Leaders vs. Followers: Investigating the Impact of Falling Interest Rates on Firm Borrowing and Investment Responses

Paul Richter

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Abstract

This thesis analyzes the strategic effect established by Liu et al. (2022), which describes the asymmetric investment responses of industry leaders and followers during periods of falling interest rates. When interest rates fall, the present value of being a persistent market leader increases. Assuming that firms can become permanent leaders through investments, the incentive to invest increases causing intense competition if leaders compete head-to-head. The expectation of fierce and costly competition disincentivizes followers to invest, causing an asymmetric investment response. This strategic effect increases if the interest rate approaches zero and reverses if it increases. Using the methods of Kroen et al. (2022), the borrowing and investment behaviors of firms in response to negative interest rate shocks in eleven Eurozone countries from 1999 to 2021 are analyzed. Leaders are defined as the top 5% of firms based on annual revenues within their 2-digit NACE industry. The results show that falling interest rates close to the zero lower bound causes increased leverage, borrowing, and investments of leaders relative to followers, justifying the strategic effect. Contrary to the proposed financial advantage followers enjoy lower borrowing costs than leaders. Both effects diminish in higher interest rate environments. A competition-neutral ESTER rate of 3,47%, at which rate shifts influence industry leaders and followers equally, is computed. The results confirm a pronounced strategic effect in more competitive industries with lower Herfindahl-Hirschman Index, consistent with the proposal by Liu et al. (2022) that leaders competing head-to-head investment more aggressively, while followers are disincentivized to invest.

Keywords: *Borrowing Costs, Economic Growth, Eurozone, Investments, Market Concentration, Market Power, Monetary Policy, Superstar Firms*

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Resumo

Esta tese estuda o efeito estratégico identificado por Liu et al. (2022), que analisa a assimetria nas respostas de investimento a períodos de descida das taxas de juro entre líderes e seguidores do setor. Quando as taxas de juro diminuem, o valor atual de ser um líder de mercado persistente aumenta, provocando respostas de investimento heterogéneas entre os líderes e seguidores da indústria. Utilizando os métodos de Kroen et al. (2022), são analisados os comportamentos dos agentes que contraem empréstimos e os investimentos das empresas em resposta a choques negativos nas taxas de juro em onze países da Zona Euro, desde 1999 até 2021. Consideram-se líderes as empresas cujas receitas anuais se situam nas 5% mais elevadas, dentro da sua indústria. Os resultados sugerem que uma diminuição das taxas de juro para níveis próximos do lower zero bound, provoca um aumento da alavancagem, dos empréstimos e dos investimentos dos líderes relativamente aos seguidores, conforme estabelecido pelo efeito estratégico. Surpreendentemente, os seguidores incorrem em custos de contração de empréstimos mais baixos do que os líderes. Os dois efeitos diminuem num contexto de taxas de juro mais elevadas. Foi calculada uma taxa ESTER neutra em termos de concorrência de 3,47%, em que as alterações das taxas influenciam igualmente os líderes e os seguidores da indústria. Os resultados confirmam a existência de um efeito estratégico pronunciado em sectores mais competitivos conforme a proposta de que os líderes que enfrentam concorrência direta investem mais agressivamente, enquanto os seguidores são desincentivados a fazê-lo.

Palavras-chave: *Concentração de Mercado, Crescimento Económico, Custos de Empréstimos, Empresas Superstar, Investimentos, Poder de Mercado, Política Monetária, Zona Euro*

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List of Abbreviations

BP	Basis Points
CAPEX	Capital Expenditures
CR	Concentration Ratio
DiD	Difference-in-differences
ECB	European Central Bank
ESTER	Euro Short-Term Rate
FOMC	Federal Open Market Committee
GDP	Gross Domestic Product
HHI	Herfindahl-Hirschman Index
LP	Local Projection
NACE	Nomenclature Statistique des Activites Economiques dans la Communaute Europeenne
NBER	National Bureau of Economic Research
OLS	Ordinary Least Squares
PPE	Property, Plant and Equipment
r	Interest Rate
RI	Total Return Index
SIC	Standard Industrial Classification
U.S.	United States of America
ZLB	Zero Lower Bound

1. Introduction

Since the establishment of the Eurozone in 1999, interest rates declined consistently globally and in the monetary union, hitting negative levels between 2015 and 2022. Despite these reduced rates, post-financial crisis business investments and the overall economic activity in the Europe remained weak (IMF, 2015).

This dissertation utilizes exogenous high-frequency interest rate shocks computed around ECB Governing Council announcements between 1999 and 2021 to identify the differences in firm-level responses among industry leaders and followers in the eleven founding countries of the Eurozone.[1]

For this research, leaders are designated as the top 5% of firms based on revenues within their specific 2-digit NACE industry classification at a given year. In contrast, the remaining firms are labeled as followers.

The analysis finds significant evidence that negative interest rate shocks close to the zero lower bound (ZLB) cause a relative increase in debt, leverage, intangibles, and property, plant & equipment (PPE) of leaders relative to followers. Followers, on the other hand, enjoy lower borrowing costs and increase their capital expenditures (CAPEX) relative to leaders. Notably, these effects intensify as the interest rate converges towards the ZLB and reduce when the interest rate increases.

A growing body of literature points to rising market concentration (Autor et al., 2020) and market power (De Loecker et al., 2020) in the U.S.. At the same time, economy-wide interest rates decreased.

Similar patterns are also observed in Europe (Bajgar et al., 2019). Market concentration is generally perceived as a long-term occurrence, typically attributed to structural shifts in developed economies. However, Kroen et al. (2022) have highlighted the interaction between market concentration and monetary policy in the U.S. in their NBER working paper.

This dissertation examines whether falling interest rates disproportionately benefit Eurozone industry leaders following the empirical approach by Kroen et al.(2022).

The motivating theoretical framework is derived from Liu et al. (2022). Their study primarily aims to understand how low interest rates affect industry leaders and followers differently,

[1] Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain (Statistisches Bundesamt, 2023)

especially concerning their borrowing costs and investment patterns, and thus cause an increase in market concentration.

Two mechanisms, the *financial advantage*, defined by Kroen et al. (2022), and *strategic effect*, defined by Liu et al.'s (2022) dynamic competition model, form the study's backbone:

The analysis by Liu et al. (2022) focuses on the effects of falling interest rates on corporate investment in productivity upgrades. The authors identified two effects: The traditional effect, due to which market leaders and followers "naturally" increase their investment after a fall in interest rates, and the *strategic effect*, due to which market leaders increase their investment more relative to followers after a fall in interest rates.

If the interest rate decreases, the present value of future cash flows increases. Assuming that the future flow profits of a permanent leader are equal to one, conclusively, the value of a permanent leader would be $v \equiv 1/i$ and become arbitrarily large if the interest rate converges to zero. Assuming a firm can become a permanent leader by investing in productivity, the incentive to invest in productivity increases after a fall in interest rates for all firms, but especially for the firms competing closely at the top in productivity. The investment optimization problem of a firm also incorporates the investment levels of its competitors and their closeness in terms of productivity, leading to an asymmetric response of leading and following firms. Leaders will invest aggressively to avoid direct head-to-head competition, which is costly because they have to share profits and invest more due to the head-to-head competition. Expecting leaders to invest more aggressively as they converge in productivity, followers become discouraged and invest less, preferring short-term profits over the long-term. This effect becomes stronger the closer the interest rate converges to zero because the present value of permanent leadership increases (Liu et al., 2022).

The *financial advantage* results from the Kroen et al. (2022) model. When interest rates fall, leading and following firms want to invest up to their debt capacity. The cost of debt - and hence the firm's investment level – depends on the investment level of its competitors. Since the leader has a strategic advantage due to its larger market share and investment volume, it also has a financial advantage. It can invest more than the follower because it is more likely to be able to repay the debt and win the market shares of the follower. The financial advantage, in turn, reduces the likelihood of payback of debt by the follower, further restricting the follower's investments and reinforcing the strategic advantage of the leader by increasing the probability that the temporary lead will become permanent. As the interest rate converges to zero, the effect becomes stronger, leading endogenously to an increase in the follower's borrowing costs and a decrease in investment.

In light of the increasing market concentration and declining interest rates in advanced economies observed in recent decades, this dissertation examines whether the proposed financial advantage and strategic effect can be observed in the Eurozone sample.

To empirically analyze the proposed mechanisms, this study uses annual firm-level data and high-frequency monetary policy shocks that Jarociński & Karadi (2020) computed. Following Kroen et al. (2022), the approach involves estimating the impulse response functions of leaders compared to followers through a local projection difference-in-difference analysis.

The main exercise is to assess the different responses of industry leaders and followers to interest rate shocks and to examine how these responses are affected by the initial interest rate level.

The significant results show that industry leaders and followers respond differently to negative rate shocks if the initial interest rate is close to the ZLB. This diverging effect diminishes in higher-rate environments.

Two years after a negative interest rate shock of 10 basis points (BP) at an initial interest rate level of zero, borrowing costs for leaders are 0,47 basis points ($p<0,01$) larger than for followers. This outcome indicates that the financial advantage, defined in the working paper of Kroen et al. (2022), was not observed. Even though the diverging effect is small, it is significant.

The other outcomes support the strategic effect proposed by Liu et al. (2022). Two years after a 10 BP negative interest rate shock with an initial interest rate of zero, leaders experience a 0,08% ($p<0,05$) greater increase in debt and a 0,03% ($p<0,01$) rise in leverage relative to followers.

The differences between industry leaders and followers also affect the real investments of the firms. Two years after a 10-point negative interest rate shock, results in leaders having 0,08% ($p<0,01$) more PPE and 0,06% ($p<0,1$) more intangible assets compared to followers. On the other hand, leaders invest 0,5% ($p<0,01$) less in CAPEX than followers.

Industry leaders exhibit a small yet statistically significant larger growth in four out of the five evaluated outcome variables, indicating a small but significant strategic advantage over their followers after a decrease in interest rates.

The difference in responses of leaders and followers diminishes in higher interest rate environments. A *competition-neutral* ESTER rate, at which the reaction of leaders and followers to a negative interest rate shock is equal, was computed to be at 3,47%.

The findings suggest that leaders and followers respond differently to decreasing interest rates. Specifically, a further reduction in interest rates from already low rates tends to increase the difference in responses.

To assess the relationship between market concentration and the different responses of industry leaders and followers to interest rate shocks, the firms were separated into four quartiles, based on their average industry Herfindahl-Hirschman Index (HHI). This analysis seeks to validate if industry concentration levels influence the strategic effect and financial advantage. Industry concentration serves as a proxy for the intensity of head-to-head competition. Liu et al. (2022) propose that firms that compete closely head-to-head tend to invest more, borrow more, and increase their leverage, whereas followers are disincentivized to invest, resulting in a more pronounced strategic effect.

While the two concentrated HHI quartiles, with HHI values ranging from 0,99 to 0,33, showed no significant evidence, the two less concentrated HHI quartiles, with HHI values ranging from 0,47 to 0,20, exhibited stronger patterns in terms of magnitude than the estimation for the population as a whole, while the coefficients maintained the same direction.

The strategic effect is evident in the two less concentrated HHI quartiles. The finding that less concentrated industries exhibit a strategic effect, while more concentrated ones can be interpreted as consistent with Liu et al.'s (2022) concept of head-to-head competition.

The findings remain robust when leaders are defined as the largest 5% of firms based on market capitalization within their industry.

Additionally, *clean control groups*, as outlined in Dube et al. (2022), were defined to test for robustness in this analysis. It removes firms that were leaders in the year before the interest rate shock but not during the shock year from the control group, the followers, and instead categorizes them as leaders for the analysis. Thus, the clean-control group can be expressed as $L_{i,j,t} = L_{i,j,t-1} = 0$, where $L_{i,j,t}$=1 represents industry leadership of a firm in period t. In their paper, Acemoglu et al. (2019) employed the same specification to define their control group.

This thesis contributes to different stands of the literature, covering the fields of market power dynamics, monetary policy, economic growth, and superstar firm literature. While Europe might not completely mirror the U.S. in terms of economic ecosystem, market concentration trends, indicators like the global emergence of superstar firms (Autor et al., 2020) and increased markups (De Loecker et al., 2020; De Loecker & Eeckhout, 2018) underscore the relevance of examining the impact of falling interest rates on market concentration in the Eurozone.

This thesis enriches the academic discourse by shifting the spotlight to the economy's supply side, expanding the scope of Kroen et al. (2022) U.S. study to the Eurozone and incorporating the high-frequency interest rate shocks defined by Jarociński & Karadi (2020).
In exploring the impact of falling interest rates on market concentration using firm-level data, this thesis directly examines the relationship between falling rates and market power. It does this by assessing whether industry leaders react more strongly than followers to decreasing interest rates. Additionally, it investigates whether the intensity of the effect depends on the initial interest rate level. Deviating from the methods used by Kroen et al. (2022), the thesis incorporates clean control groups as defined by Dube et al. (2022) in the analysis to check the robustness of the results. In addition, it tests for heterogeneities by grouping the studied firms based on their industry HHI, testing if the strategic effect is stronger in more competitive industries.
Furthermore, intangible assets as an additional factor for investments in new technologies are incorporated in the analysis.

The remaining of the thesis is organized as follows: Section 2 provides an overview of the literature related to the topic and used in the analysis. Section 3 presents the theoretical framework from the dynamic competition model of Liu et al. (2022) and Kroen et al. (2022), which were used to develop the research question. Section 4 describes the data used, the variables constructed, and the methodology. Section 5 presents the results on the impacts of negative interest rate shock on borrowing costs, investments, and the competition neutral rate, Section 6 presents the heterogeneity analysis, Section 7 robustness checks, and Section 8 provides a conclusion.

2. Literature Review

Interest rates in the Eurozone have steadily decreased over recent decades, reaching negative levels in 2022. This dissertation explores the relationship between falling interest rates, firm-level investments, and stock market concentration, providing an overview how low interest rates have affected industry leaders and followers differently through the investment channel.

Generally speaking, market concentration measures the size and number of companies operating within a given market and significantly impacts firms' pricing and production quantities (Church & Ware, 2000). It is closely related to market power, defined as the ability of a firm to set prices above marginal cost and earn excessive profits (Church & Ware, 2000). The Lerner Index is a common proxy for market power in a symmetric oligopoly. It is computed by subtracting the marginal costs from the unit price and dividing the result by the unit price (Church & Ware, 2000). However, it is more common to encounter asymmetric oligopoly firms. This leads to different firms having varying price-cost margins and sizes, making other measures necessary to proxy market concentration. Market Concentration can be measured by the concentration ratio (CR) or the Herfindahl-Hirschman Index (HHI). The CR is the sum of market shares of the largest, pre-specified number of firms, ordered by their market shares (Church & Ware, 2000). The HHI, on the other hand, is the sum of the squares of all a firm's market shares and is sensitive to asymmetry in terms of market share (Church & Ware, 2000). An increase in the HHI, CR, and Lerner Index can be interpreted as increasing market concentration and power.

Gutiérrez & Philippon (2017) demonstrate that since the 2000s, investment in the U.S. has been weak compared to profitability and Tobin's Q. They also observe that industries with higher concentration and common ownership tend to invest less.

Crouzet & Eberly (2019) report that the increase in intangible capital accounts for much of the decline in physical capital investment since 2000. Further, they demonstrate that this rise in intangibles is driven by industry leaders and is associated with increased industry concentration and market power.

Barkai (2019) finds that the decline in labor and capital shares results from reduced competition. The research by Autor et al. (2020) on the emergence of highly productive "superstar" firms with a low labor share and contributing to increased market concentration in their industry is also relevant to this field of study.

Grullon et al. (2018) discovered that U.S. industry concentration and firm markups increased. They find no evidence of a corresponding increase in productivity, indicating that the rise in markups is driven by increased market power.

De Loecker & Eeckhout (2018) demonstrate that market power has increased globally over the past decades. This trend is evidenced by the rise in mark-ups. This increase is most pronounced in Europe and North America and least in emerging economies. De Loecker et al. (2020) also found a shift in market shares from firms with low mark-ups to those with high mark-ups.

Syverson (2019) finds conflicting evidence that larger market power has caused lower investment rates, attributing this to factors such as the rise of efficiency-enhancing intangibles, differing economic mechanisms, and sector-specific trends.

Döttling et al. (2017) compared investments in the U.S. and Europe, discovering that investments are weak in both regions. They argue that the weakness in Europe is cyclical, as investments align with measures of profitability and Tobin's Q. In contrast, they conclude that weak investments in the U.S. are structural and attributed to increased concentration due to inadequate anti-trust policies.

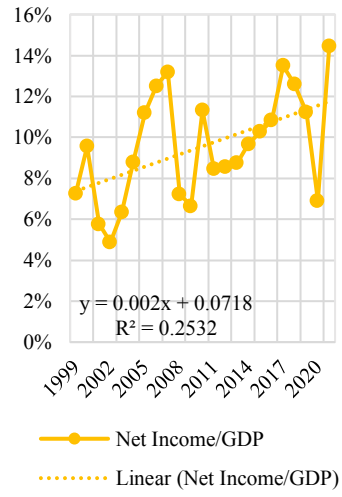
Research by Gutiérrez & Philippon (2018) indicates that markets in Europe were more competitive than in the U.S. in 2018. Their study characterizes European markets by less concentration, lower entry barriers, and fewer excess profits.

Bajgar et al. (2019) found that from 2001 to 2012, there was a 2-3% growth in the share of sales for the 10% largest companies within the average industry across 10 European economies.

Comparing the literature for Europe and the U.S., it is found that market concentration has increased in both regions, with the U.S. showing more substantial evidence of increased market concentration. The patterns of growing market concentration are also evident in the euro area sample studied, as evidenced by a positive trend coefficient, estimated with a linear OLS regression, for net income (measured as a share of GDP for all euro area countries), Tobin's Q, and profit margins, displayed in Figure 1.

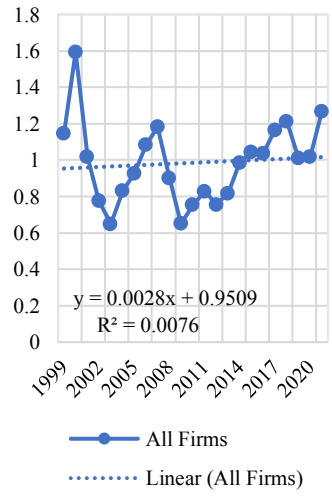
Figure 1: *Market Concentration Measures in the Studied Eurozone Sample*

(a) Net Income/GDP



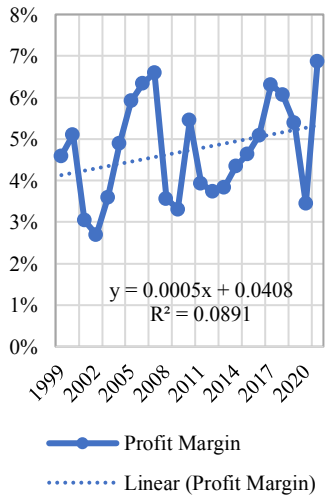
Notes: The Net Income/ GDP ratio is computed by summing the Net income of all firms each year and dividing them by the GDP of the EA 19 countries, which are considered as markets for all Eurozone firms, at the respective year.

(b) Average Tobin's Q



Notes: The Average Tobin's Q is computed by dividing the Market Capitalization of a firm by its Assets. Afterwards the average of all firms per year was computed.

(c) Profit Margin



Notes: The profit margin is computed by summing the Net Incomes of all firms at a year and dividing them by Revenues of all firms at a year.

Source*: Thomson Reuters Refinitiv (2023), Eurostat (2023) and own calculations*

According to standard economic theory, a reduction in interest rates stimulates economic activity and increases investments.

Farhi & Gourio (2018) investigate the recent decline in interest rates and negative trends in investments, identifying rising market power and increasing intangibles as critical factors in explaining the negative investment trends.

On the other hand, Jasova et al. (2021) discovered that small and young firms experienced the most significant investment growth after interest rate reductions (Jasova et al., 2021).

Eggertsson et al. (2021) explain the decline in interest rates and increased market power in the U.S. over recent decades utilizing dynamic models.

Cette et al. (2016) demonstrate a global decline in productivity growth, noting that this trend started before the financial crisis in 2007 for the U.S. and Europe.

