanness Eff. Dummy*, which is one if the firm's *Leanness Eff.* exceeds the industry-year median, and else zero. Using this dummy variable in unreported regressions, we find leaner firms to attract more institutional investors. Regardless of whether we use the fraction of shares held by institutional investors or the number of institutional investors holding shares of the firm as the dependent variable, the coefficient on *Leanness Eff. Dummy* is positive and statistically significant at the 1% level.

significantly associated with institutional ownership.

Panel B reports the results from the quadratic models. In contrast to our earlier findings, we find evidence for an inverted U-shape using the leanness scores based on Modi & Mishra (2011) in columns (1), (3), (5), and (6). This finding is consistent with our Hypothesis II stating that there is an optimal level of operational leanness after which the positive effect diminishes. Employing the individual scores based on Eroglu & Hofer (2011b) and Bendig et al. (2017), the results are similar to those found in Section 5.4.3. Nevertheless, the results from these robustness checks strengthen our previous findings that institutional investors are generally attracted by operational leanness. Institutional investors might, however, view extremely high levels of operational leanness with some scepticism.

As with any other research, our study is subject to some limitations. We note that the exclusion of firm-fixed effects might raise concerns related to omitted variable bias. Yet, we conduct several tests to address this concern. Furthermore, our study suffers from the same limitations as outlined in Modi & Mishra (2011). For instance, our measure for operational leanness is only measured at an aggregate level and we cannot assess how firms adopt lean practices. Certain strategies or tactics that lean firms adopt might particularly attract institutional investors, while others might be viewed as less beneficial. Also, future research might investigate other mechanisms that might moderate the relationship between operational leanness and institutional ownership. While we examine the impact of environmental dynamism, other factors such as institutional investor biases (see e.g., Chakravarty & Ray, 2020; Grinblatt & Keloharju, 2000) might affect the relationship.

Table 5.11: This table displays regression results of measures of institutional ownership on alternative measures of operational leanness (Leanness Efficiency, PPE ELI and Inv. ELI, and PPE Eff. and Inv. Eff.) and a set of control variables. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Panel A: Linear Model						
Dependent Variable:	*% Inst. Ownership*			*ln(# Inst. Ownership)*		
	(1)	(2)	(3)	(4)	(5)	(6)
Leanness Eff.	0.676*			0.024***		
	(1.945)			(3.589)		
PPE ELI		1.738***			0.037***	
		(3.444)			(3.456)	
Inv. ELI		1.092**			0.014*	
		(2.236)			(1.749)	
PPE Eff.			1.427**			0.038***
			(2.444)			(3.508)
Inv. Eff.			0.197			0.015
			(0.379)			(1.635)
Observations	15105	15105	15105	15105	15105	15105
Firms	1280	1280	1280	1280	1280	1280
Industry Fixed Effects	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Adjusted R-Squared	0.583	0.586	0.583	0.927	0.927	0.927
Panel B: Quadratic Model						
Leanness Eff.	1.806***			0.040***		
	(3.976)			(4.911)		
Leanness Eff.^{2}	−0.665***			−0.010***		
	(−4.470)			(−3.246)		
PPE ELI		1.789***			0.037***	
		(3.548)			(3.381)	
Inv. ELI		1.063**			0.014*	
		(2.174)			(1.716)	
PPE ELI^2		−0.428			−0.002	
		(−1.094)			(−0.283)	
Inv. ELI^2		0.196			0.002	
		(0.604)			(0.266)	
PPE Eff.			3.239***			0.058***
			(4.050)			(3.520)
Inv Eff.			1.409**			0.036***
			(2.010)			(2.975)
PPE Eff.^{2}			−1.367***			−0.015*
			(−3.396)			(−1.866)
Inv Eff.^{2}			−0.927***			−0.016***
			(−2.854)			(−2.630)
Observations	15105	15105	15105	15105	15105	15105
Firms	1280	1280	1280	1280	1280	1280
Industry Fixed Effects	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Adjusted R-Squared	0.585	0.586	0.586	0.927	0.927	0.927

5.6 Discussion and Conclusion

The share of US equity held by institutional investors has increased enormously in the last decades. In the hope that institutional investors increase firm value due to their substantial investments and monitoring experience, a common goal of many stock-listed firms is to attract institutional investors. Given that institutional investors conduct extensive research before investing in firms, we contribute to the literature by investigating whether institutional investors consider operational leanness when making their investment decisions.