Liu et al. (2022) developed a dynamic competition model. They discovered that a fall in long-term interest rates can cause a more aggressive investment response from market leaders relative to market followers. They conclude that this investment asymmetry can lead to more concentrated markets and less productivity growth. Therefore, leading to increased market concentration, firm profits and less productivity growth. The authors' findings suggest that

changes in the long-term interest rate can play an essential role in shaping market structure and economic growth.

The paper of Liu et al. (2022) inspires this dissertation, which uses firm-level data to analyze the impact of falling interest rates on industry leaders and followers in the Eurozone. The specific model by Liu et al. (2022) is elaborated in the subsequent section.

In their study, Kroen et al. (2022) further investigate the work of Liu et al. (2022) by analyzing the impact of falling interest rates on firms in the U.S., distinguishing between industry leaders and followers. Their research reveals that during periods of low interest rates, leaders benefit significantly more from negative interest rate shocks compared to followers, enjoy a financial advantage in the form of lower borrowing costs, and invest more than their counterparts due to the strategic effect, which is further reinforced by the strategic advantage.

The leader's advantage increases as the interest rate approaches the zero lower bound (ZLB) but decreases in an environment of increased interest rates.

This phenomenon occurs because companies apply higher discount rates to future profits after an interest rate increase, reducing the incentive to invest to secure a permanent leadership position. Conversely, the motivation to invest increases after an interest rate cut. According to research by Kroen et al. (2022), these patterns suggest a temporal relationship between rising market concentration and falling interest rates.

3. Conceptual Framework

This section presents the conceptual framework, starting with the strategic effect followed by the financial advantage, which reinforces the strategic effect.

Strategic Effect

In their study, Liu et al. (2022) explore how falling interest rates affect market concentration through the channel of firm investments in productivity. They prove theoretically and empirically that industry leaders respond more strongly to falling interest rates than followers. As a result, this causes a rise in market concentration, an increase in markups and productivity gaps between leaders and followers, and a decrease in economy-wide productivity growth (Liu et al., 2022).

The authors developed a dynamic competition model to explain the diverging effect of falling interest rates on leader and follower investments. While traditional models only account for the *traditional effect*, due to which a decrease in interest rate causes an increase in investments for all firms, leaders, and followers; the model of Liu et al. (2022) defines a second force, the *strategic effect*, according to which industry leaders have a stronger incentive to invest compared to followers in low-interest rate environments. Their central result is that the strategic effect strengthens as the interest rate approaches zero. At a sufficiently low-interest rate, the strategic effect overpowers the traditional effect, causing leaders to invest more than followers, increasing market concentration and less productivity growth (Liu et al., 2022).

In their simplified model, firms compete on a technological ladder in intertemporal competition. Leader and follower firms can progress on the ladder through investments. The ladder consists of three steps, with the distribution of flow profits depending on the distance between the firms on the ladder. There are three possible scenarios in which leader and follower firms compete.

Zero steps distance: When the firms are at the same step, they are competing head-to-head, sharing the market's flow profits $\pi_0 = 0{,}5$ equally for each firm.

One step apart: If the firms are one step apart, the leading firm captures all the flow profits $\pi_1 = 1$, while the follower earns zero flow profits $\pi_{-1} = 0$

Two steps apart: The gap becomes permanent if the follower and leader are two steps apart. The leader enjoys perpetual flow $\pi_2 = 1$, while the follower's flow profits remain at $\pi_{-2} = 0$, indefinitely.

Both firms strive to create a two-step gap, which enables the leader to become the permanent monopoly and secure all the profits. Investments are the only tool to advance and leave the

competitor behind. If the follower's investment is successful before the leaders, the gap closes by one step (Liu et al., 2022).

The present value of a firm is determined by dividing its flow profit by the interest rate (r). Conclusively the present value of a permanent leader equals $v_2 \equiv 1/r$ and increases with a lower *r*. In contrast, a permanent follower has a value of $v_{-2} \equiv 0$ (Liu et al., 2022).

When the firms have zero or one-step distance, each firm maximizes its value by independently choosing an investment level to advance one step, considering the competitor's investment as given (Liu et al., 2022). At low-interest rates, the present value of being a permanent market leader becomes arbitrarily large. Thus, the incitive to invest in productivity to maintain leadership gets amplified by lower interest rates.

When two firms compete on the same stage, the anticipation of fierce competition, especially in a low-interest-rate environment, becomes stronger. Leaders anticipate this, invest more aggressively to distance themselves from followers, and avoid direct, head-to-head competition. Followers also expect competition to intensify and that leaders will invest aggressively, thus they become discouraged from winning the race and are disincentivized to invest. Ceteris paribus, increased investment by a firm increases its probability of advancing and the probability of the competition retreating.

As interest rates approach zero, the strategic effect dominates the traditional effect.

A critical assumption for these dynamics is that market followers cannot instantly surpass or "leapfrog" the market leader regarding productivity. Instead, followers must gradually close the productivity gap. This gradual catch-up process incentivizes leading companies to invest not only for greater future profits but also to manifest their lead strategically.

This assumption is consistent with real-world observations where market leaders might engage in defensive R&D, erect barriers to entry, or make predatory acquisitions to maintain their advantage.

In a more comprehensive model featuring infinite states without the certainty of perpetual leadership, the authors highlight that when interest rates drop low enough, average followers stop their investments, effectively diminishing industry competition. While the original model established permanent leadership exogenously, the extended model suggests that market leadership becomes permanent endogenously. This leads to the conclusion that extremely low-interest rates amplify market concentration, elevate profits, and lower productivity growth (Liu et al., 2022).

Financial Advantage

Kroen et al. (2022) expanded the model to a setting where firms finance their investments using short-term debt. As interest rates converge toward zero, leader and follower firms seek to invest as much as their debt capacity allows. The amount of debt a firm can accumulate and invest in is endogenous to the investment level of its competitor. Because of its better strategic position, the leading firm has more predictable profits for the next period, and is less risky, giving it a financial advantage. This allows the leader to borrow and invest more than the follower. This financial edge of the leader negatively impacts the follower's likelihood of repaying its debt, further constraining the follower's investment. As interest rates converge to zero, this reinforcing cycle intensifies. The follower's borrowing costs increase significantly, its investment capacity diminishes, and it loses the opportunity to progress to a higher state.

Drawing upon the dynamic competition models introduced by Liu et al. (2022) and extension by Kroen et al. (2022), the thesis tests if the strategic effect and financial advantage can be observed in the studied Eurozone sample and how these effects are affected by the industry concentration.

4. Data and Methodology

4.1. Data

This thesis analyzes annual firm-level data obtained from Datastream from 1999 to 2021. The time frame was chosen as it coincides with the introduction of the Euro in January 1999 and aligns with the availability of high-frequency interest rate shock data from Jarociński & Karadi (2020). Details on these shocks will be elaborated in the subsequent section.

The initial data set comprises public firms incorporated in the 11 countries that first adopted the Euro in 1999: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain (Statistisches Bundesamt, 2023). These nations constitute a significant portion of the Eurozone's GDP and population. Firms from the financial and insurance sector were excluded, resulting in a sample of 1970 firms.

Data transformations and exclusions were conducted based on criteria established by Kroen et al. (2022), with a few distinctions. Firms exhibiting leverage over 1000% during any year within the observation period were removed, excluding 24 firms. Additionally, companies with a net current asset ratio exceeding 10 or falling below -10 were excluded; however, this criterion did not lead to any firm removals.[2] Further, leverage data was winsorized at the 0,5% and 99,5% levels. Negative borrowing costs were marked as missing, and the top 5% were omitted to avoid unrealistically large values.

Contrary to the approach of Kroen et al. (2022), this study retained firms with adjusted real sales growth beyond 100% or below -100% due to the annual nature of the analysis, as opposed to a quarterly review. Except for the previously modified leverage, net current asset ratio, and borrowing costs, the firm-level data utilized in this study were winsorized at the 0,5% and 99,5% percentile levels. The analysis incorporated data on intangible assets, supporting the conclusions drawn by Farhi & Gourio (2018) about the relationship between rising intangible assets, falling interest rates, and growing market power, thereby extending the research conducted by Kroen et al. (2022).

[2] The net current asset ratio is computed by deducting current liabilities from current assets and dividing by total assets.

The data quality for the outcome variable acquisitions, rated as 2 out of 3 stars by Datastream, was poor. I included it in my analysis for completeness, but due to its poor quality, the results were unrealistic and therefore play a minor role in the interpretation.

Table 1 outlines the summary statistics of the outcome variables used in the analysis: Borrowing cost, RI returns, leverage, intangible assets, CAPEX, debt, assets, and PPE. The construction of each variable is explained in the table's notes.

Table 1: *Summary Statistics of the Outcome Variables*

	N	Mean	SD	Min.	25%	50%	75%	Max
Borrowing Costs (%)	21.616	6,19	4,52	0,00	3,12	5,26	8,09	23,56
RI Returns (%)	29.571	0,55	19,42	-104,48	-3,76	0,87	4,65	145,72
Leverage (%)	33.186	39	31,52	0,00	19,87	38,41	55,66	201,06
Acquisitions (%)	20.665	58,13	375,26	-2,39	0,00	0,00	0,19	4.051,56
CAPEX (%)	31.415	5,73	11,73	0,00	1,03	3,00	6,19	123,20
Debt (millions)	33.484	2.317,12	12.826,60	-2.157,63	-2,56	19,42	318,99	143.195,40
Assets (millions)	33.639	12.098,85	64.878,58	0,54	56,19	288,59	2.120,35	716.719,11
PPE (millions)	33.383	1.192,19	4.251,86	0,00	4,87	52,33	405,04	38.603,70
Intangibles (millions)	33.062	952,47	3656,33	0,00	1,77	18,32	196,29	33.269,31

Notes: This table presents the summary statistics of the primary outcome variables.
*Borrowing Costs = Interest Expense on Debt (t) / Debt (t)*100*
RI Returns= ln(RI at t) / ln (RI at t-1)
Leverage is given in % by Datastream
*Acquisitions (%) = Acquisition (t) / Total Assets (t-1)*100*
*CAPEX (%)= CAPEX (t) / Total Assets (t-1)*100*
Debt, Assets, PPE and Intangibles were given by Datastream.
***Source**: Thomson Reuters Refinitiv (2023) and own calculations*

Following Kroen et al. (2022), the analysis categorizes firms as industry "leaders" or "followers" based on revenue size. A "leader" is defined as a firm within the top 5% of its respective 2-digit NACE industry based on revenue during the assessment year. Industries with fewer than 20 firms have one leader, identified as the firm with the highest revenue within the 2-digit NACE industry. The robustness section shows consistent findings for alternative leader definitions based on market capitalization, alongside clean control groups for both industry leader definitions. Unlike Kroen et al.(2022), who utilized 2-digit SIC and Fama-French industries for their analysis, this study employs 2-digit NACE industries, a comparable standard adopted in the European Union. The final sample consists of 19 NACE Sectors, which unfold in 88 2-Digit NACE industries.

Based on the top 5% of firms in their industry by market capitalization and revenues, the leader definition follows the approach of Kroen et al. (2022), with additional tests to verify the robustness of the analysis through clean control groups for both leader definitions.

Leaders are chosen based on percentage rather than total value to facilitate more consistent comparisons, given the substantial variation in the number of firms across industries, ranging from fewer than ten to over a hundred firms in each industry.

The firm-level data met two critical requirements for the study: First, the panel length of 23 years allowed to exploit variation within individual firms. Second, the dataset contained extensive balance sheet information that facilitated the construction of the outcome variables. The shortcoming of the dataset is that, firstly, private firms are excluded. Second, the firm-level data was collected on a quarterly and annual basis and thus had to be unified on a yearly level.

4.2. Methodology

The main empirical test of this dissertation is to measure the *strategic effect* using the investment response of industry leaders compared to followers after negative interest rate shocks. It also aims to distinguish how their reaction varies depending on the initial interest rate level.

The following LP-DiD model uses like Kroen et al. (2022) two coefficients, $ß^h_{ZLB}$ and $ß^h_{\Delta}$, to study the effect of interest rate shocks on firms in the U.S. depending on the initial Federal Funds Rate level. I compute the difference-in-differences local projections at horizons h = 1, 2, 3 years. The horizon of three years was chosen because Kroen et al. (2022) estimated the result for the same time horizon and because local projections lose precision over longer horizons.

$$\Delta y_{i,j,t+h-1} = \alpha^h_{j,t} + ß^h_{ZLB}\left(shock_t * L_{i,j,t}\right) + ß^h_{\Delta}\left(shock_t * L_{i,j,t} * ESTER_t\right) + \sum_{l=1}^{2} \theta_{h,i} \Delta y_{i,j,t+h-1} + \epsilon_{i,j,t+h} \quad (1)$$

$\Delta y_{i,j,t+h-1} = y_{i,j,t+h-1} - y_{i,j,t-1}$ is the aggregate change in the dependent variable of firm *i* in 2-Digit NACE industry *j* ranging from year *t-1* to *t+h-1*. $\alpha^h_{j,t}$ are industry and time fixed effects to eliminate variation across industries. $L_{i,j,t}$ serves as a dummy variable, taking the value of 1 if firm i meets the criteria for being an industry leader at time *t*. Industry leaders are defined as firms that rank in the top 5% in terms of revenues of their respective industries, guaranteeing at least one leader per industry. $ESTER_t$ is the rate of the nominal ESTER rate at year t. The variable $shock_t$ represents the measure of the exogenous high-frequency shock at year *t*, a topic which is elaborated in the following sub-section, $shock_t$ is computed by summing

all interest rate shocks at the year. Following Montiel Olea & Plagborg-Møller (2021), $\Delta y_{i,j,t+h-1}$, as lags of the dependent variable were incorporated in the local projections difference-in-differences regression, to eliminate the necessity to adjust standard errors for autocorrelation. Consequently, heteroskedasticity-robust standard errors became suitable for this regression.

The first derivative of Equation (1) with respect to the leadership dummy variable, $L_{i,j,t}$, facilitates the interpretation of the two coefficients of interest ß$^h_{ZLB}$ and ß$^h_{\Delta}$.

$$\frac{\partial\, \Delta y_{i,j,t+h-1}}{L_{i,j,t}} = ß^h_{ZLB} * shock_t + ß^h_{\Delta} * shock_t * L_{i,j,t} * ESTER_t \qquad \textbf{(2)}$$

Since leader and follower experience the same size of interest rate shock, the relative effect of leaders compared followers reduced to:

$$ß^h_{ZLB} + ß^h_{\Delta} * ESTER_t \qquad \textbf{(3)}$$

If the ESTER (Euro Short-Term Rate) equals zero, the entire effect of the interest rate shock on a leader's outcome relative to a follower is captured by ß$^h_{ZLB}$. If the ESTER is positive, the negative interest rate shock is absorbed by both coefficients ß$^h_{\Delta}$ and ß$^h_{ZLB}$, and ß$^h_{\Delta}$ is supposed to have an opposing direction to ß$^h_{ZLB}$ (Kroen et al., 2022). This relationship should display the strategic effect described by Liu et al. (2022). This means that the relative increase in investment for a leader compared to a follower decreases when the initial interest rate is high. This suggests that if the initial interest rate is sufficiently high, the impact of a negative interest rate shock becomes weaker, leading to a smaller investment gap between followers and leaders. Conversely, a negative change in interest rates near the ZLB will lead to an increase in investment for leaders relative to followers. This relationship showcases how different initial interest rates can lead to different responses between leaders and followers.

Local projections (LPs) have become an increasingly prominent methodological approach in dynamic macroeconomic analysis and in estimating impulse response functions, following the work by Jordà (2005). Impulse response functions describe how a variable responds over time after an exogenous shock.

Plagborg-Møller & Wolf (2021) provide evidence that Vector Autoregressions (VARs) and local projections (LPs) estimate the same impulse responses in the population.

According to Plagborg-Møller & Wolf (2021), the implementation of lag-augmented local projections offers the advantage that by incorporating lagged values of the explanatory variables as additional controls in the regression analysis eliminates the need to control for autocorrelated standard errors. Consequently, heteroskedasticity-robust standard errors are adequate when using lag-augmented local projections.

Lag-augmented local projections are additionally robust to both persistence in the data and longer horizons, which are common characteristics in macroeconomic applications (Montiel Olea & Plagborg-Møller, 2021).

Plagborg-Møller & Wolf (2021) point out that another advantage of local projections is their straightforward interpretation as regression coefficients.

Those characteristics make local projections a valuable tool to estimate the causal effect of monetary policy on firm investments.

Local projections difference-in-differences (LP-DiD) described in Dube et al. (2022) can identify the treatment effect over multiple period settings, allowing for staggered treatment adoption, where individuals enter treatment at different time periods, and enable dynamic heterogeneous treatment effects.

However, potential bias can arise in this multi-period setting when previously treated units, still experiencing lagged treatment effects, are used as controls for newly treated units. To mitigate this bias, the *clean control group condition* of LP-DiD restricts the estimation sample, excluding *unclean* observations that may still be influenced by a previous change in treatment status (Dube et al., 2022). This approach is used in Section 7 to test for robustness.

The analysis will apply local projections difference-in-differences that incorporates exogenous shocks following Dube et al. (2022) and Jordà (2005). The advantage of using exogenous, high-frequency interest rate shocks is that LP-DiD can identify the specific impact of interest rates on investments without confounding factors. Unlike traditional DiD, LP-DiD allows for observing shocks over multiple time periods. This enables a richer understanding of how the relationship between interest rates and firm investments evolves over time. LP-DiD reduces the risk of bias due to omitted variables or other underlying trends by focusing on exogenous shocks, providing a more accurate estimate of the causal relationship.

4.3. High-Frequency Interest Rate Shocks

To analyze the impact of falling interest rates on investments, exogenous interest rate shocks are needed, which represent an exogenous shift in the aggregate interest rate. High-frequency interest rate shocks are standard exogenous shocks in economic literature to assess the effects of monetary policy.

This dissertation relies on the high-frequency interest rate shocks estimated by Jarociński & Karadi (2020), which were computed within a 30-minute timeframe that begins 10 minutes prior to the ECB's Governing Council announcement and concludes 20 minutes after it by tracing changes in asset prices and interest rate swaps.

Jarociński & Karadi (2020) assume that in the 30-minute time window around the ECB governing council, only information due to the central bank announcements can surprise the markets and therefore change the interest rate, making them exogenous shifters of the interest rate. This method effectively eliminates two common sources of distortion frequently encountered in lower-frequency analyses of policy impacts on stocks: reverse causality and omitted variable bias.

High-frequency interest rate shocks are considered unpredictable for financial markets. This perspective is backed by the argument that if these surprises were predictable, financial markets would arbitrage them away, thereby eliminating the shock. Therefore, high-frequency interest rate shocks are likely to be exogenous to all publicly known macroeconomic variables before the Central Bank announcement. This makes them a valid instrument for analyzing the effects of monetary policy in local projections (Bauer & Swanson, 2022).

According to Stock & Watson (2018), high-frequency interest rate shocks are an external instrument, which is a variable that is "correlated with a shock of interest, but not with other shocks" (Stock & Watson, 2018, p.918). This correlation allows the instrument to capture some exogenous variation in the shock of interest. Therefore, high-frequency interest rate shocks serve as valid instruments for analyzing the effects of Monetary Policy within a Local projection.

Gürkaynak et al. (2005) are pioneers in using high-frequency interest rate shocks around the Federal Open Market Committee (FOMC) to analyze the impact of the published information of these meetings on asset prices. They show that a FOMC announcement has two factors influencing the entire yield curve. Those factors are i) the current federal funds target influencing the short run and ii) the future path of policy influencing the long run. Those factors are comparable to the presented findings by Hillenbrand (2020) and strengthen the argument that high-frequency shocks can explain a large fraction of short and long-run interest rates.

Moreover, forward guidance during central bank meetings continues to influence expected future interest rates, even when the central bank is already operating at the ZLB. This leads to empirical variation, which is helpful in the analysis of the last decade when the European economy has been operating at the ZLB. Awareness that the high-frequency shocks capture long- and short-term information is crucial for this analysis because the analyzed firm-level investment decisions depend on current and future expected interest rates (Kroen et al., 2022). Following Kroen et al. (2022), Gertler & Karadi (2015), and Ottonello & Winberry (2020), the high-frequency shocks used in this thesis are aggregated but on an annual level instead of a quarterly level. The summary statistics for the high-frequency interest rate shocks and ESTER are in Table 2 and illustrated in Figure 2.

Table 2: *Summary Statistics of High-Frequency Shocks Interest Rate Shocks and ESTER*

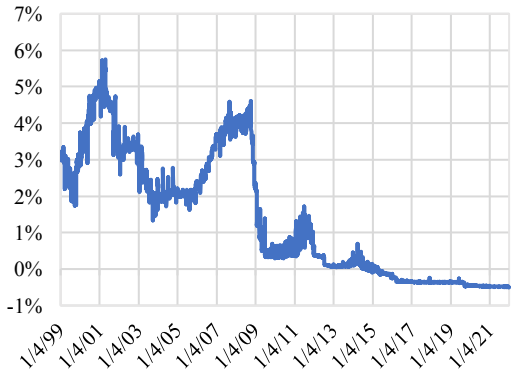
	N	Mean	SD	Min.	25%	50%	75%	Max
Shocks (in BP)	23	2,551	12,322	-18,104	-6,449	1,077	10,799	39,441
ESTER (%)	23	1,370	1,691	-0,483	-0,320	0,708	2,834	4,387

Notes: The shocks are given in basis points and the Ester is given in percent. The high-frequency interest rate shocks are denoted as shocks were aggregated on an annual level.

Source: *ECB & (Jarociński, 2022)*

Figure 2*: ESTER Path and High-Frequency Interest rate Shocks*

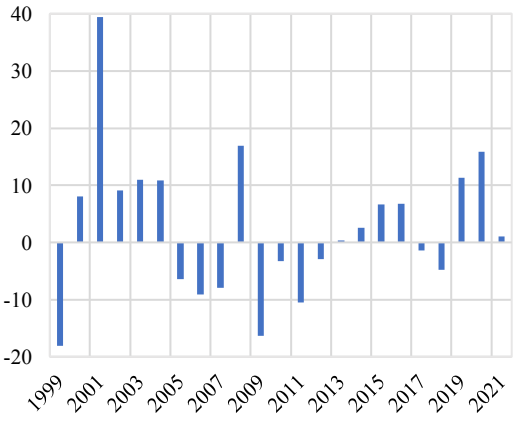
(1): *ESTER Path 1999-2021*



The Figure plots the path of the ESTER rate in percent.

Source: *ECB (2023)*

(2): *High-Frequency Interest Rate Shocks*



The high-frequency interest rate shocks are denoted as shocks were aggregated on an annual level. The figure plots the shocks in basis points

Source: *Jarociński & Karadi (2022)*

5. Results

This section displays the outcomes of the local projections difference-in-differences equation *(1)* for the dependent variables: Borrowing cost, log debt, leverage, log intangibles, log assets, log PPE, CAPEX(%), acquisitions (%), and RI returns (%). The local projections are calculated for one to three years post the interest rate shock, and the local projections difference-in-differences coefficients is illustrated in Figure 3 within their 95% confidence intervals. Leaders are defined as the top 5% by revenue in their industry, with at least one leader per industry. While the impact of an interest rate shock at the ZLB, when the ESTER is at 0, is fully captured by $ß_{ZLB}$it is captured by both difference-in-differences coefficients, $ß_{ZLB}$ and $ß_{\Delta}$ in all other interest rate environments.

For consistency, the results are interpreted using coefficients two years after the shock in the context of a ten basis point (BP) negative interest rate shock. This distance is chosen because Kroen et al. (2022) also report their results at this time gap, and it is also due to the nature of local projections, which become less precise for longer time horizons. The results are displayed in Table 3, and the Figure 3 in the appendix shows the path of coefficients over the horizon. Following Kroen et al. (2022), I am grouping the outcome variables by borrowing costs, firm growth, investments, and stock returns. Furthermore, this thesis provides an ESTER rate for which the effect of leadership on the outcome variable is halved in Table 4. This rate is computed by solving the following equation:

$$ESTER_{halved\ effect} = -\frac{ß_{ZLB}}{2 * ß_{\Delta}} \quad \textbf{(4)}$$

The analysis finds significant evidence that if the interest rate converges to the ZLB, a negative interest rate shock causes a relative increase in debt, leverage, intangibles, and PPE of leaders relative to followers. Followers, on the other hand, enjoy lower borrowing costs and increase their CAPEX relative to leaders. There are no statistically significant results for the log of assets, acquisitions, and RI returns. The different responses of leaders and followers are mitigated in a higher interest rate environment, and the effect of a shock on the outcome variables, if the interest rate is close to the ZLB, is halved for an initial ESTER rate ranging from 0,87% to 2,63%.

Table 3: *Estimated Different Responses of Leaders Two Years After Interest Rate Shock*

Dependent Variable	(1) $\widehat{\beta}_{ZLB}$	(2) $\widehat{\beta}_{\Delta}$	N
Borrowing Cost	-0,0474 ***	0,0090 **	10.894
	(0,0143)	*(0,0041)*	
Log Debt (mn)	-0,0085 **	0,0018 *	12.553
	(0,0034)	*(0,0010)*	
Leverage	-0,0028 ***	0,0007 ***	23.357
	(0,0006)	*(0,0002)*	
Log Intangibles	-0,0061 *	0,0035 ***	21.479
	(0,0033)	*(0,0009)*	
Log Assets	0,0006	-0,0002	23.787
	(0,0015)	*(0,0004)*	
Log PPE	-0,0082 ***	0,0025 ***	23.201
	(0,0019)	*(0,0005)*	
CAPEX	0,0492 ***	-0,0242 ***	21.196
	(0,0127)	*(0,0063)*	
Acquisitions	-0,5357	-0,0055	9.990
	(0,4534)	*(0,1579)*	
RI Returns	-0,0028	-0,0131	20.827
	(0,0385)	*(0,0104)*	

*Significance levels: *** p<0,01, ** p<0,05, * p<0,1*

Regression estimates for the coefficients of equation 1. According to Olea and Plagborg-Møller (2021), implementing lag augmentation ensures that the heteroskedasticity-robust standard errors are adequate. The results are given two years after the shock, whilst the coefficient for Stock Returns is obtained one year after the shock. – Standard Errors in Parentheses

Source: *Own calculation*

5.1. Borrowing Costs

A fall in interest rates due to a high-frequency interest rate shock causes a significant increase in borrowing costs for industry leaders compared to followers, especially in an interest rate environment close to the ZLB, due to the positive direction of ß$_{ZLB}$.

After a ten basis point negative interest rate shock, borrowing costs for leaders increase 0,47 basis points (p<0,01) more than for followers if the ESTER is equal to zero. This implies that followers benefit more from interest rate reductions in a low-rate environment and enjoy lower borrowing costs than leaders. The regression results indicate that the *financial advantage* posited in the NBER working paper by Kroen et al. (2022) was not detected using this approach since leaders face higher borrowing costs than followers.

The significant values of the ß$_{ZLB}$ coefficients increase in magnitude over three years after the shock, indicating that the pass-through of lower interest rates onto borrowing costs occurs over time, as Kroen et al.(2022) noted.

When initial interest rates are higher, the financial disadvantage of leaders is reduced. For instance, a 0,47 basis point disadvantage for leaders halves when the interest rate is 2,6%.

In higher interest rate scenarios, the disparity between leaders and followers lessens, leading to a competition-neutral rate where both groups are equally affected by an interest rate shock. This rate is detailed in Section 5.5.

5.2.Firm Growth

Even though leaders do not enjoy relatively lower borrowing costs, they still respond to the overall lower ESTER and negative interest rate shocks by borrowing more, increasing debt and leverage compared to followers.

A ten BP negative interest rate shock at the ZLB results in a 0,005% increase in asset growth one year after a shock and 0,01% less asset growth for leaders two years post-shock. On the other hand, leaders experience a 0,08% greater increase in debt issued despite the relatively larger borrowing costs. This contributes to a 0,03% rise in their leverage. These effects diminish as initial ESTER rates increase, halving when the ESTER is between 1,52% and 2,3%.

The findings for leverage are significant at p=0,01 and for debt at p=0,05, but they are not significant for assets.

5.3. Investments

The study analyzed how declining interest rates influence firm investments by regressing log PPE, log intangible assets, acquisitions, and CAPEX in equation *(1)*. To provide a relative measure, acquisitions, and CAPEX were adjusted using assets from the same year. This research differed from Kroen et al.'s (2022) approach by including intangibles, given the conclusions drawn by Farhi & Gourio (2018) about the relationship between rising intangible assets, falling interest rates, and growing market power.

The $ß_{ZLB}$ coefficients for intangibles and PPE are negative. This indicates that near the zero lower bound, a negative interest rate shock leads leaders to invest more in these areas than their followers. Specifically, a 10 BP negative ESTER shock close to the ZLB results in leaders having 0,08% more PPE and 0,06% more intangibles two years post-shock. Conversely, positive $ß_{\Delta}$ coefficients for PPE and intangible assets suggest that leaders relative advantage decreases in higher-rate environments. The results indicate that this advantage for leaders is halved when the ESTER reaches 0,87% for intangibles and 1,65% for PPE.

However, the $ß_{ZLB}$ coefficient for CAPEX is positive, meaning that after a negative 10 BP interest rate shock near the ZLB, leaders invest 0,5% less in CAPEX than followers. This disparity lessens in environments with higher rates and is halved when the ESTER is 1,02%.

The coefficients for acquisitions were found to be insignificant, potentially due to the suboptimal data quality from Datastream, rated two out of three stars.

In summary, the impact of a negative interest rate shock is influenced by the starting interest rate. Leaders tend to benefit more from an additional decrease in interest rates when starting rates are already low. As per Kroen et al. (2022) interpretation, this suggests that larger firms expand further and enhance their market power when interest rates drop from an already reduced level. The paths of the coefficients are displayed in Figure 3 in the appendix.

5.4. Stock Returns

Based on the Kroen et al. (2022) approach, the results for RI returns are observed one-period post-shock, considering it a forward-looking outcome variable. The coefficients, $ß_{ZLB}$ and $ß_{\Delta}$, for RI, returns one year after the shock are not statistically significant, which could be due to the extended duration between the initial shock and the observed RI outcome.

5.5.Competition Neutral Rate

Kroen et al. (2022) define the competition-neutral interest rate as an economy-wide interest rate level where changes in the interest rate affect industry leaders and followers equally. Thus, changes in the interest rate are neutral from a competitive perspective. The competition-neutral nominal rate of interest, denoted by η, can be estimated empirically with the following equation:

$$\eta = -\frac{ß_{ZLB}}{ß_{\Delta}} \qquad (5)$$

The competition neutral rate was calculated for each outcome variable based on the coefficient values observed two years post-shock. The range for the competition-neutral ESTER rate, as indicated by significant coefficients, lies between 5,26% and 1,76%. In this range, the borrowing costs constitute the upper bound, while the logarithm of intangibles represents the lower bound. The average value of the nominal competition neutral rates, as determined from the significant coefficients, is 3,47%.

Table 4: *Competition Neutral Rate and Rate for Halved Effect*

	Borrowing Cost	Log Debt	Leverage	Log Intang.	Log Assets	Log PPE	CAPEX	Acqui-sitions	RI Returns
ESTER halved effect	2,6294	2,3071	1,9206	0,8787	1,5275	1,6468	1,0183	-48,6073	0,5000
Competition Neutral Rate	5,2589	4,6141	3,8412	1,7573	3,0550	3,2936	2,0366	-97,2146	3,4474

Notes: ESTER halved effect is computed by solving equation (4) and the competition neutral rate is computed solving equation (5)

Source: Own calculation

6. Heterogenous Responses

To investigate if industry concentration could be a fundamental factor influencing the divergent responses of leaders and followers in a low-interest rate environment, the firms were divided into quartiles according to their average industry HHI over the whole observation period. Afterwards, equation 1 was estimated again for each quartile. This section goes beyond the work of Kroen et al. (2022).

The HHI for an industry is calculated by squaring the market shares of all firms in that industry for a specific year and then summing these squared values; each firm's market share is determined by dividing its annual revenues by the total aggregated revenues of all firms in the industry for the same year.

The results of each quartile are displayed in Table 5. Consistent with the head-to-head competition channel, there is a correlation between the different impulse responses of market leaders and followers in industries with different concentration levels.

In highly competitive markets, indicated by a low HHI, industry leaders may be more inclined to invest aggressively when competing directly, whereas smaller firms might invest less. To analyze this correlation, industries were segmented into four quartiles based on the HHI, which was computed using firms' market share by revenues within their 2-digit NACE industry. The HHI was chosen because it takes the size of firms and the total number of firms in the industry into account. It was observed that industries with higher concentration typically have fewer firms. The HHI was deemed more suitable than the Concentration Ratio (CR) index for the study, as the CR index is bound to a predefined number of firms and does not factor in the total number of firms in an industry, which can vary significantly.

Table 5: *LP-DiD Result for HHI Quartile Analysis*

	HHI Quartile 1				HHI Quartile 2			
Dep. Var	$\widehat{\beta}_{ZLB}$		$\widehat{\beta}_{\Delta}$		$\widehat{\beta}_{ZLB}$		$\widehat{\beta}_{\Delta}$	
Borrowing Costs (pp)	-0,0659		0,0076		0,0105		0,0032	
	(0,0444)		(0,0115)		(0,0380)		(0,0105)	
Log Debt (millions)	0,0082		-0,0014		-0,0121		0,0017	
	(0,0090)		(0,0026)		(0,0110)		(0,0028)	
Leverage	-0,0074	***	0,0019	***	-0,0004		-0,0001	
	(0,0028)		(0,0007)		(0,0015)		(0,0004)	
Log Intangibles (millions)	-0,0101		0,0031		-0,0034		0,0029	
	(0,0105)		(0,0028)		(0,0067)		(0,0019)	
Log Assets (millions)	0,0058		-0,0020		0,0012		-0,0003	
	(0,0059)		(0,0016)		(0,0035)		(0,0009)	
Log PPE (millions)	-0,0085		0,0020		-0,0062		0,0014	
	(0,0063)		(0,0018)		(0,0040)		(0,0010)	
CAPEX (pp)	0,0596		-0,0278		0,0322		-0,0059	
	(0,0413)		(0,0199)		(0,0343)		(0,0168)	
RI Returns (pp)	0,0387		-0,0255		-0,1330	*	0,0291	
	(0,1239)		(0,0338)		(0,0703)		(0,0211)	

	HHI Quartile 3				HHI Quartile 4			
Dep. Var	$\widehat{\beta}_{ZLB}$		$\widehat{\beta}_{\Delta}$		$\widehat{\beta}_{ZLB}$		$\widehat{\beta}_{\Delta}$	
Borrowing Costs (pp)	-0,0340		0,0075		-0,0660	***	0,0113	
	(0,0318)		(0,0086)		(0,0186)		(0,0060)	
Log Debt (millions)	-0,0202	***	0,0040	**	-0,0055		0,0018	
	(0,0066)		(0,0018)		(0,0043)		(0,0015)	
Leverage	-0,0032	***	0,0008	**	-0,0015	**	0,0005	**
	(0,0011)		(0,0003)		(0,0007)		(0,0002)	
Log Intangibles (millions)	-0,0111		0,0049	**	-0,0038		0,0033	**
	(0,0074)		(0,0019)		(0,0045)		(0,0015)	
Log Assets (millions)	-0,0032		0,0010		0,0000		0,0001	
	(0,0029)		(0,0008)		(0,0018)		(0,0006)	
Log PPE (millions)	-0,0096	***	0,0030	***	-0,0079	***	0,0027	***
	(0,0033)		(0,0009)		(0,0027)		(0,0008)	
CAPEX (pp)	0,0646	***	-0,0350	***	0,0466	***	-0,0287	***
	(0,0194)		(0,0068)		(0,0159)		(0,0075)	
RI Returns (pp)	0,0905		-0,0344		-0,0642	*	-0,0017	
	(0,1038)		(0,0283)		(0,0330)		(0,0092)	

Source: *Own calculations*

The results of the table present the following findings for the four HHI quartiles:

HHI Quartile 1: HHI ranges from 0,99 to 0,47. Two significant coefficients were identified for the outcome variable leverage. Specifically, leaders in these industries responded to a 10 BP negative rate shock by augmenting their leverage by 0,07%, a more than double increase compared to the coefficient for all industries, which is 0,03%.

HHI Quartile 2: HHI range from 0,47 to 0,33. The ß$_{\Delta}$ coefficient for acquisitions was significant at p=0,1, but given the poor data quality, it has been excluded from interpretation.

HHI Quartile 3: HHI ranges from 0,31 to 0,20. Significant coefficients were observed for log debt, leverage, log PPE, and CAPEX outcomes. Notably, the debt increase of leaders relative to followers near the ZLB was 3,6 times the size of the all-industry average, and the leverage coefficient ß$_{ZLB}$ was 19% larger. There was a 21% and 38% increase for the ß$_{ZLB}$ of log PPE and Capex, respectively, when compared to the all-industry ß$_{ZLB}$ coefficients.
HHI Quartile 4: HHI ranges from 0,19 to 0,04. Leaders in this bracket encountered 39% higher borrowing costs near the ZLB than the all-industry average. Additionally, they increased their leverage by 45% less than the all-industry average. This quartile provides the significant evidence against the proposed financial advantage. The ß$_{ZLB}$ for log PPE and CAPEX are like those for the industry as a whole, with differences of 4% and 18%.
Overall, a pronounced strategic effect is evident in the two less concentrated HHI quartiles, characterized by steeper impulse response functions with a larger magnitude but the same direction as the impulse response functions for the industries. However, the strategic effect is insignificant across the two high-HHI quartiles.

One possible reason for the lack of significant results in concentrated industries could be attributed to the findings of Gutiérrez & Philippon (2017), which suggest that industries with greater concentration typically exhibit lower levels of investment; consequently, the LP-DiD methodology may struggle to detect meaningful variance due to the limited investment activity. The finding that less concentrated industries exhibit a strategic effect, while more concentrated ones can be interpreted as consistent with Liu et al.'s (2022) concept of head-to-head competition. Their model suggests that firms that compete closely head-to-head, tend to invest more, borrow more, and increase their leverage, whereas followers are disincentivized to invest.

When examining the significant outcomes of the third HHI quartile and fourth HHI quartile, it is evident that all coefficients of the more concentrated third quartile exceed those of the less concentrated fourth quartile. The range spans from a factor of 2,1 for ß$_{ZLB}$ for the change in leverage to 1,09 for ß$_{\Delta}$ the change in log PPE. Additionally, the competition neutral rate is consistently greater for HHI quartile 3 than for HHI quartile 4.
These findings suggest that industries with a lower HHI, and thus a higher competitive nature, might mitigate the strategic effect. It is noteworthy that Q4 is the sole quartile showing significant evidence of borrowing costs, implying leaders, defined as the top 5% of firms in terms of revenues in their industry, have elevated borrowing costs near the ZLB compared to followers.

The relationship between increased competition and its potential to mitigate the strategic effect will be interesting for future research and can be further investigated with different industry leader definitions. This study, focussing on the Eurozone, which has a lower degree of market concentration than the U.S., provides a preliminary analysis.

However, the fact that no significant results were found in the two quartiles with high HHI may also be due to the definition of market leaders, as these industries typically consist of a small number of firms and have only one market leader, so direct competition is not captured by equation (1), in which market leaders are defined as the top 5% in their industry by revenue. Figure 4 in the appendix shows the average number of firms per HHI quartile. Due to the design of this analysis, the number of observations for quartile 1 and 2 is relatively small and can be a source of bias. Conversely, the results for quartiles 3 and 4 with a lower HHI suggest that increased industry competition strengthens the resilience to low-interest rate scenarios and the associated strategic asymmetry between leaders and followers. Nevertheless, the significance of this analysis also depends to a large extent on the definition of industry leadership. To the best of my knowledge, Kroen et al. (2022) did not examine the heterogeneous responses of firms as a function of their industry concentration.

7. Robustness

As a first robustness test, an *alternative industry leader definition* is employed, defining leaders as the top 5% of firms within their industry based on market capitalization, instead of revenue. This definition was also used by Kroen et al. (2022).