Using a sample of 15,105 firm-year observations of US manufacturing firms from 1998 to 2020, we find leaner firms to be associated with a roughly three percentage points higher fraction of shares held by institutional investors. The results hold in various tests addressing endogeneity concerns and also using alternative measures for operational leanness. Contrary to our expectations and the studies investigating the association between operational leanness and firm performance or credit ratings respectively, we find no consistent evidence of an inverted U-shape relationship. For instance, using our original measure, we find institutional investors to view at least very high levels of operational leanness with some scepticism. In our robustness tests, where we use an alternative measure, the results show that the relationship appears to be concave. In additional tests, we show institutions types to differ substantially in how they evaluate operational leanness and also that institutional investors particularly prefer lean firms operating in industries with high demand uncertainty. Besides, our results provide some evidence indicating that institutional investors put more emphasis on operational leanness when firms operate in innovative industries, whereas they put less emphasis on operational leanness when firms operate in competitive industries.

Our results have three major implications. First, institutional investors consider operational leanness when selecting stocks. If firms plan to attract institutional investors, they should adopt lean operation practices and reduce slack. Our results even imply that institutional investors might only view very high levels of operational leanness as problematic. Second, we show that particularly investment advisors and hedge funds are attracted by operational leanness. Banks, insurance companies, and pension funds appear to prefer more prudent stocks. Firms should thus keep in mind which institutional investors they might attract. Especially, hedge funds are typically associated with shorter

investment horizons (see e.g., Massoud et al., 2011). Third and finally, firms in innovative and demand uncertain industries can particularly attract institutional investors if they maintain lean operations. Institutional investors consider that operational leanness might result in a greater competitive advantage in these industries.

A Appendix for Chapter 2

B Appendix for Chapter 3

C Appendix for Chapter 4

D Appendix for Chapter 5

Table D1: This table reports the distribution of firms in our sample over the observation period.

Year	Number of Firms
1998	494
1999	520
2000	535
2001	565
2002	570
2003	535
2004	544
2005	557
2006	579
2007	551
2008	597
2009	634
2010	645
2011	674
2012	703
2013	699
2014	727
2015	746
2016	796
2017	820
2018	876
2019	892
2020	846
Total	15105

Table D2: Descriptions and sources of variables used throughout the paper. "TR" refers to Thomson Reuters Eikon, "CS" to the Compustat database, and "CRSP" to The Center for Research in Security Prices.

Variable	Description (for firm i in year t)	Source
Analysts	Number of analysts following the firm	TR
Bid Ask	Average daily relative bid-ask spread calculated as $\frac{\text{Ask}-\text{Bid}}{(\text{Ask}+\text{Bid})/2}$	CRSP
Capex	The firm's capital expenditures divided by total assets	CS
Competition Intensity	Proportion of top-4 industry (SIC) revenues over total industry revenues	CS
Demand Uncertainty	Mean squared error of the residuals of an unobserved components model of aggregated quarterly industry revenues that is determined by a level component, trend component, seasonal component and an irregular component	CS
Div. Yield	Annual dividend yield calculated as the dividends per share divided by the share price	CS
Environmental Score	The firm's score on the environmental pillar of the ESG rating	TR
Firm Age	Number of years since the firm's first appearance in the Compustat database	CS
Governance Score	The firm's score on the governance pillar of the ESG rating	TR
% Inst. Ownership	Percentage of the firm's shares held by institutional investors multiplied by 100	TR
# Inst. Ownership	Number of institutional investors holding shares of the firm	TR
Innovative Intensity	Ratio of total industry (SIC) R&D expenditures to total industry revenues	CS
Inst. Herding	The number of net institutional buyers of the firm's shares divided by the sum of net institutional buyers and net institutional sellers	TR
Intangibles	The firm's intangible assets divided by total assets	CS
Inventory ELI	Measure for inventory leanness based on the methodology proposed in Eroglu & Hofer (2011b). For each four-digit SIC industry and year, we run regressions where the natural logarithm of the firm's total inventory is the dependent variable, and where the natural logarithm of a firm's sales is the independent variable. The studentized residuals from these regressions multiplied by -1 are then used as the individual scores for inventory leanness for each firm-year	CS
% Lean Firms in MSA	Ratio of lean manufacturing firms to all manufacturing firms (excluding the focal firm) located in the same metropolitan statistical area (MSA) as the focal firm in the fiscal year	CS
Leanness	Measure for total operational leanness calculated as the sum of Inventory ELI and PPE ELI	CS
Leanness Dummy	Indicator variable that is one if the firm's *Leanness* exceeds the industry-year median, and else zero	CS

Table is continued on the next page.