As a second robustness test, *clean control groups* following Dube et al. (2022) were defined for both leader definitions. The results of the robustness tests are displayed in Tables 6-10 in the appendix.

Using local-projections difference-in-difference can cause bias to arise in this multi-period setting with staggered, non-absorbing treatment if previously treated units, which are still experiencing lagged treatment effects, are used as controls for newly treated units. To mitigate this bias, the *clean control* condition of LP-DiD restricts the estimation sample, excluding *unclean* observations that may still be influenced by a previous change in treatment status from the control group (Dube et al., 2022).

The clean-control group condition was defined to test for robustness in this analysis. It removes firms that were leaders in the year prior to the shock but not during the shock year from the control group, the followers, and instead categorizes them as leaders for the analysis. Thus, the clean-control group can be expressed *as:* $L_{i,j,t} = L_{i,j,t-1} = 0$. In their paper titled "Democracy Causes Growth," Acemoglu et al. (2019) employed the same specification to define their control group.

Both robustness checks, the alternative leader definition by market capitalization, and the clean control condition for both leader definitions were tested on all firms at once and separately on the four HHI-quartiles.

In the analysis of leaders defined by market capitalization and using their clean control groups, the direction and the magnitude of the significant coefficients found two years after the shock show a large similarity between the specified quartiles and the aggregate analysis, which includes all firms. A notable difference between leaders defined by market capitalization and their clean control group appears in the $ß_{\Delta}$ coefficient for log debt. It is significant for industry leaders defined by market capitalization but remains non-significant for the clean control group by market capitalization. This suggests that there is no substantial evidence that the propensity of leading firms to increase their debt decreases as interest rates approach the ZLB.

The coefficients on leaders defined by revenues and their clean control group exhibit identical direction and magnitude two years after the shock. The patterns of significance between the clean control group and leader outcomes are also aligned. When a particular outcome variable has two significant coefficients for the same outcome in leaders defined by revenues, a similar pattern is seen in the regression with clean control groups. Nevertheless, the difference between clean control groups by revenues and leaders defined by revenues in terms of significance is minimal.

In the clean controls by revenues analysis, the $ß_{ZLB}$ coefficient for the cost of borrowing is positive. In contrast, the $ß_{\Delta}$ coefficient is negative, with a significance of $p<0,01$. This result stands out because it suggests a potential financial benefit for leading firms. In contrast, the leaders defined by revenue results do not confirm this financial advantage for leaders and posit the opposite. The p-values associated with leaders defined by revenues are higher, with the $ß_{ZLB}$ at $p<0,01$ and $ß_{\Delta}$ $p<0,05$. A consistent trend across both definitions of leaders and their clean controls is the tendency of industry leaders to increase their leverage relative to followers

as they approach the zero lower bound. This trend reverses in scenarios characterized by higher interest rates as expected by the theoretical framework.

When examining significance, some variations emerge for log PPE and log intangibles for the Leaders defined by market capitalization and leaders defined by revenues definitions in quartiles two, three and four. In summary, while both leader definitions exhibit nuanced differences in the significance of the coefficients for log PPE and log intangibles across different quartiles, the direction and size magnitude remain similar.

A noticeable divergence between leaders defined by market capitalization and leaders defined by revenues emerges in the regression of equation (1) for the full range of firms. A significant negative coefficient on borrowing costs emerges for Leaders defined by revenues but not for leaders defined by market capitalization. This result is evidence for the financial advantage posited by Kroen et al. (2022), showing that leaders defined as the top 5% by market capitalization enjoy lower borrowing costs than their followers.

Apart from this distinction, the main results for the different leader definitions and their clean control groups are mainly consistent. The two quartiles with a low HHI exhibit pronounced significance patterns, while the two with a high HHI report rarely significant coefficients. Across all definitions, there is a significant increase in leaders' leverage, for quartiles 1, 3, and 4, and if all firms and industries are regressed at once. The relationships between ß$_{\Delta}$ and ß$_{ZLB}$ are consistent in magnitude and direction, underscoring the narrowing of the gap between leaders and followers in higher interest rate environments and its widening in low-interest rate environments. It is noteworthy that no definition has significant coefficients on assets.

The robustness analysis underscores an interesting observation: A financial advantage for industry leaders is found using the clean control group condition for leaders defined by revenues. However, evaluating equation *(1)* without clean controls leads to opposite results, and evaluating the equation for leaders defined by market capitalization, both with and without clean controls, does not lead to robust implications for the financial advantage or disadvantage of leaders relative to followers.

The key finding of this dissertation is that falling interest in a low interest rate environment allows industry leaders to invest more and increase their leverage. According to the theoretical framework proposed by Liu et al. (2022), this stronger investment response by leaders may help increase their market power and, hence market concentration. The results of falling interest rates on the investment channel of firms are consistent for clean control groups and defining market leaders as the top 5% by market capitalization in their industry.

8. Conclusion

This dissertation used Datastream firm-level panel data from 1999 to 2021, covering the 11 founding countries of the Eurozone, to explore the impact of falling interest rates on industry leaders and followers and their investment and borrowing strategies. High-frequency interest rate shocks were used as exogenous shifters in the Eurozone-wide interest rates. Leaders were defined as the top 5% by revenues in their 2-digit NACE industry.

The analysis finds significant evidence that negative interest rate shocks close to the ZLB cause a relative increase in debt, leverage, intangibles, and PPE of leaders relative to followers, serving as a proof for the strategic advantage proposed by Liu et al. (2022). Conversely, followers enjoy lower borrowing costs and increase their CAPEX relative to leaders, which is evidence against the financial advantage proposed by Kroen et al. (2022). Notably, these effects intensify as the interest rate converges towards the ZLB and reduces when the interest rate increases. Further analysis indicates the existence of a competition-neutral interest rate level, where both leaders and followers are similarly affected by changes in the rate. This rate was calculated to be approximately 3,47%.

Moreover, the reaction of firms to falling interest rates appears to be heterogeneous, depending on the HHI of the respective industry. In industries with low HHI, implying low concentration and high competition, leaders and followers respond strongly to falling interest rates, aligning with the proposal that the strategic effect intensifies when firms compete head-to-head. This behavior was not observed in industries with a large HHI.

Furthermore, the empirical results remain robust when considering alternative definitions of industry leaders, and incorporating clean control groups in the analysis.

Overall, the findings present a complex narrative regarding the theories proposed by Kroen et al. (2022) and Liu et al. (2022) that low interest rate environments promote the emergence of superstar firms and increase market concentration in the U.S.

While there is empirical evidence supporting these theories, the magnitude and direction of the estimated coefficients suggest a comparatively weaker causal relationship within the Eurozone sample, particularly when compared with patterns observed in the U.S.

This discrepancy could be attributed to different antitrust policies in the Eurozone, which mitigate the potential negative externalities on competition associated with monetary policies.

Future research could incorporate antitrust policies and alternative leader definitions to gain a more comprehensive understanding of the role of monetary policy in the rise of superstar firms in developed economies.

9. Bibliography

Acemoglu, D., Naidu, S., Restrepo, P., & Robinson, J. A. (2019). Democracy Does Cause Growth. *Journal of Political Economy*, *127*(1), 47–100. https://doi.org/10.1086/700936

Autor, D., Dorn, D., Katz, L. F., Patterson, C., & Van Reenen, J. (2020). The Fall of the Labor Share and the Rise of Superstar Firms*. *The Quarterly Journal of Economics*, *135*(2), 645–709. https://doi.org/10.1093/qje/qjaa004

Bajgar, M., Berlingieri, G., Calligaris, S., Criscuolo, C., & Timmis, J. (2019). Industry concentra- tion in europe and north america. *OECD Productivity Working Papers*.

Barkai, S. (2019). Declining Labor and Capital Shares. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3489965

Bauer, M., & Swanson, E. (2022). *A reassessment of monetary policy surprises and High-Frequency identification. NBER Working Papers*, https://doi.org/10.3386/w29939

Cette, G., Fernald, J., & Mojon, B. (2016). The pre-Great Recession slowdown in productivity. *European Economic Review*, *88*, 3–20. https://doi.org/10.1016/j.euroecorev.2016.03.012

Church, J., & Ware, R. (2000). *Industrial Organization - A Strategic Approach*. Boston: Irwin/McGraw-Hill.

Crouzet, N., & Eberly, J. (2019). *Understanding Weak Capital Investment: the Role of Market Concentration and Intangibles*. *NBER Working Papers*, https://doi.org/10.3386/w25869

De Loecker, J., & Eeckhout, J. (2018). *Global Market Power. NBER Working Papers,* https://doi.org/10.3386/w24768

De Loecker, J., Eeckhout, J., & Unger, G. (2020). The Rise of Market Power and the Macroeconomic Implications*. *The Quarterly Journal of Economics*, *135*(2), 561–644. https://doi.org/10.1093/qje/qjz041

Döttling, R., Gutierrez Gallardo, G., & Philippon, T. (2017). Is There an Investment Gap in Advanced Economies? If So, Why? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3002796

Dube, A., Girardi, D., Jordà, Ò., & Taylor, A. M. (2023). A Local Projections Approach to Difference-in-Differences Event Studies. *Social Science Research Network*. https://doi.org/10.2139/ssrn.4433863

ECB. (2023). EON: EONIA: Euro Interbank Offered Rate (discounted). ECB. https://sdw.ecb.europa.eu/quickview.do;jsessionid=F89B52407E2AB46BCE0F643342E0E6D6?SERIES_KEY=198.EON.D.EONIA_TO.RATE&start=&end=&submitOptions.x=0&submitOptions.y=0&trans=QF [Last access: 11/09/2023]

Eggertsson, G. B., Robbins, J. A., & Wold, E. G. (2021). Kaldor and Piketty's facts: The rise of monopoly power in the United States. *Journal of Monetary Economics*, *124*, S19–S38. https://doi.org/10.1016/j.jmoneco.2021.09.007

Eurostat, Real Gross Domestic Product for Euro Area (19 Countries) [CLVMNACSCAB1GQEA19], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/CLVMNACSCAB1GQEA19, [Last access: 11/09/2023]

Farhi, E., & Gourio, F. (2018). Accounting for Macro-Finance Trends: Market Power, Intangibles, and Risk Premia." *Brookings Papers on Economic Activity,* Fall, 147-250. https://doi.org/10.1353/eca.2018.0024

Gertler, M., & Karadi, P. (2015). Monetary Policy Surprises, Credit Costs, and Economic Activity. *American Economic Journal: Macroeconomics*, *7*(1), 44–76. https://doi.org/10.1257/mac.20130329

Grullon, G., Larkin, Y., & Michaely, R. (2018). T Are U.S. Industries Becoming More Concentrated? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2612047

Gürkaynak, R. S., Sack, B. P., & Swanson, E. T. (2005). Do actions speak louder than words? The response of asset prices to monetary policy actions and statements. *Social Science Research Network*. https://doi.org/10.2139/ssrn.633281

Gutiérrez, G., & Philippon, T. (2017). Investmentless Growth: An Empirical Investigation. *Source: Brookings Papers on Economic Activity*, 89–169. https://doi.org/10.2307/90019456

Gutiérrez, G., & Philippon, T. (2018). *How EU Markets Became More Competitive Than US Markets: A Study of Institutional Drift*. *NBER Working Papers,* https://doi.org/10.3386/w24700

Hillenbrand, S. (2020). The Secular Decline in Long-Term Yields around FOMC Meetings. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3550593

IMF. (2015). Investment in the Euro Area: Why Has It Been So Weak? https://www.imf.org/en/Blogs/Articles/2015/02/19/investment-in-the-euro-area-why-has-it-been-so-weak [Last access: 12/09/2023]

Jarociński, M., & Karadi, P. (2020). Deconstructing Monetary Policy Surprises— The Role of Information Shocks. *American Economic Journal: Macroeconomics*, *12*(2), 1–43. https://doi.org/10.1257/mac.20180090

Jasova, M., Mendicino, C., Panetti, E., Peydró, J.-L., & Supera, D. (2021). *Monetary policy, labor income redistribution and the credit channel: Evidence from matched employer-employee and credit registers. CEPR Discussion Papers*.

Jordà, Ò. (2005). Estimation and Inference of Impulse Responses by Local Projections. *American Economic Review*, *95*(1), 161–182. https://doi.org/10.1257/0002828053828518

Kroen, T., Liu, E., Mian, A., & Sufi, A. (2022). *Falling Rates and Rising Superstars*. *NBER Working Papers,* https://doi.org/10.3386/w29368

Liu, E., Mian, A., & Sufi, A. (2022). Low Interest Rates, Market Power, and Productivity Growth. *Econometrica*, *90*(1), 193–221. https://doi.org/10.3982/ecta17408

Montiel Olea, J. L., & Plagborg-Møller, M. (2021). Local Projection Inference Is Simpler and More Robust Than You Think. *Econometrica*, *89*(4), 1789–1823. https://doi.org/10.3982/ECTA18756

Ottonello, P., & Winberry, T. (2020). Financial Heterogeneity and the Investment Channel of Monetary Policy. *Econometrica*, *88*(6), 2473–2502. https://doi.org/10.3982/ecta15949

Plagborg-Møller, M., & Wolf, C. K. (2021). Local Projections and VARs Estimate the Same Impulse Responses. *Econometrica*, *89*(2), 955–980. https://doi.org/10.3982/ECTA17813

Statistisches Bundesamt (2023). EU and eurozone over time, https://www.destatis.de/Europa/EN/Country/EU-Member-States/_EU_EZ_Zeitverlauf_en.html [Last access: 11/09/2023]

Stock, J. H., & Watson, M. W. (2018). Identification and Estimation of Dynamic Causal Effects in Macroeconomics Using External Instruments. *The Economic Journal*, *128*(610), 917–948. https://doi.org/10.1111/ecoj.12593

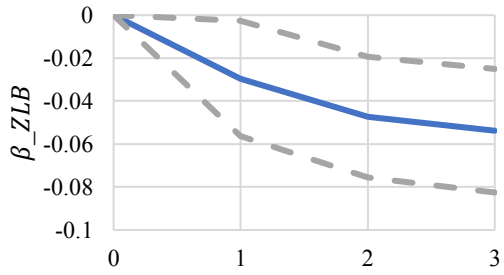
Syverson, C. (2019). Macroeconomics and Market Power: Context, Implications, and Open Questions. *Journal of Economic Perspectives*, *33*(3), 23–43. https://doi.org/10.1257/jep.33.3.23

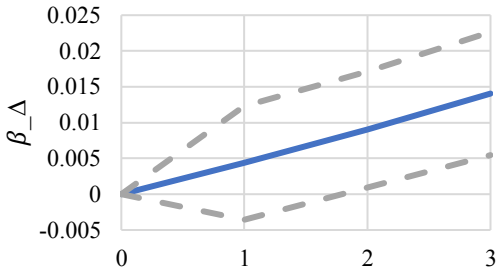
Thomson Reuters Refinitiv. (2023). *Refinitiv Eikon*. https://emea1.apps.cp.thomsonreuters.com/web/Apps/Homepage

10. Appendix

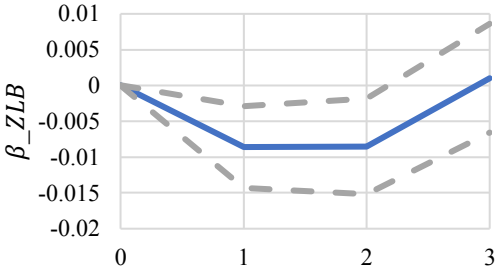
***Figure 3**: Impulse Responses - L5*

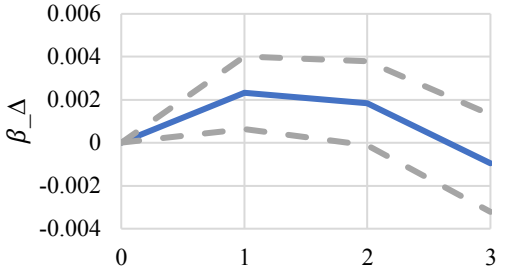
(1) Borrowing Costs



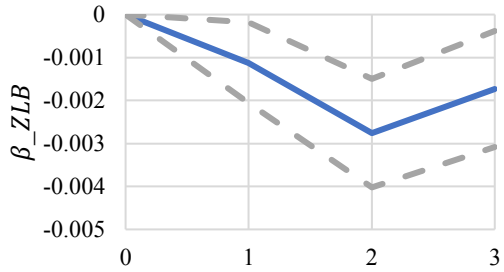


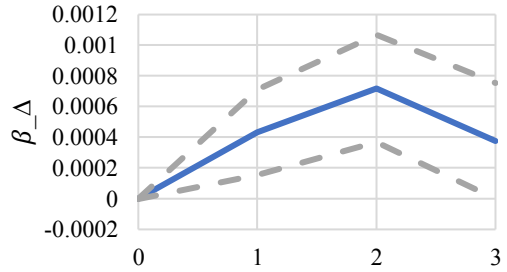
(2) Log Debt (Millions)



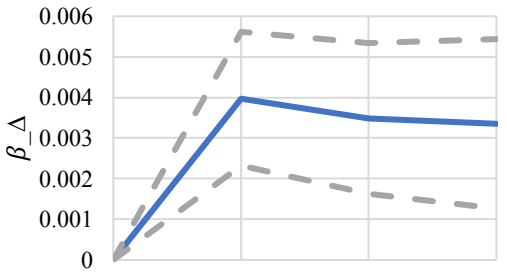


(3) Leverage

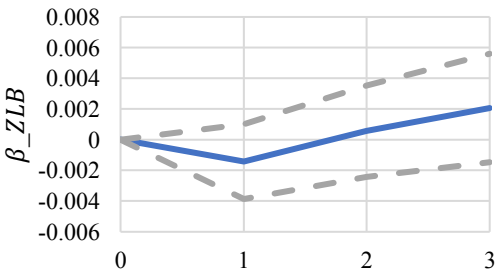


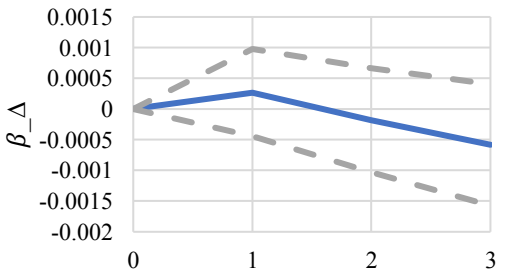


(4) Log Intangibles (Millions)

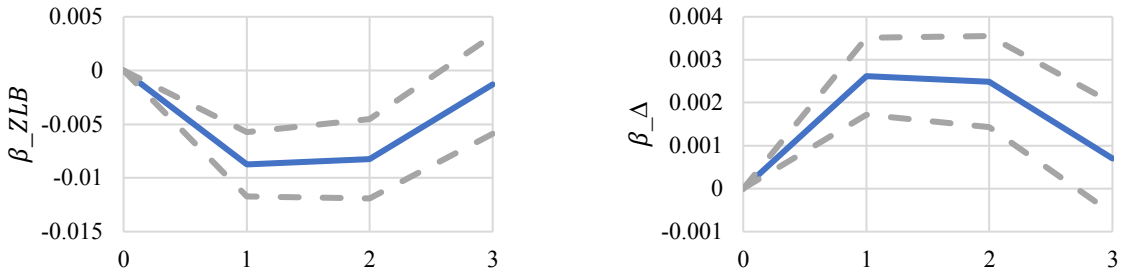


(5) Log Assets Millions

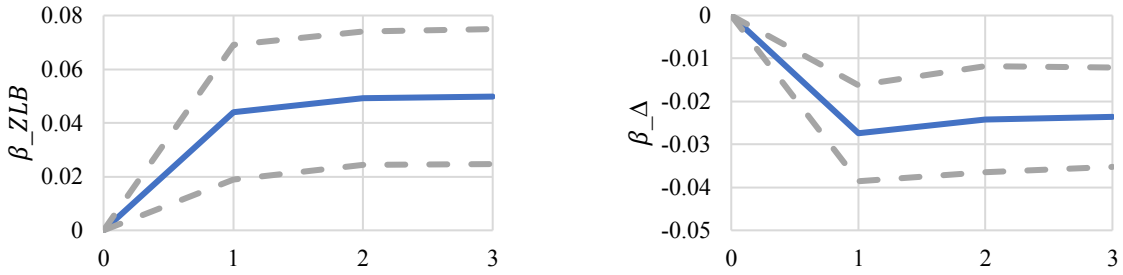




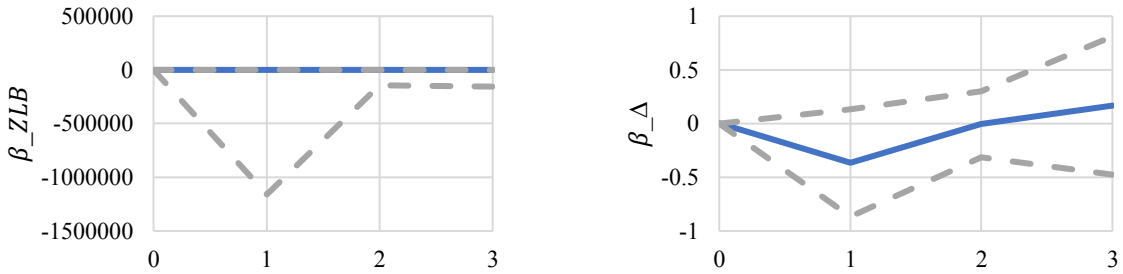
(6) Log PPE Millions



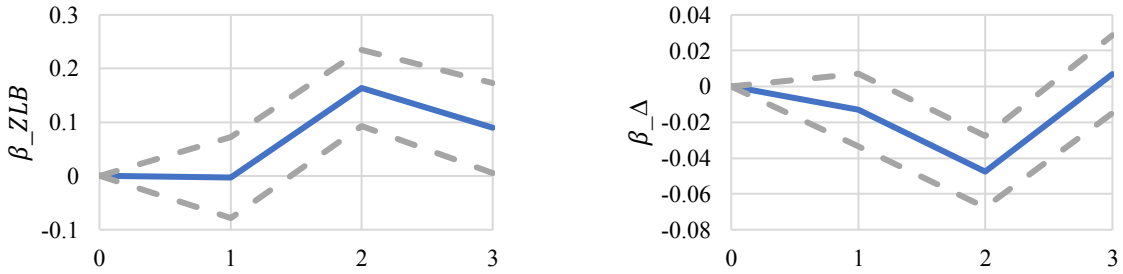
(7) CAPEX PP



(8) Acquisitions PP



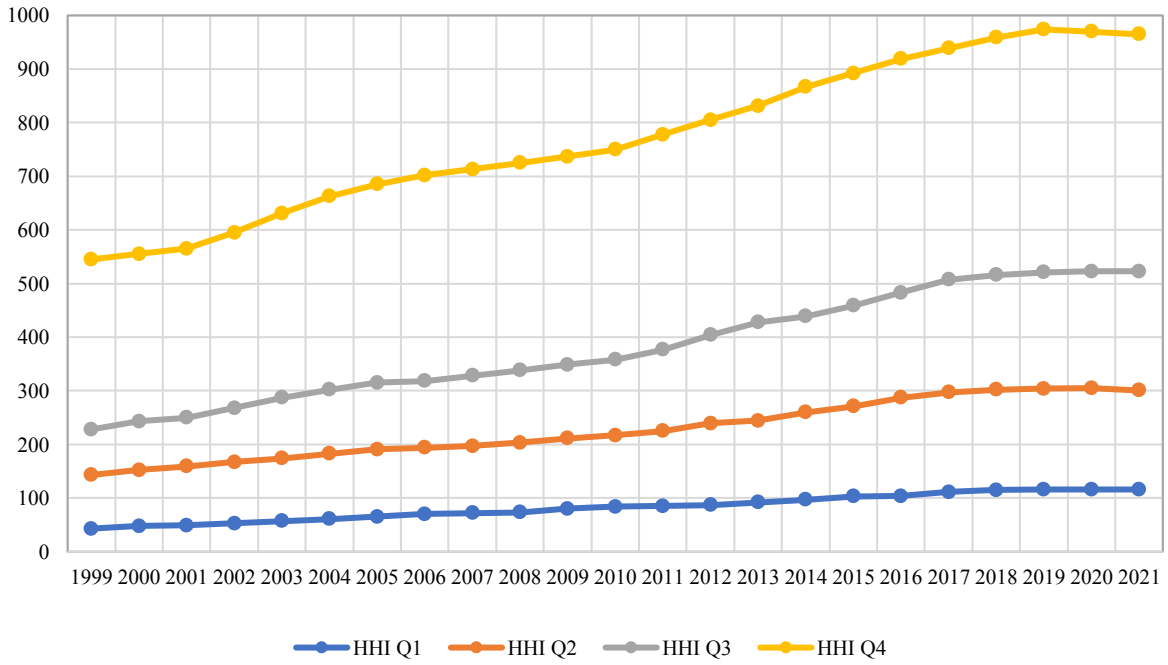
(9) RI Returns PP



Notes: Impulse Response functions of all outcome variables estimated with equation (1)
The x axis displays the years after the shock.

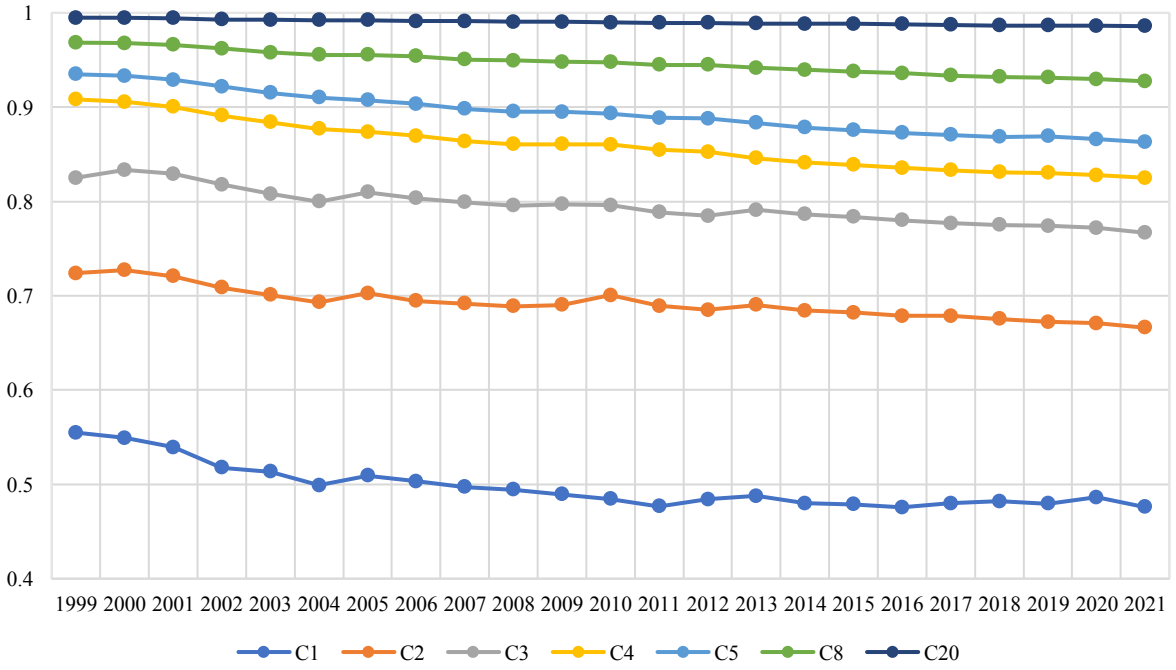
Source: Own Calculations

Figure 4: *Number of Firms per HHI Quartile*



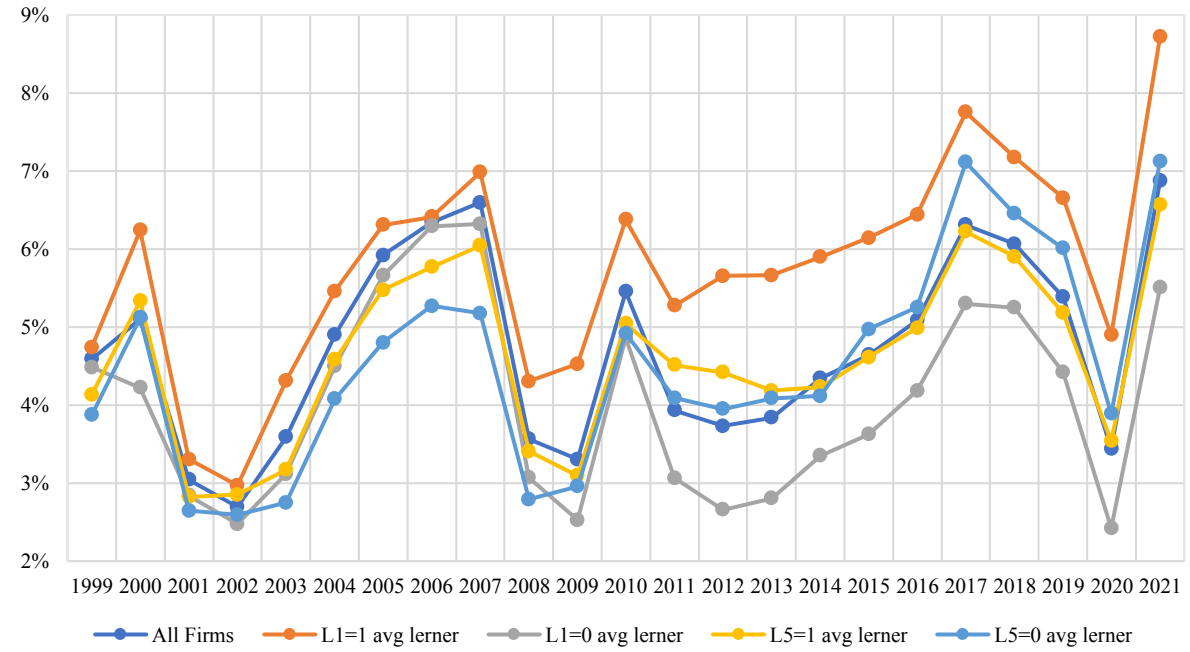
Source: Own Calculations

Figure 5: *Average CR Index for all Industries*



Source: Own Calculations

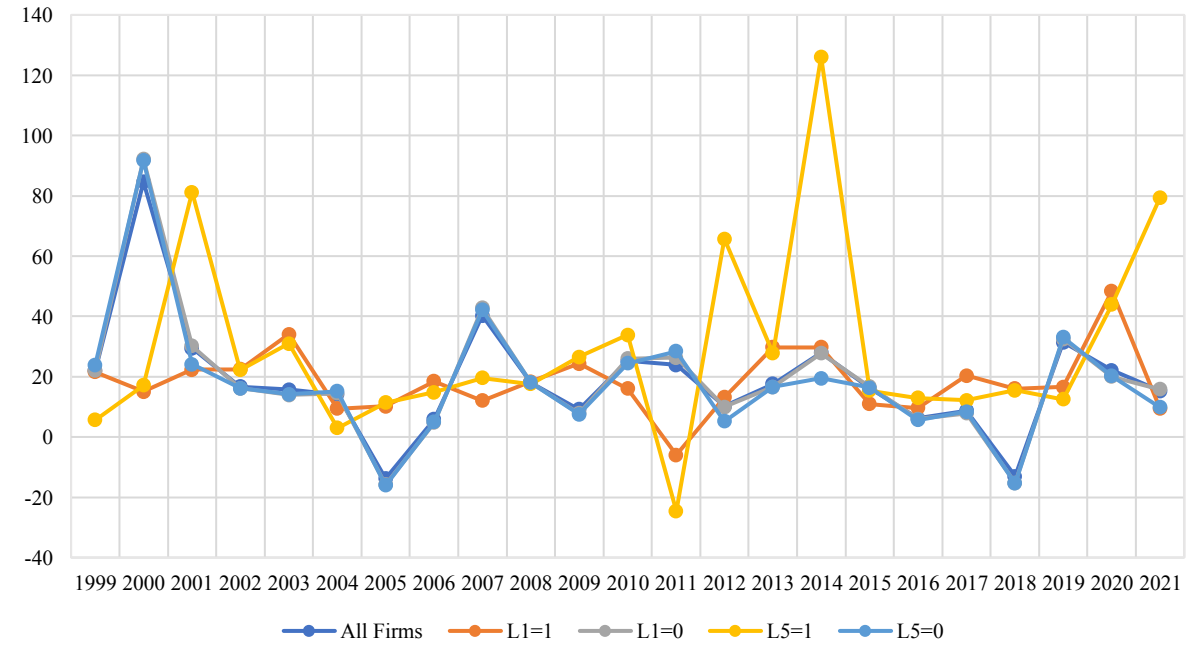
Figure 6: *Average Profit Margin of Leaders and Followers*



Notes: All Firms represents all Firms, L1=1 represents Leaders by Market Capitalization, L1=0 represents Followers by Market Capitalization, L5=1 represents Leaders by Revenues, , L5=1 represents Followers by Revenues

Source: Own Calculations

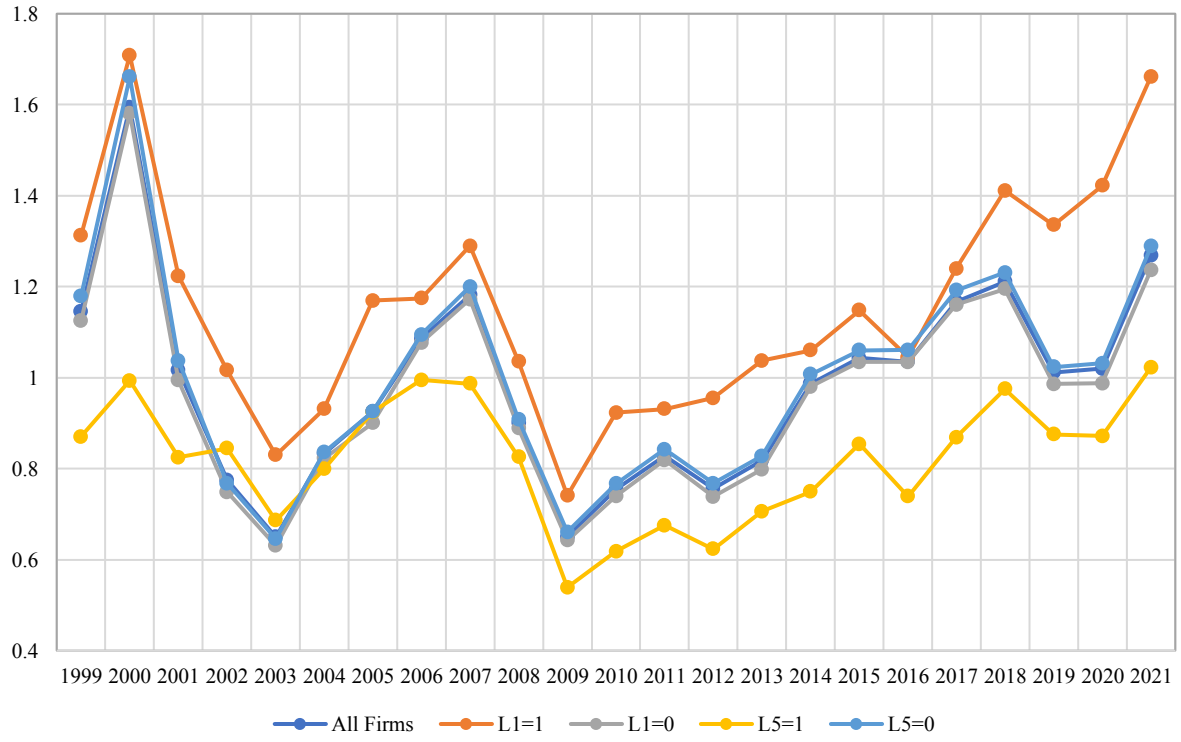
Figure 7: *Average Investment / Net Income*



Notes: All Firms represents All Firms, L1=1 represents Leaders by Market Capitalization, L1=0 represents Followers by Market Capitalization, L5=1 represents Leaders by Revenues, , L5=1 represents Followers by Revenues

Source: Own Calculations

Figure 8: *Average Tobins Q*



Notes: All Firms represents All Firms, L1=1 represents Leaders by Market Capitalization, L1=0 represents Followers by Market Capitalization, L5=1 represents Leaders by Revenues, , L5=1 represents Followers by Revenues

Source: Own Calculations

Table 5: *LP-DiD results for Q1*

Q1								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	0,0128	0,0393	0,7440	-0,0641	0,0898
			2	-0,0414	0,0425	0,3300	-0,1248	0,0419
			3	-0,0694	0,0320	0,0300	-0,1321	-0,0067
		$\hat{\beta}_{\Delta}$	1	-0,0116	0,0109	0,2890	-0,0330	0,0098
			2	0,0039	0,0110	0,7210	-0,0177	0,0256
			3	0,0225	0,0086	0,0090	0,0057	0,0394
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0038	0,0074	0,6090	-0,0184	0,0108
			2	0,0027	0,0086	0,7570	-0,0142	0,0196
			3	0,0180	0,0104	0,0830	-0,0024	0,0383
		$\hat{\beta}_{\Delta}$	1	0,0017	0,0023	0,4490	-0,0027	0,0062
			2	0,0000	0,0025	0,9940	-0,0049	0,0048
			3	-0,0050	0,0027	0,0620	-0,0103	0,0003
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0032	0,0023	0,1600	-0,0078	0,0013
			2	-0,0086	0,0032	0,0070	-0,0148	-0,0024
			3	-0,0091	0,0035	0,0100	-0,0159	-0,0022
		$\hat{\beta}_{\Delta}$	1	0,0009	0,0006	0,1250	-0,0003	0,0021
			2	0,0021	0,0008	0,0080	0,0006	0,0036
			3	0,0022	0,0009	0,0090	0,0006	0,0039
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	0,0037	0,0096	0,6990	-0,0150	0,0224
			2	0,0123	0,0112	0,2730	-0,0097	0,0343
			3	0,0075	0,0143	0,5980	-0,0205	0,0355
		$\hat{\beta}_{\Delta}$	1	0,0003	0,0026	0,9000	-0,0049	0,0055
			2	-0,0020	0,0030	0,5110	-0,0080	0,0040
			3	-0,0006	0,0037	0,8770	-0,0078	0,0066
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	0,0010	0,0033	0,7580	-0,0055	0,0075
			2	0,0054	0,0046	0,2380	-0,0036	0,0144
			3	0,0042	0,0058	0,4730	-0,0072	0,0156
		$\hat{\beta}_{\Delta}$	1	-0,0006	0,0009	0,5220	-0,0025	0,0012
			2	-0,0016	0,0013	0,2070	-0,0041	0,0009
			3	-0,0012	0,0016	0,4420	-0,0044	0,0019
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0066	0,0055	0,2290	-0,0174	0,0042
			2	-0,0046	0,0063	0,4690	-0,0170	0,0078
			3	-0,0002	0,0076	0,9800	-0,0151	0,0147
		$\hat{\beta}_{\Delta}$	1	0,0020	0,0016	0,2100	-0,0011	0,0052
			2	0,0016	0,0018	0,3660	-0,0019	0,0051
			3	0,0007	0,0024	0,7830	-0,0040	0,0053
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0995	0,0779	0,2020	-0,0532	0,2521
			2	0,0669	0,0516	0,1950	-0,0343	0,1680
			3	-0,1048	0,0829	0,2060	-0,2674	0,0577
		$\hat{\beta}_{\Delta}$	1	-0,0350	0,0220	0,1120	-0,0781	0,0081
			2	-0,0184	0,0202	0,3620	-0,0579	0,0212
			3	0,0420	0,0469	0,3710	-0,0499	0,1340
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0630	0,1084	0,5610	-0,2753	0,1494
			2	0,2852	0,0963	0,0030	0,0965	0,4740
			3	0,0884	0,1006	0,3800	-0,1088	0,2855
		$\hat{\beta}_{\Delta}$	1	0,0033	0,0306	0,9150	-0,0566	0,0631
			2	-0,0703	0,0309	0,0230	-0,1308	-0,0097
			3	0,0343	0,0305	0,2610	-0,0254	0,0940