Table D2 continued

Variable	Description (for firm i in year t)	Source
Leanness Eff.	Measure for total operational leanness calculated as the sum of the inventory resource efficiency score and the production resource efficiency score as proposed in Modi & Mishra (2011)	CS
Leanness Eff. Dummy	Indicator variable that is one if the firm's *Leanness Eff.* exceeds the industry-year median, and else zero	CS
Leverage	Ratio of total debt to the book value of total assets	CS
Market Cap	The number of shares outstanding multiplied with the share price at the end of the fiscal year	CS
PPE	The firm's property, plant and equipment divided by total assets	CS
PPE ELI	Measure for production leanness based on the methodology proposed in Bendig et al. (2017) and Eroglu & Hofer (2011b). For each four-digit SIC industry and year, we run regressions where the natural logarithm of the firm's PPE is the dependent variable, and where the natural logarithm of a firm's sales is the independent variable. The studentized residuals from these regressions multiplied by -1 are then used as the individual scores for inventory leanness for each firm-year	CS
Price	Average stock price	CRSP
Return	Continuously compounded annual stock return	CRSP
R&D	The firm's research and development expenditures divided by total assets	CS
ROA	The firm's operating income divided by the book value of total assets	CS
Social Score	The firm's score on the social pillar of the ESG rating	TR
Tobin's Q	The firm's total assets minus its book value of equity plus its market value of equity all divided by total assets	CS
Turnover	Average ratio of monthly trading volume to the number of shares outstanding	CRSP
Volatility	Standard deviation of daily returns	CRSP

Table D3: This table displays the results from regressions using sample splits based on environmental dynamism variables (innovative intensity, demand uncertainty, and competitive intensity). Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Panel A: % Inst. Ownership

Environment:	*Innovative Intensity*		*Demand Uncertainty*		*Competitive Intensity*	
	= 0	= 1	= 0	= 1	= 0	= 1
Leanness	1.288***	1.881***	1.077***	2.394***	1.412***	1.365***
	(3.655)	(3.599)	(3.455)	(3.416)	(3.968)	(2.976)
Leanness^2	−0.030	−0.300	−0.302**	0.200	−0.137	−0.036
	(−0.189)	(−1.430)	(−2.235)	(0.717)	(−0.929)	(−0.176)
Observations	11052	3943	11229	3876	11252	3853
Firms	963	487	1002	367	1101	520
Industry Fixed Effects	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Adjusted R-Squared	0.592	0.572	0.629	0.474	0.552	0.688

Panel B: ln(# Inst. Ownership)

Environment:	*Innovative Intensity*		*Demand Uncertainty*		*Competitive Intensity*	
	= 0	= 1	= 0	= 1	= 0	= 1
Leanness	0.024***	0.025**	0.021***	0.037**	0.026***	0.021**
	(3.649)	(2.086)	(3.378)	(2.569)	(3.752)	(2.378)
Leanness^2	0.002	−0.001	−0.001	0.003	−0.001	0.007
	(0.580)	(−0.157)	(−0.267)	(0.498)	(−0.263)	(1.607)
Observations	11052	3943	11229	3876	11252	3853
Firms	963	487	1002	367	1101	520
Industry Fixed Effects	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Adjusted R-Squared	0.928	0.927	0.925	0.932	0.922	0.941

Table D4: This table displays the results from regressions examining the effect of environmental dynamism (innovative intensity, demand uncertainty, and competitive intensity) on the relation between institutional ownership and operational leanness. Table D2 in the Appendix contains information on the variable definitions and sources. Below the coefficient estimates, we provide t-statistics in parentheses calculated on the basis of standard errors clustered by firm. The following significance levels are indicated by asterisks: *** (1 %), ** (5 %), * (10 %).

Dependent Variable:	*% Inst. Ownership*			*ln(# Inst. Ownership)*		
	(1)	(2)	(3)	(4)	(5)	(6)
Leanness	1.269***	0.866***	1.465***	0.024***	0.017***	0.026***
	(3.657)	(2.734)	(4.280)	(3.770)	(2.763)	(3.922)
Leanness^2	−0.040	−0.244*	−0.142	0.002	0.000	−0.001
	(−0.251)	(−1.821)	(−0.985)	(0.656)	(0.006)	(−0.291)
Innov. Intensity	0.706			−0.015		
	(0.556)			(−0.529)		
Leanness x Innov. Int.	0.444			0.002		
	(0.796)			(0.212)		
Leanness^2 x Innov. Int.	−0.225			−0.003		
	(−0.889)			(−0.713)		
Demand Unc.		0.051			0.033	
		(0.031)			(0.998)	
Leanness x Demand Unc.		2.045***			0.031**	
		(3.108)			(2.427)	
Leanness^2 x Demand Unc.		0.252			0.0003	
		(0.847)			(0.047)	
Comp. Intensity			1.280			−0.024
			(1.480)			(−1.304)
Leanness x Comp. Intensity			−0.253			−0.004
			(−0.478)			(−0.461)
Leanness^2 x Comp. Intensity			0.018			0.007
			(0.076)			(1.460)
Observations	14995	15105	15105	14995	15105	15105
Firms	1280	1280	1280	1280	1280	1280
Industry Fixed Effects	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Adjusted R-Squared	0.586	0.588	0.586	0.927	0.928	0.927

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