Q1								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Clean control group for: leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	0,0028	0,0383	0,9410	-0,0723	0,0780
			2	-0,0446	0,0409	0,2760	-0,1248	0,0357
			3	-0,0601	0,0313	0,0540	-0,1214	0,0011
		$\hat{\beta}_{\Delta}$	1	-0,0098	0,0107	0,3590	-0,0308	0,0112
			2	0,0071	0,0108	0,5100	-0,0141	0,0284
			3	0,0231	0,0087	0,0080	0,0061	0,0401
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0057	0,0072	0,4320	-0,0199	0,0085
			2	0,0018	0,0083	0,8270	-0,0145	0,0181
			3	0,0177	0,0099	0,0760	-0,0018	0,0371
		$\hat{\beta}_{\Delta}$	1	0,0022	0,0022	0,3080	-0,0021	0,0066
			2	0,0000	0,0024	0,9880	-0,0047	0,0048
			3	-0,0052	0,0026	0,0470	-0,0103	-0,0001
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0040	0,0022	0,0650	-0,0082	0,0002
			2	-0,0086	0,0030	0,0040	-0,0145	-0,0027
			3	-0,0085	0,0033	0,0090	-0,0149	-0,0021
		$\hat{\beta}_{\Delta}$	1	0,0011	0,0006	0,0410	0,0000	0,0023
			2	0,0021	0,0007	0,0060	0,0006	0,0035
			3	0,0020	0,0008	0,0110	0,0005	0,0036
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	0,0059	0,0092	0,5210	-0,0121	0,0239
			2	0,0171	0,0108	0,1140	-0,0041	0,0383
			3	0,0111	0,0142	0,4360	-0,0168	0,0389
		$\hat{\beta}_{\Delta}$	1	-0,0003	0,0025	0,9030	-0,0053	0,0047
			2	-0,0032	0,0029	0,2670	-0,0090	0,0025
			3	-0,0016	0,0036	0,6600	-0,0087	0,0055
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	0,0027	0,0033	0,4210	-0,0039	0,0092
			2	0,0072	0,0044	0,1000	-0,0014	0,0159
			3	0,0060	0,0056	0,2840	-0,0050	0,0170
		$\hat{\beta}_{\Delta}$	1	-0,0010	0,0009	0,2640	-0,0029	0,0008
			2	-0,0022	0,0012	0,0720	-0,0045	0,0002
			3	-0,0018	0,0015	0,2400	-0,0048	0,0012
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0058	0,0062	0,3530	-0,0180	0,0064
			2	-0,0011	0,0069	0,8690	-0,0147	0,0125
			3	0,0021	0,0078	0,7900	-0,0132	0,0174
		$\hat{\beta}_{\Delta}$	1	0,0016	0,0017	0,3480	-0,0018	0,0050
			2	0,0005	0,0019	0,7690	-0,0031	0,0042
			3	-0,0002	0,0024	0,9210	-0,0049	0,0044
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0999	0,0750	0,1830	-0,0471	0,2469
			2	0,0397	0,0537	0,4600	-0,0656	0,1450
			3	-0,1038	0,0795	0,1920	-0,2597	0,0520
		$\hat{\beta}_{\Delta}$	1	-0,0367	0,0211	0,0810	-0,0780	0,0046
			2	-0,0137	0,0197	0,4860	-0,0523	0,0249
			3	0,0387	0,0442	0,3810	-0,0479	0,1254
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0586	0,1521	0,7000	-0,3567	0,2395
			2	0,3358	0,1082	0,0020	0,1237	0,5479
			3	0,1211	0,1228	0,3240	-0,1195	0,3618
		$\hat{\beta}_{\Delta}$	1	-0,0052	0,0404	0,8980	-0,0844	0,0740
			2	-0,0838	0,0330	0,0110	-0,1485	-0,0190
			3	0,0230	0,0358	0,5210	-0,0472	0,0931

Q1								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0120	0,0420	0,7750	-0,0944	0,0703
			2	-0,0659	0,0444	0,1380	-0,1529	0,0211
			3	-0,0915	0,0343	0,0080	-0,1587	-0,0242
		$\hat{\beta}_{\Delta}$	1	-0,0061	0,0115	0,5940	-0,0287	0,0164
			2	0,0076	0,0115	0,5100	-0,0150	0,0302
			3	0,0275	0,0090	0,0020	0,0099	0,0452
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0005	0,0076	0,9480	-0,0155	0,0145
			2	0,0082	0,0090	0,3640	-0,0095	0,0258
			3	0,0229	0,0110	0,0380	0,0013	0,0445
		$\hat{\beta}_{\Delta}$	1	0,0009	0,0023	0,6930	-0,0036	0,0054
			2	-0,0014	0,0026	0,5940	-0,0064	0,0037
			3	-0,0065	0,0028	0,0220	-0,0121	-0,0009
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0027	0,0019	0,1640	-0,0065	0,0011
			2	-0,0074	0,0028	0,0070	-0,0128	-0,0020
			3	-0,0064	0,0030	0,0320	-0,0122	-0,0005
		$\hat{\beta}_{\Delta}$	1	0,0009	0,0005	0,0740	-0,0001	0,0018
			2	0,0019	0,0007	0,0050	0,0006	0,0032
			3	0,0017	0,0007	0,0240	0,0002	0,0031
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0124	0,0091	0,1750	-0,0302	0,0055
			2	-0,0101	0,0105	0,3370	-0,0307	0,0105
			3	-0,0175	0,0135	0,1960	-0,0441	0,0090
		$\hat{\beta}_{\Delta}$	1	0,0044	0,0025	0,0740	-0,0004	0,0093
			2	0,0031	0,0028	0,2700	-0,0024	0,0086
			3	0,0046	0,0035	0,1860	-0,0022	0,0115
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	0,0002	0,0049	0,9680	-0,0094	0,0098
			2	0,0058	0,0059	0,3180	-0,0056	0,0173
			3	0,0049	0,0069	0,4810	-0,0086	0,0184
		$\hat{\beta}_{\Delta}$	1	-0,0006	0,0013	0,6630	-0,0031	0,0020
			2	-0,0020	0,0016	0,2050	-0,0050	0,0011
			3	-0,0018	0,0018	0,3240	-0,0054	0,0018
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0119	0,0053	0,0240	-0,0223	-0,0015
			2	-0,0085	0,0063	0,1770	-0,0207	0,0038
			3	0,0034	0,0073	0,6360	-0,0108	0,0177
		$\hat{\beta}_{\Delta}$	1	0,0029	0,0016	0,0720	-0,0003	0,0061
			2	0,0020	0,0018	0,2770	-0,0016	0,0055
			3	-0,0016	0,0020	0,4430	-0,0056	0,0024
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0828	0,0441	0,0600	-0,0036	0,1693
			2	0,0596	0,0413	0,1490	-0,0214	0,1406
			3	0,0392	0,0395	0,3210	-0,0382	0,1165
		$\hat{\beta}_{\Delta}$	1	-0,0393	0,0192	0,0410	-0,0770	-0,0015
			2	-0,0278	0,0199	0,1630	-0,0669	0,0112
			3	-0,0247	0,0191	0,1960	-0,0621	0,0127
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	0,0387	0,1239	0,7550	-0,2042	0,2816
			2	0,1199	0,1226	0,3280	-0,1204	0,3601
			3	0,0167	0,1045	0,8730	-0,1882	0,2216
		$\hat{\beta}_{\Delta}$	1	-0,0255	0,0338	0,4500	-0,0917	0,0407
			2	-0,0295	0,0361	0,4140	-0,1003	0,0413
			3	0,0482	0,0313	0,1240	-0,0132	0,1096

Q1								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
clean control group for leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0232	0,0403	0,5650	-0,1021	0,0557
			2	-0,0648	0,0419	0,1220	-0,1470	0,0174
			3	-0,0927	0,0334	0,0060	-0,1583	-0,0272
		$\hat{\beta}_{\Delta}$	1	-0,0041	0,0112	0,7130	-0,0260	0,0178
			2	0,0078	0,0111	0,4800	-0,0139	0,0295
			3	0,0286	0,0089	0,0010	0,0112	0,0460
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0003	0,0073	0,9650	-0,0145	0,0139
			2	0,0050	0,0087	0,5650	-0,0120	0,0220
			3	0,0244	0,0105	0,0200	0,0039	0,0449
		$\hat{\beta}_{\Delta}$	1	0,0010	0,0022	0,6610	-0,0034	0,0053
			2	-0,0006	0,0025	0,8100	-0,0055	0,0043
			3	-0,0066	0,0027	0,0150	-0,0119	-0,0013
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0020	0,0018	0,2700	-0,0054	0,0015
			2	-0,0059	0,0026	0,0230	-0,0111	-0,0008
			3	-0,0057	0,0027	0,0370	-0,0110	-0,0004
		$\hat{\beta}_{\Delta}$	1	0,0007	0,0005	0,1090	-0,0002	0,0016
			2	0,0015	0,0006	0,0180	0,0003	0,0028
			3	0,0015	0,0007	0,0270	0,0002	0,0028
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0072	0,0090	0,4240	-0,0247	0,0104
			2	-0,0020	0,0102	0,8430	-0,0221	0,0180
			3	-0,0040	0,0136	0,7710	-0,0307	0,0228
		$\hat{\beta}_{\Delta}$	1	0,0035	0,0024	0,1420	-0,0012	0,0082
			2	0,0015	0,0027	0,5840	-0,0038	0,0068
			3	0,0019	0,0035	0,5900	-0,0050	0,0088
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	0,0028	0,0045	0,5430	-0,0061	0,0117
			2	0,0083	0,0053	0,1210	-0,0022	0,0188
			3	0,0034	0,0077	0,6570	-0,0116	0,0185
		$\hat{\beta}_{\Delta}$	1	-0,0011	0,0012	0,3440	-0,0035	0,0012
			2	-0,0025	0,0014	0,0780	-0,0054	0,0003
			3	-0,0013	0,0021	0,5390	-0,0053	0,0028
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0088	0,0060	0,1390	-0,0205	0,0029
			2	-0,0048	0,0067	0,4760	-0,0179	0,0083
			3	0,0049	0,0074	0,5070	-0,0096	0,0194
		$\hat{\beta}_{\Delta}$	1	0,0022	0,0017	0,2010	-0,0012	0,0057
			2	0,0011	0,0019	0,5650	-0,0026	0,0048
			3	-0,0019	0,0021	0,3580	-0,0059	0,0021
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0668	0,0491	0,1730	-0,0294	0,1631
			2	0,0673	0,0421	0,1100	-0,0153	0,1499
			3	0,0173	0,0445	0,6970	-0,0699	0,1045
		$\hat{\beta}_{\Delta}$	1	-0,0357	0,0198	0,0710	-0,0745	0,0030
			2	-0,0303	0,0198	0,1250	-0,0690	0,0084
			3	-0,0179	0,0192	0,3500	-0,0556	0,0197
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0773	0,1450	0,5940	-0,3616	0,2070
			2	0,1837	0,1197	0,1250	-0,0508	0,4183
			3	-0,0178	0,1469	0,9040	-0,3057	0,2701
		$\hat{\beta}_{\Delta}$	1	0,0014	0,0380	0,9700	-0,0731	0,0759
			2	-0,0423	0,0357	0,2360	-0,1122	0,0276
			3	0,0606	0,0418	0,1470	-0,0212	0,1424

Table 6: *LP-DiD results for Q2*

Q2								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]** **LB**	**UB**
Leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	0,0216	0,0259	0,4030	-0,0291	0,0723
			2	0,0226	0,0291	0,4380	-0,0345	0,0797
			3	0,0357	0,0376	0,3430	-0,0381	0,1095
		$\hat{\beta}_{\Delta}$	1	-0,0074	0,0084	0,3780	-0,0238	0,0090
			2	-0,0038	0,0091	0,6740	-0,0217	0,0141
			3	-0,0071	0,0115	0,5380	-0,0296	0,0154
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0081	0,0083	0,3290	-0,0242	0,0081
			2	-0,0072	0,0097	0,4560	-0,0262	0,0117
			3	-0,0070	0,0102	0,4920	-0,0270	0,0130
		$\hat{\beta}_{\Delta}$	1	0,0022	0,0023	0,3270	-0,0022	0,0067
			2	0,0012	0,0026	0,6390	-0,0039	0,0064
			3	0,0006	0,0028	0,8340	-0,0049	0,0061
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0004	0,0009	0,6800	-0,0022	0,0014
			2	-0,0012	0,0011	0,2670	-0,0033	0,0009
			3	0,0008	0,0012	0,5080	-0,0016	0,0032
		$\hat{\beta}_{\Delta}$	1	0,0004	0,0003	0,2090	-0,0002	0,0011
			2	0,0005	0,0004	0,1740	-0,0002	0,0012
			3	-0,0001	0,0004	0,7170	-0,0009	0,0006
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0097	0,0068	0,1540	-0,0230	0,0036
			2	-0,0126	0,0079	0,1100	-0,0281	0,0028
			3	-0,0167	0,0091	0,0680	-0,0346	0,0012
		$\hat{\beta}_{\Delta}$	1	0,0038	0,0024	0,1180	-0,0010	0,0085
			2	0,0043	0,0027	0,1110	-0,0010	0,0095
			3	0,0044	0,0030	0,1460	-0,0015	0,0104
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0032	0,0031	0,3100	-0,0093	0,0030
			2	-0,0024	0,0036	0,5010	-0,0094	0,0046
			3	-0,0004	0,0042	0,9270	-0,0086	0,0078
		$\hat{\beta}_{\Delta}$	1	0,0005	0,0010	0,6310	-0,0014	0,0024
			2	0,0002	0,0011	0,8410	-0,0019	0,0024
			3	-0,0002	0,0012	0,8690	-0,0025	0,0021
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0133	0,0034	0,0000	-0,0199	-0,0067
			2	-0,0110	0,0042	0,0090	-0,0191	-0,0028
			3	-0,0015	0,0054	0,7760	-0,0122	0,0091
		$\hat{\beta}_{\Delta}$	1	0,0036	0,0010	0,0000	0,0016	0,0056
			2	0,0027	0,0013	0,0300	0,0003	0,0052
			3	0,0002	0,0016	0,8870	-0,0028	0,0033
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0044	0,0393	0,9110	-0,0726	0,0814
			2	0,0294	0,0314	0,3480	-0,0321	0,0909
			3	0,0017	0,0347	0,9620	-0,0664	0,0698
		$\hat{\beta}_{\Delta}$	1	-0,0228	0,0171	0,1820	-0,0563	0,0107
			2	-0,0280	0,0120	0,0200	-0,0516	-0,0045
			3	-0,0214	0,0116	0,0640	-0,0442	0,0013
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0698	0,0595	0,2410	-0,1863	0,0468
			2	0,1152	0,0470	0,0140	0,0231	0,2073
			3	0,1015	0,0577	0,0790	-0,0116	0,2146
		$\hat{\beta}_{\Delta}$	1	-0,0030	0,0249	0,9030	-0,0517	0,0457
			2	-0,0381	0,0196	0,0520	-0,0765	0,0003
			3	-0,0087	0,0199	0,6610	-0,0477	0,0302

Q2								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Clean control group for: leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	0,0351	0,0279	0,2080	-0,0195	0,0897
			2	0,0203	0,0282	0,4710	-0,0349	0,0755
			3	0,0391	0,0364	0,2830	-0,0323	0,1105
		$\hat{\beta}_{\Delta}$	1	-0,0098	0,0085	0,2510	-0,0264	0,0069
			2	-0,0019	0,0086	0,8280	-0,0188	0,0151
			3	-0,0071	0,0108	0,5080	-0,0283	0,0140
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0065	0,0078	0,4070	-0,0218	0,0088
			2	-0,0065	0,0092	0,4770	-0,0245	0,0115
			3	-0,0072	0,0097	0,4580	-0,0261	0,0118
		$\hat{\beta}_{\Delta}$	1	0,0019	0,0021	0,3800	-0,0023	0,0061
			2	0,0011	0,0025	0,6610	-0,0038	0,0060
			3	0,0008	0,0026	0,7630	-0,0043	0,0059
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0004	0,0009	0,6150	-0,0022	0,0013
			2	-0,0011	0,0010	0,2880	-0,0032	0,0009
			3	0,0008	0,0012	0,5130	-0,0016	0,0031
		$\hat{\beta}_{\Delta}$	1	0,0004	0,0003	0,1830	-0,0002	0,0010
			2	0,0005	0,0003	0,1740	-0,0002	0,0011
			3	-0,0001	0,0004	0,8240	-0,0008	0,0007
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0103	0,0063	0,1010	-0,0227	0,0020
			2	-0,0122	0,0074	0,0970	-0,0266	0,0022
			3	-0,0145	0,0085	0,0900	-0,0312	0,0022
		$\hat{\beta}_{\Delta}$	1	0,0034	0,0023	0,1360	-0,0011	0,0078
			2	0,0035	0,0025	0,1640	-0,0014	0,0084
			3	0,0034	0,0028	0,2250	-0,0021	0,0090
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0026	0,0030	0,3860	-0,0084	0,0033
			2	-0,0011	0,0034	0,7490	-0,0078	0,0056
			3	0,0011	0,0040	0,7800	-0,0068	0,0090
		$\hat{\beta}_{\Delta}$	1	0,0000	0,0010	0,9920	-0,0020	0,0019
			2	-0,0005	0,0011	0,6760	-0,0027	0,0018
			3	-0,0010	0,0013	0,4430	-0,0034	0,0015
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0130	0,0032	0,0000	-0,0192	-0,0068
			2	-0,0102	0,0040	0,0100	-0,0180	-0,0024
			3	-0,0010	0,0051	0,8490	-0,0110	0,0091
		$\hat{\beta}_{\Delta}$	1	0,0034	0,0010	0,0010	0,0015	0,0053
			2	0,0024	0,0012	0,0490	0,0000	0,0047
			3	-0,0001	0,0015	0,9270	-0,0031	0,0028
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0083	0,0376	0,8250	-0,0654	0,0820
			2	0,0168	0,0324	0,6030	-0,0466	0,0803
			3	-0,0043	0,0343	0,9000	-0,0715	0,0629
		$\hat{\beta}_{\Delta}$	1	-0,0199	0,0170	0,2410	-0,0532	0,0134
			2	-0,0162	0,0160	0,3090	-0,0476	0,0151
			3	-0,0120	0,0142	0,3990	-0,0398	0,0159
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0905	0,0639	0,1570	-0,2156	0,0347
			2	0,1144	0,0510	0,0250	0,0144	0,2144
			3	0,0936	0,0587	0,1110	-0,0214	0,2086
		$\hat{\beta}_{\Delta}$	1	0,0022	0,0248	0,9310	-0,0464	0,0507
			2	-0,0377	0,0199	0,0580	-0,0766	0,0012
			3	-0,0017	0,0198	0,9310	-0,0406	0,0372

Q2								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0039	0,0288	0,8920	-0,0604	0,0526
			2	0,0105	0,0380	0,7830	-0,0640	0,0849
			3	0,0147	0,0516	0,7750	-0,0863	0,1158
		$\hat{\beta}_{\Delta}$	1	0,0044	0,0085	0,6070	-0,0123	0,0211
			2	0,0032	0,0105	0,7570	-0,0173	0,0237
			3	0,0027	0,0135	0,8420	-0,0238	0,0292
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0068	0,0089	0,4460	-0,0242	0,0106
			2	-0,0121	0,0110	0,2710	-0,0337	0,0095
			3	-0,0052	0,0116	0,6510	-0,0280	0,0175
		$\hat{\beta}_{\Delta}$	1	0,0011	0,0022	0,6150	-0,0033	0,0055
			2	0,0017	0,0028	0,5390	-0,0037	0,0071
			3	-0,0005	0,0029	0,8670	-0,0062	0,0052
	Leverage	$\hat{\beta}_{ZLB}$	1	0,0001	0,0010	0,9590	-0,0019	0,0020
			2	-0,0004	0,0015	0,8040	-0,0033	0,0026
			3	0,0011	0,0015	0,4570	-0,0019	0,0041
		$\hat{\beta}_{\Delta}$	1	-0,0001	0,0003	0,6890	-0,0007	0,0004
			2	-0,0001	0,0004	0,8750	-0,0009	0,0007
			3	-0,0005	0,0004	0,2070	-0,0013	0,0003
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0060	0,0056	0,2910	-0,0170	0,0051
			2	-0,0034	0,0067	0,6120	-0,0165	0,0097
			3	-0,0004	0,0073	0,9580	-0,0147	0,0139
		$\hat{\beta}_{\Delta}$	1	0,0032	0,0017	0,0600	-0,0001	0,0064
			2	0,0029	0,0019	0,1260	-0,0008	0,0066
			3	0,0022	0,0019	0,2470	-0,0015	0,0060
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0005	0,0030	0,8670	-0,0063	0,0053
			2	0,0012	0,0035	0,7280	-0,0056	0,0081
			3	0,0056	0,0040	0,1570	-0,0022	0,0134
		$\hat{\beta}_{\Delta}$	1	0,0001	0,0008	0,9410	-0,0015	0,0017
			2	-0,0003	0,0009	0,7750	-0,0021	0,0016
			3	-0,0012	0,0010	0,2700	-0,0032	0,0009
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0077	0,0032	0,0160	-0,0139	-0,0014
			2	-0,0062	0,0040	0,1230	-0,0141	0,0017
			3	0,0034	0,0050	0,4960	-0,0064	0,0132
		$\hat{\beta}_{\Delta}$	1	0,0017	0,0008	0,0400	0,0001	0,0033
			2	0,0014	0,0010	0,1680	-0,0006	0,0035
			3	-0,0008	0,0013	0,5560	-0,0033	0,0018
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0806	0,0335	0,0160	0,0149	0,1463
			2	0,0322	0,0343	0,3480	-0,0351	0,0995
			3	0,0183	0,0318	0,5650	-0,0440	0,0806
		$\hat{\beta}_{\Delta}$	1	-0,0295	0,0117	0,0120	-0,0525	-0,0066
			2	-0,0059	0,0168	0,7240	-0,0387	0,0269
			3	-0,0006	0,0144	0,9670	-0,0287	0,0276
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,1330	0,0703	0,0580	-0,2708	0,0047
			2	0,1487	0,0584	0,0110	0,0342	0,2632
			3	0,1569	0,0677	0,0200	0,0243	0,2896
		$\hat{\beta}_{\Delta}$	1	0,0291	0,0211	0,1680	-0,0123	0,0705
			2	-0,0381	0,0187	0,0420	-0,0747	-0,0014
			3	-0,0187	0,0192	0,3300	-0,0564	0,0189

Q2								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Clean control group for leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	0,0050	0,0278	0,8570	-0,0495	0,0595
			2	0,0153	0,0359	0,6700	-0,0551	0,0857
			3	0,0114	0,0482	0,8130	-0,0830	0,1058
		$\hat{\beta}_{\Delta}$	1	0,0025	0,0083	0,7620	-0,0137	0,0188
			2	0,0019	0,0100	0,8520	-0,0178	0,0215
			3	0,0032	0,0128	0,8020	-0,0218	0,0282
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0087	0,0086	0,3140	-0,0256	0,0082
			2	-0,0127	0,0105	0,2300	-0,0333	0,0080
			3	-0,0049	0,0111	0,6600	-0,0267	0,0169
		$\hat{\beta}_{\Delta}$	1	0,0016	0,0022	0,4780	-0,0027	0,0059
			2	0,0018	0,0027	0,4890	-0,0034	0,0070
			3	-0,0005	0,0028	0,8520	-0,0060	0,0050
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0001	0,0010	0,8900	-0,0020	0,0018
			2	-0,0004	0,0014	0,7620	-0,0033	0,0024
			3	0,0010	0,0015	0,4830	-0,0018	0,0039
		$\hat{\beta}_{\Delta}$	1	-0,0001	0,0003	0,8520	-0,0006	0,0005
			2	0,0000	0,0004	0,9260	-0,0008	0,0007
			3	-0,0005	0,0004	0,2310	-0,0013	0,0003
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0075	0,0055	0,1730	-0,0183	0,0033
			2	-0,0056	0,0065	0,3900	-0,0183	0,0072
			3	-0,0027	0,0071	0,7020	-0,0167	0,0112
		$\hat{\beta}_{\Delta}$	1	0,0035	0,0016	0,0340	0,0003	0,0067
			2	0,0033	0,0018	0,0700	-0,0003	0,0070
			3	0,0027	0,0019	0,1490	-0,0010	0,0064
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0009	0,0029	0,7410	-0,0066	0,0047
			2	0,0007	0,0034	0,8390	-0,0059	0,0073
			3	0,0048	0,0039	0,2210	-0,0029	0,0124
		$\hat{\beta}_{\Delta}$	1	0,0001	0,0008	0,8920	-0,0015	0,0017
			2	-0,0002	0,0009	0,8310	-0,0020	0,0016
			3	-0,0010	0,0010	0,3280	-0,0030	0,0010
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0082	0,0031	0,0090	-0,0143	-0,0020
			2	-0,0067	0,0040	0,0890	-0,0145	0,0010
			3	0,0034	0,0049	0,4920	-0,0063	0,0131
		$\hat{\beta}_{\Delta}$	1	0,0018	0,0008	0,0300	0,0002	0,0034
			2	0,0015	0,0010	0,1360	-0,0005	0,0035
			3	-0,0008	0,0013	0,5260	-0,0033	0,0017
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0732	0,0325	0,0250	0,0094	0,1369
			2	0,0324	0,0333	0,3300	-0,0328	0,0976
			3	0,0186	0,0308	0,5460	-0,0418	0,0790
		$\hat{\beta}_{\Delta}$	1	-0,0281	0,0115	0,0140	-0,0506	-0,0056
			2	-0,0059	0,0165	0,7210	-0,0382	0,0265
			3	-0,0005	0,0141	0,9720	-0,0282	0,0272
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,1322	0,0733	0,0710	-0,2759	0,0114
			2	0,1328	0,0559	0,0170	0,0233	0,2423
			3	0,1141	0,0720	0,1130	-0,0269	0,2552
		$\hat{\beta}_{\Delta}$	1	0,0281	0,0218	0,1980	-0,0146	0,0708
			2	-0,0335	0,0183	0,0660	-0,0693	0,0023
			3	-0,0084	0,0203	0,6780	-0,0482	0,0314

***Table** 7: LP-DiD results for Q3*

Q3								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]** **LB**	**UB**
Leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0042	0,0329	0,8990	-0,0687	0,0603
			2	-0,0142	0,0347	0,6830	-0,0823	0,0539
			3	-0,0418	0,0381	0,2720	-0,1165	0,0328
		$\hat{\beta}_{\Delta}$	1	-0,0028	0,0092	0,7660	-0,0209	0,0154
			2	0,0040	0,0089	0,6520	-0,0135	0,0215
			3	0,0119	0,0095	0,2130	-0,0068	0,0306
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0125	0,0054	0,0220	-0,0231	-0,0018
			2	-0,0172	0,0068	0,0110	-0,0305	-0,0039
			3	-0,0049	0,0077	0,5260	-0,0200	0,0102
		$\hat{\beta}_{\Delta}$	1	0,0032	0,0016	0,0370	0,0002	0,0063
			2	0,0039	0,0018	0,0330	0,0003	0,0076
			3	0,0018	0,0022	0,4060	-0,0024	0,0060
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0012	0,0010	0,2050	-0,0031	0,0007
			2	-0,0029	0,0011	0,0110	-0,0051	-0,0007
			3	-0,0017	0,0012	0,1590	-0,0042	0,0007
		$\hat{\beta}_{\Delta}$	1	0,0003	0,0003	0,2870	-0,0003	0,0009
			2	0,0008	0,0003	0,0180	0,0001	0,0014
			3	0,0006	0,0004	0,1440	-0,0002	0,0014
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0169	0,0073	0,0210	-0,0312	-0,0025
			2	-0,0160	0,0085	0,0610	-0,0328	0,0007
			3	-0,0179	0,0097	0,0650	-0,0368	0,0011
		$\hat{\beta}_{\Delta}$	1	0,0065	0,0019	0,0000	0,0029	0,0102
			2	0,0065	0,0022	0,0030	0,0022	0,0108
			3	0,0079	0,0027	0,0040	0,0025	0,0133
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0034	0,0027	0,2110	-0,0087	0,0019
			2	-0,0025	0,0033	0,4480	-0,0091	0,0040
			3	-0,0027	0,0041	0,5150	-0,0106	0,0053
		$\hat{\beta}_{\Delta}$	1	0,0009	0,0007	0,1850	-0,0004	0,0022
			2	0,0009	0,0009	0,2710	-0,0007	0,0026
			3	0,0016	0,0012	0,1860	-0,0008	0,0040
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0091	0,0030	0,0020	-0,0150	-0,0033
			2	-0,0076	0,0035	0,0270	-0,0144	-0,0009
			3	0,0009	0,0048	0,8480	-0,0085	0,0103
		$\hat{\beta}_{\Delta}$	1	0,0026	0,0008	0,0010	0,0011	0,0042
			2	0,0022	0,0009	0,0140	0,0004	0,0040
			3	0,0006	0,0013	0,6720	-0,0020	0,0031
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0465	0,0183	0,0110	0,0106	0,0825
			2	0,0502	0,0223	0,0240	0,0065	0,0938
			3	0,0743	0,0240	0,0020	0,0273	0,1214
		$\hat{\beta}_{\Delta}$	1	-0,0321	0,0078	0,0000	-0,0475	-0,0168
			2	-0,0229	0,0110	0,0370	-0,0445	-0,0013
			3	-0,0349	0,0115	0,0020	-0,0575	-0,0123
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0686	0,0468	0,1430	-0,1604	0,0232
			2	0,0996	0,0381	0,0090	0,0249	0,1744
			3	0,0099	0,0387	0,7990	-0,0660	0,0858
		$\hat{\beta}_{\Delta}$	1	0,0030	0,0177	0,8640	-0,0316	0,0377
			2	-0,0274	0,0173	0,1140	-0,0613	0,0066
			3	0,0396	0,0158	0,0120	0,0087	0,0706

Q3								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Clean control group for: leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0310	0,0328	0,3440	-0,0952	0,0332
			2	-0,0319	0,0338	0,3450	-0,0981	0,0343
			3	-0,0455	0,0351	0,1950	-0,1143	0,0233
		$\hat{\beta}_{\Delta}$	1	0,0053	0,0090	0,5600	-0,0124	0,0230
			2	0,0076	0,0087	0,3790	-0,0093	0,0246
			3	0,0129	0,0091	0,1560	-0,0049	0,0307
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0100	0,0051	0,0500	-0,0201	0,0000
			2	-0,0146	0,0064	0,0220	-0,0272	-0,0021
			3	-0,0046	0,0073	0,5310	-0,0189	0,0097
		$\hat{\beta}_{\Delta}$	1	0,0024	0,0014	0,0990	-0,0004	0,0052
			2	0,0031	0,0017	0,0750	-0,0003	0,0064
			3	0,0013	0,0020	0,5200	-0,0027	0,0053
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0100	0,0051	0,0500	-0,0201	0,0000
			2	-0,0146	0,0064	0,0220	-0,0272	-0,0021
			3	-0,0046	0,0073	0,5310	-0,0189	0,0097
		$\hat{\beta}_{\Delta}$	1	0,0024	0,0014	0,0990	-0,0004	0,0052
			2	0,0031	0,0017	0,0750	-0,0003	0,0064
			3	0,0013	0,0020	0,5200	-0,0027	0,0053
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0163	0,0065	0,0120	-0,0291	-0,0035
			2	-0,0146	0,0079	0,0640	-0,0300	0,0008
			3	-0,0162	0,0090	0,0710	-0,0338	0,0014
		$\hat{\beta}_{\Delta}$	1	0,0062	0,0017	0,0000	0,0029	0,0096
			2	0,0059	0,0021	0,0050	0,0018	0,0099
			3	0,0070	0,0026	0,0070	0,0019	0,0120
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0034	0,0025	0,1740	-0,0082	0,0015
			2	-0,0019	0,0031	0,5310	-0,0079	0,0041
			3	-0,0020	0,0037	0,5900	-0,0093	0,0053
		$\hat{\beta}_{\Delta}$	1	0,0004	0,0007	0,5400	-0,0009	0,0017
			2	0,0001	0,0009	0,8610	-0,0015	0,0018
			3	0,0007	0,0011	0,5600	-0,0016	0,0029
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0095	0,0027	0,0000	-0,0148	-0,0042
			2	-0,0075	0,0032	0,0200	-0,0138	-0,0012
			3	-0,0006	0,0046	0,8910	-0,0096	0,0083
		$\hat{\beta}_{\Delta}$	1	0,0027	0,0007	0,0000	0,0012	0,0041
			2	0,0021	0,0009	0,0140	0,0004	0,0038
			3	0,0007	0,0012	0,5500	-0,0017	0,0032
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0610	0,0196	0,0020	0,0225	0,0995
			2	0,0588	0,0219	0,0070	0,0158	0,1017
			3	0,0674	0,0231	0,0040	0,0220	0,1127
		$\hat{\beta}_{\Delta}$	1	-0,0390	0,0098	0,0000	-0,0583	-0,0197
			2	-0,0282	0,0108	0,0090	-0,0493	-0,0070
			3	-0,0349	0,0106	0,0010	-0,0557	-0,0141
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0778	0,0462	0,0920	-0,1684	0,0128
			2	0,1096	0,0368	0,0030	0,0375	0,1818
			3	0,0272	0,0403	0,4990	-0,0517	0,1062
		$\hat{\beta}_{\Delta}$	1	-0,0021	0,0172	0,9010	-0,0358	0,0316
			2	-0,0368	0,0164	0,0240	-0,0689	-0,0048
			3	0,0323	0,0145	0,0260	0,0038	0,0608

Q3								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0259	0,0311	0,4040	-0,0869	0,0350
			2	-0,0340	0,0318	0,2840	-0,0963	0,0282
			3	-0,0248	0,0246	0,3150	-0,0730	0,0235
		$\hat{\beta}_{\Delta}$	1	0,0010	0,0089	0,9120	-0,0165	0,0185
			2	0,0075	0,0086	0,3810	-0,0093	0,0243
			3	0,0078	0,0073	0,2890	-0,0066	0,0222
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0174	0,0057	0,0020	-0,0285	-0,0063
			2	-0,0202	0,0066	0,0020	-0,0332	-0,0072
			3	-0,0081	0,0074	0,2730	-0,0225	0,0064
		$\hat{\beta}_{\Delta}$	1	0,0038	0,0016	0,0170	0,0007	0,0070
			2	0,0040	0,0018	0,0270	0,0004	0,0076
			3	0,0012	0,0020	0,5440	-0,0027	0,0051
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0014	0,0010	0,1530	-0,0033	0,0005
			2	-0,0032	0,0011	0,0040	-0,0054	-0,0010
			3	-0,0019	0,0012	0,1210	-0,0043	0,0005
		$\hat{\beta}_{\Delta}$	1	0,0004	0,0003	0,1370	-0,0001	0,0010
			2	0,0008	0,0003	0,0220	0,0001	0,0014
			3	0,0003	0,0004	0,4510	-0,0004	0,0010
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0137	0,0066	0,0380	-0,0266	-0,0007
			2	-0,0111	0,0074	0,1310	-0,0256	0,0033
			3	-0,0117	0,0084	0,1630	-0,0282	0,0047
		$\hat{\beta}_{\Delta}$	1	0,0053	0,0017	0,0030	0,0018	0,0087
			2	0,0049	0,0019	0,0120	0,0011	0,0087
			3	0,0048	0,0023	0,0340	0,0004	0,0092
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0041	0,0024	0,0930	-0,0088	0,0007
			2	-0,0032	0,0029	0,2700	-0,0090	0,0025
			3	-0,0019	0,0036	0,6020	-0,0089	0,0051
		$\hat{\beta}_{\Delta}$	1	0,0011	0,0007	0,1310	-0,0003	0,0025
			2	0,0010	0,0008	0,2390	-0,0007	0,0027
			3	0,0007	0,0010	0,5020	-0,0013	0,0027
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0108	0,0028	0,0000	-0,0163	-0,0053
			2	-0,0096	0,0033	0,0040	-0,0160	-0,0031
			3	-0,0009	0,0044	0,8300	-0,0096	0,0077
		$\hat{\beta}_{\Delta}$	1	0,0035	0,0009	0,0000	0,0018	0,0053
			2	0,0030	0,0009	0,0010	0,0012	0,0048
			3	0,0009	0,0012	0,4570	-0,0015	0,0033
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0511	0,0160	0,0010	0,0197	0,0824
			2	0,0646	0,0194	0,0010	0,0266	0,1025
			3	0,0795	0,0215	0,0000	0,0374	0,1215
		$\hat{\beta}_{\Delta}$	1	-0,0368	0,0067	0,0000	-0,0499	-0,0237
			2	-0,0350	0,0068	0,0000	-0,0484	-0,0216
			3	-0,0402	0,0098	0,0000	-0,0593	-0,0210
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	0,0905	0,1038	0,3830	-0,1129	0,2939
			2	0,1599	0,0887	0,0710	-0,0140	0,3337
			3	-0,0115	0,1210	0,9250	-0,2485	0,2256
		$\hat{\beta}_{\Delta}$	1	-0,0344	0,0283	0,2250	-0,0899	0,0211
			2	-0,0431	0,0240	0,0730	-0,0903	0,0040
			3	0,0419	0,0298	0,1590	-0,0164	0,1002

Q3								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
clean control group for leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0173	0,0296	0,5590	-0,0753	0,0407
			2	-0,0287	0,0303	0,3420	-0,0880	0,0305
			3	-0,0219	0,0233	0,3480	-0,0676	0,0238
		$\hat{\beta}_{\Delta}$	1	0,0001	0,0086	0,9910	-0,0168	0,0170
			2	0,0092	0,0084	0,2770	-0,0073	0,0256
			3	0,0099	0,0072	0,1720	-0,0043	0,0240
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0171	0,0054	0,0010	-0,0277	-0,0066
			2	-0,0194	0,0063	0,0020	-0,0317	-0,0071
			3	-0,0075	0,0070	0,2870	-0,0212	0,0063
		$\hat{\beta}_{\Delta}$	1	0,0038	0,0015	0,0130	0,0008	0,0069
			2	0,0038	0,0017	0,0290	0,0004	0,0072
			3	0,0011	0,0019	0,5710	-0,0027	0,0049
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0016	0,0010	0,1120	-0,0035	0,0004
			2	-0,0032	0,0012	0,0050	-0,0055	-0,0010
			3	-0,0021	0,0013	0,0930	-0,0046	0,0004
		$\hat{\beta}_{\Delta}$	1	0,0005	0,0003	0,1150	-0,0001	0,0011
			2	0,0008	0,0003	0,0280	0,0001	0,0014
			3	0,0003	0,0004	0,3730	-0,0004	0,0011
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0147	0,0063	0,0200	-0,0271	-0,0023
			2	-0,0128	0,0071	0,0690	-0,0267	0,0010
			3	-0,0118	0,0081	0,1440	-0,0276	0,0040
		$\hat{\beta}_{\Delta}$	1	0,0055	0,0017	0,0010	0,0022	0,0088
			2	0,0053	0,0019	0,0050	0,0016	0,0090
			3	0,0048	0,0022	0,0290	0,0005	0,0091
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0046	0,0023	0,0460	-0,0092	-0,0001
			2	-0,0037	0,0028	0,1910	-0,0092	0,0018
			3	-0,0021	0,0034	0,5320	-0,0089	0,0046
		$\hat{\beta}_{\Delta}$	1	0,0012	0,0007	0,0900	-0,0002	0,0026
			2	0,0011	0,0008	0,1950	-0,0005	0,0027
			3	0,0007	0,0010	0,4700	-0,0012	0,0027
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0112	0,0027	0,0000	-0,0165	-0,0058
			2	-0,0100	0,0032	0,0020	-0,0162	-0,0037
			3	-0,0002	0,0044	0,9610	-0,0088	0,0084
		$\hat{\beta}_{\Delta}$	1	0,0036	0,0009	0,0000	0,0019	0,0053
			2	0,0031	0,0009	0,0010	0,0013	0,0048
			3	0,0007	0,0012	0,5820	-0,0017	0,0030
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0492	0,0159	0,0020	0,0181	0,0804
			2	0,0664	0,0186	0,0000	0,0300	0,1028
			3	0,0835	0,0207	0,0000	0,0428	0,1241
		$\hat{\beta}_{\Delta}$	1	-0,0362	0,0066	0,0000	-0,0492	-0,0233
			2	-0,0352	0,0066	0,0000	-0,0483	-0,0222
			3	-0,0402	0,0096	0,0000	-0,0590	-0,0214
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	0,0474	0,1115	0,6700	-0,1710	0,2659
			2	0,2238	0,1231	0,0690	-0,0174	0,4650
			3	0,0712	0,1225	0,5610	-0,1689	0,3114
		$\hat{\beta}_{\Delta}$	1	-0,0349	0,0333	0,2950	-0,1002	0,0304
			2	-0,0825	0,0443	0,0620	-0,1693	0,0043
			3	0,0088	0,0341	0,7970	-0,0581	0,0757

***Table 8**: LP-DiD results for Q4*

Q4								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0195	0,0176	0,2670	-0,0539	0,0149
			2	-0,0392	0,0186	0,0350	-0,0756	-0,0028
			3	-0,0636	0,0237	0,0070	-0,1101	-0,0171
		$\hat{\beta}_{\Delta}$	1	0,0031	0,0053	0,5640	-0,0073	0,0135
			2	0,0056	0,0058	0,3280	-0,0057	0,0169
			3	0,0129	0,0071	0,0680	-0,0009	0,0267
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0074	0,0039	0,0570	-0,0151	0,0002
			2	-0,0053	0,0042	0,2100	-0,0135	0,0030
			3	0,0043	0,0054	0,4300	-0,0064	0,0150
		$\hat{\beta}_{\Delta}$	1	0,0025	0,0012	0,0300	0,0002	0,0048
			2	0,0016	0,0013	0,2050	-0,0009	0,0042
			3	-0,0013	0,0018	0,4550	-0,0048	0,0022
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0016	0,0007	0,0180	-0,0029	-0,0003
			2	-0,0025	0,0009	0,0040	-0,0041	-0,0008
			3	-0,0022	0,0010	0,0250	-0,0042	-0,0003
		$\hat{\beta}_{\Delta}$	1	0,0007	0,0003	0,0090	0,0002	0,0012
			2	0,0007	0,0003	0,0290	0,0001	0,0014
			3	0,0006	0,0003	0,1010	-0,0001	0,0012
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0043	0,0046	0,3470	-0,0133	0,0047
			2	-0,0036	0,0055	0,5060	-0,0144	0,0071
			3	0,0011	0,0061	0,8620	-0,0109	0,0130
		$\hat{\beta}_{\Delta}$	1	0,0035	0,0014	0,0110	0,0008	0,0062
			2	0,0026	0,0017	0,1430	-0,0009	0,0060
			3	0,0016	0,0018	0,3760	-0,0020	0,0052
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0001	0,0017	0,9390	-0,0036	0,0033
			2	0,0015	0,0020	0,4670	-0,0025	0,0054
			3	0,0032	0,0025	0,1970	-0,0016	0,0080
		$\hat{\beta}_{\Delta}$	1	0,0001	0,0005	0,8870	-0,0009	0,0010
			2	-0,0002	0,0006	0,7440	-0,0013	0,0009
			3	-0,0006	0,0007	0,4220	-0,0019	0,0008
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0052	0,0024	0,0310	-0,0098	-0,0005
			2	-0,0057	0,0029	0,0530	-0,0115	0,0001
			3	-0,0022	0,0036	0,5420	-0,0093	0,0049
		$\hat{\beta}_{\Delta}$	1	0,0021	0,0007	0,0020	0,0008	0,0034
			2	0,0023	0,0008	0,0050	0,0007	0,0039
			3	0,0015	0,0010	0,1220	-0,0004	0,0035
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0377	0,0200	0,0590	-0,0014	0,0768
			2	0,0568	0,0193	0,0030	0,0189	0,0947
			3	0,0619	0,0208	0,0030	0,0212	0,1026
		$\hat{\beta}_{\Delta}$	1	-0,0289	0,0073	0,0000	-0,0432	-0,0145
			2	-0,0326	0,0074	0,0000	-0,0471	-0,0181
			3	-0,0249	0,0080	0,0020	-0,0405	-0,0093
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0544	0,0310	0,0790	-0,1151	0,0064
			2	0,1394	0,0331	0,0000	0,0745	0,2043
			3	0,0449	0,0326	0,1680	-0,0190	0,1089
		$\hat{\beta}_{\Delta}$	1	-0,0019	0,0088	0,8320	-0,0191	0,0154
			2	-0,0458	0,0107	0,0000	-0,0668	-0,0249
			3	0,0026	0,0117	0,8250	-0,0204	0,0256

Q4								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]** **LB**	**UB**
Clean control group for: leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0222	0,0180	0,2180	-0,0574	0,0131
			2	-0,0453	0,0175	0,0100	-0,0796	-0,0109
			3	-0,0663	0,0220	0,0030	-0,1094	-0,0233
		$\hat{\beta}_{\Delta}$	1	0,0040	0,0051	0,4320	-0,0060	0,0140
			2	0,0083	0,0053	0,1190	-0,0021	0,0187
			3	0,0137	0,0064	0,0320	0,0012	0,0262
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0058	0,0036	0,1130	-0,0129	0,0014
			2	-0,0034	0,0040	0,3960	-0,0111	0,0044
			3	0,0058	0,0051	0,2570	-0,0042	0,0157
		$\hat{\beta}_{\Delta}$	1	0,0021	0,0011	0,0540	0,0000	0,0042
			2	0,0011	0,0012	0,3610	-0,0012	0,0034
			3	-0,0016	0,0016	0,3410	-0,0048	0,0016
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0014	0,0006	0,0350	-0,0026	-0,0001
			2	-0,0022	0,0008	0,0070	-0,0038	-0,0006
			3	-0,0021	0,0009	0,0300	-0,0039	-0,0002
		$\hat{\beta}_{\Delta}$	1	0,0007	0,0003	0,0040	0,0002	0,0012
			2	0,0007	0,0003	0,0220	0,0001	0,0013
			3	0,0006	0,0003	0,0800	-0,0001	0,0012
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0041	0,0043	0,3310	-0,0125	0,0042
			2	-0,0026	0,0051	0,6010	-0,0126	0,0073
			3	0,0003	0,0057	0,9550	-0,0108	0,0115
		$\hat{\beta}_{\Delta}$	1	0,0032	0,0013	0,0140	0,0007	0,0058
			2	0,0022	0,0016	0,1770	-0,0010	0,0054
			3	0,0017	0,0017	0,3260	-0,0017	0,0051
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	0,0002	0,0016	0,8960	-0,0029	0,0034
			2	0,0019	0,0019	0,3040	-0,0017	0,0056
			3	0,0034	0,0023	0,1330	-0,0011	0,0079
		$\hat{\beta}_{\Delta}$	1	-0,0002	0,0005	0,7170	-0,0011	0,0007
			2	-0,0005	0,0005	0,3640	-0,0016	0,0006
			3	-0,0008	0,0007	0,2080	-0,0021	0,0005
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0045	0,0022	0,0410	-0,0089	-0,0002
			2	-0,0048	0,0027	0,0790	-0,0101	0,0006
			3	-0,0012	0,0034	0,7290	-0,0078	0,0054
		$\hat{\beta}_{\Delta}$	1	0,0019	0,0006	0,0020	0,0007	0,0031
			2	0,0020	0,0008	0,0070	0,0005	0,0035
			3	0,0012	0,0009	0,1890	-0,0006	0,0030
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0391	0,0188	0,0370	0,0023	0,0760
			2	0,0606	0,0182	0,0010	0,0249	0,0963
			3	0,0596	0,0195	0,0020	0,0214	0,0977
		$\hat{\beta}_{\Delta}$	1	-0,0309	0,0070	0,0000	-0,0447	-0,0172
			2	-0,0342	0,0070	0,0000	-0,0478	-0,0205
			3	-0,0258	0,0074	0,0010	-0,0404	-0,0112
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0519	0,0311	0,0950	-0,1129	0,0090
			2	0,1403	0,0314	0,0000	0,0788	0,2019
			3	0,0595	0,0321	0,0640	-0,0035	0,1225
		$\hat{\beta}_{\Delta}$	1	-0,0052	0,0090	0,5650	-0,0229	0,0125
			2	-0,0481	0,0101	0,0000	-0,0679	-0,0282
			3	-0,0032	0,0112	0,7770	-0,0252	0,0189

Q4								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0432	0,0193	0,0250	-0,0810	-0,0054
			2	-0,0660	0,0186	0,0000	-0,1024	-0,0296
			3	-0,0777	0,0211	0,0000	-0,1190	-0,0363
		$\hat{\beta}_{\Delta}$	1	0,0083	0,0061	0,1730	-0,0036	0,0201
			2	0,0113	0,0060	0,0600	-0,0005	0,0232
			3	0,0165	0,0070	0,0180	0,0028	0,0302
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0071	0,0039	0,0690	-0,0147	0,0006
			2	-0,0055	0,0043	0,1950	-0,0138	0,0028
			3	0,0007	0,0050	0,8920	-0,0091	0,0105
		$\hat{\beta}_{\Delta}$	1	0,0026	0,0013	0,0490	0,0000	0,0051
			2	0,0018	0,0015	0,2170	-0,0011	0,0047
			3	-0,0001	0,0018	0,9520	-0,0037	0,0035
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0007	0,0006	0,2360	-0,0019	0,0005
			2	-0,0015	0,0007	0,0270	-0,0029	-0,0002
			3	-0,0012	0,0008	0,1300	-0,0027	0,0003
		$\hat{\beta}_{\Delta}$	1	0,0005	0,0002	0,0240	0,0001	0,0009
			2	0,0005	0,0002	0,0210	0,0001	0,0010
			3	0,0003	0,0002	0,2290	-0,0002	0,0008
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0034	0,0039	0,3820	-0,0111	0,0043
			2	-0,0038	0,0045	0,3960	-0,0127	0,0050
			3	-0,0022	0,0051	0,6690	-0,0121	0,0078
		$\hat{\beta}_{\Delta}$	1	0,0034	0,0013	0,0080	0,0009	0,0060
			2	0,0033	0,0015	0,0240	0,0004	0,0062
			3	0,0030	0,0016	0,0560	-0,0001	0,0061
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0010	0,0014	0,4720	-0,0039	0,0018
			2	0,0000	0,0018	0,9930	-0,0034	0,0035
			3	0,0004	0,0021	0,8430	-0,0038	0,0046
		$\hat{\beta}_{\Delta}$	1	0,0003	0,0005	0,5580	-0,0007	0,0012
			2	0,0001	0,0006	0,9090	-0,0011	0,0012
			3	-0,0001	0,0007	0,8380	-0,0014	0,0012
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0067	0,0022	0,0020	-0,0110	-0,0024
			2	-0,0079	0,0027	0,0040	-0,0132	-0,0025
			3	-0,0055	0,0032	0,0850	-0,0118	0,0008
		$\hat{\beta}_{\Delta}$	1	0,0023	0,0006	0,0000	0,0011	0,0035
			2	0,0027	0,0008	0,0010	0,0012	0,0043
			3	0,0021	0,0010	0,0320	0,0002	0,0039
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0216	0,0173	0,2110	-0,0123	0,0554
			2	0,0466	0,0159	0,0030	0,0154	0,0779
			3	0,0536	0,0154	0,0010	0,0234	0,0839
		$\hat{\beta}_{\Delta}$	1	-0,0223	0,0096	0,0200	-0,0411	-0,0035
			2	-0,0287	0,0075	0,0000	-0,0435	-0,0139
			3	-0,0298	0,0064	0,0000	-0,0424	-0,0173
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0642	0,0330	0,0510	-0,1289	0,0004
			2	0,1413	0,0263	0,0000	0,0898	0,1928
			3	0,0556	0,0319	0,0810	-0,0069	0,1180
		$\hat{\beta}_{\Delta}$	1	-0,0017	0,0092	0,8530	-0,0197	0,0163
			2	-0,0497	0,0089	0,0000	-0,0673	-0,0322
			3	0,0077	0,0087	0,3790	-0,0094	0,0247

Q4								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
clean control group for leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0412	0,0184	0,0250	-0,0772	-0,0052
			2	-0,0586	0,0180	0,0010	-0,0940	-0,0232
			3	-0,0729	0,0201	0,0000	-0,1124	-0,0334
		$\hat{\beta}_{\Delta}$	1	0,0066	0,0056	0,2410	-0,0044	0,0176
			2	0,0099	0,0056	0,0770	-0,0011	0,0208
			3	0,0154	0,0064	0,0150	0,0030	0,0279
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0071	0,0037	0,0580	-0,0143	0,0002
			2	-0,0060	0,0041	0,1390	-0,0140	0,0019
			3	0,0014	0,0049	0,7800	-0,0082	0,0109
		$\hat{\beta}_{\Delta}$	1	0,0029	0,0012	0,0180	0,0005	0,0052
			2	0,0023	0,0014	0,0960	-0,0004	0,0049
			3	0,0000	0,0017	0,9780	-0,0033	0,0034
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0009	0,0006	0,1260	-0,0020	0,0002
			2	-0,0018	0,0007	0,0080	-0,0031	-0,0005
			3	-0,0012	0,0007	0,0930	-0,0027	0,0002
		$\hat{\beta}_{\Delta}$	1	0,0005	0,0002	0,0080	0,0001	0,0009
			2	0,0005	0,0002	0,0100	0,0001	0,0009
			3	0,0003	0,0002	0,2340	-0,0002	0,0007
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0053	0,0040	0,1920	-0,0132	0,0026
			2	-0,0062	0,0047	0,1880	-0,0153	0,0030
			3	-0,0008	0,0052	0,8780	-0,0109	0,0093
		$\hat{\beta}_{\Delta}$	1	0,0038	0,0013	0,0030	0,0013	0,0062
			2	0,0038	0,0014	0,0080	0,0010	0,0065
			3	0,0026	0,0015	0,0880	-0,0004	0,0057
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0011	0,0014	0,4320	-0,0040	0,0017
			2	-0,0003	0,0017	0,8550	-0,0037	0,0031
			3	0,0003	0,0021	0,8810	-0,0038	0,0044
		$\hat{\beta}_{\Delta}$	1	0,0004	0,0005	0,3880	-0,0005	0,0013
			2	0,0003	0,0005	0,6240	-0,0008	0,0013
			3	0,0000	0,0006	0,9590	-0,0012	0,0013
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0071	0,0021	0,0010	-0,0112	-0,0029
			2	-0,0086	0,0026	0,0010	-0,0137	-0,0035
			3	-0,0061	0,0032	0,0540	-0,0123	0,0001
		$\hat{\beta}_{\Delta}$	1	0,0025	0,0006	0,0000	0,0013	0,0037
			2	0,0032	0,0008	0,0000	0,0017	0,0047
			3	0,0025	0,0009	0,0080	0,0006	0,0043
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0250	0,0169	0,1390	-0,0081	0,0581
			2	0,0473	0,0156	0,0030	0,0166	0,0779
			3	0,0515	0,0153	0,0010	0,0216	0,0814
		$\hat{\beta}_{\Delta}$	1	-0,0215	0,0086	0,0120	-0,0383	-0,0046
			2	-0,0267	0,0070	0,0000	-0,0405	-0,0129
			3	-0,0267	0,0062	0,0000	-0,0388	-0,0147
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0665	0,0323	0,0400	-0,1298	-0,0031
			2	0,1338	0,0259	0,0000	0,0830	0,1846
			3	0,0658	0,0313	0,0360	0,0045	0,1271
		$\hat{\beta}_{\Delta}$	1	-0,0021	0,0091	0,8210	-0,0199	0,0158
			2	-0,0475	0,0084	0,0000	-0,0640	-0,0310
			3	0,0057	0,0085	0,5020	-0,0110	0,0224

Table 9: *LP-DiD results for All Firms*

All Firms								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0046	0,0132	0,7270	-0,0306	0,0213
			2	-0,0235	0,0143	0,1010	-0,0515	0,0046
			3	-0,0434	0,0164	0,0080	-0,0756	-0,0111
		$\hat{\beta}_{\Delta}$	1	-0,0024	0,0039	0,5280	-0,0101	0,0052
			2	0,0028	0,0041	0,4950	-0,0052	0,0108
			3	0,0102	0,0047	0,0300	0,0010	0,0194
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0082	0,0029	0,0040	-0,0138	-0,0026
			2	-0,0072	0,0033	0,0310	-0,0137	-0,0006
			3	0,0026	0,0039	0,5160	-0,0052	0,0103
		$\hat{\beta}_{\Delta}$	1	0,0025	0,0008	0,0030	0,0009	0,0041
			2	0,0018	0,0009	0,0600	-0,0001	0,0036
			3	-0,0010	0,0012	0,3960	-0,0033	0,0013
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0016	0,0006	0,0040	-0,0027	-0,0005
			2	-0,0035	0,0007	0,0000	-0,0049	-0,0020
			3	-0,0027	0,0008	0,0010	-0,0043	-0,0011
		$\hat{\beta}_{\Delta}$	1	0,0006	0,0002	0,0000	0,0003	0,0010
			2	0,0010	0,0002	0,0000	0,0005	0,0014
			3	0,0007	0,0002	0,0020	0,0003	0,0012
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0066	0,0032	0,0420	-0,0129	-0,0002
			2	-0,0050	0,0038	0,1930	-0,0124	0,0025
			3	-0,0048	0,0044	0,2790	-0,0134	0,0039
		$\hat{\beta}_{\Delta}$	1	0,0037	0,0010	0,0000	0,0018	0,0055
			2	0,0029	0,0011	0,0100	0,0007	0,0051
			3	0,0030	0,0013	0,0200	0,0005	0,0056
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0012	0,0013	0,3600	-0,0036	0,0013
			2	0,0008	0,0016	0,6000	-0,0022	0,0039
			3	0,0020	0,0019	0,2890	-0,0017	0,0057
		$\hat{\beta}_{\Delta}$	1	0,0002	0,0004	0,6750	-0,0006	0,0009
			2	-0,0002	0,0004	0,5880	-0,0011	0,0006
			3	-0,0004	0,0005	0,4940	-0,0014	0,0007
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0079	0,0016	0,0000	-0,0111	-0,0047
			2	-0,0069	0,0020	0,0010	-0,0108	-0,0030
			3	-0,0007	0,0025	0,7730	-0,0057	0,0042
		$\hat{\beta}_{\Delta}$	1	0,0025	0,0005	0,0000	0,0016	0,0035
			2	0,0023	0,0006	0,0000	0,0012	0,0034
			3	0,0009	0,0007	0,2290	-0,0006	0,0023
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0405	0,0174	0,0200	0,0064	0,0746
			2	0,0482	0,0137	0,0000	0,0214	0,0750
			3	0,0234	0,0183	0,2000	-0,0124	0,0593
		$\hat{\beta}_{\Delta}$	1	-0,0279	0,0061	0,0000	-0,0399	-0,0160
			2	-0,0258	0,0057	0,0000	-0,0369	-0,0146
			3	-0,0140	0,0093	0,1350	-0,0323	0,0043
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0377	0,0300	0,2090	-0,0965	0,0211
			2	0,1739	0,0303	0,0000	0,1146	0,2333
			3	0,0967	0,0327	0,0030	0,0326	0,1608
		$\hat{\beta}_{\Delta}$	1	-0,0059	0,0091	0,5180	-0,0237	0,0119
			2	-0,0511	0,0094	0,0000	-0,0696	-0,0327
			3	0,0013	0,0098	0,8940	-0,0179	0,0205

All Firms								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Clean control group for: leader = firm which is amongst the top 5% by market capitalization in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0119	0,0135	0,3770	-0,0383	0,0145
			2	-0,0315	0,0137	0,0220	-0,0585	-0,0046
			3	-0,0440	0,0154	0,0040	-0,0742	-0,0137
		$\hat{\beta}_{\Delta}$	1	0,0000	0,0038	0,9910	-0,0075	0,0074
			2	0,0059	0,0039	0,1300	-0,0017	0,0135
			3	0,0109	0,0043	0,0120	0,0024	0,0195
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0069	0,0027	0,0110	-0,0121	-0,0016
			2	-0,0058	0,0031	0,0650	-0,0119	0,0004
			3	0,0031	0,0037	0,4020	-0,0041	0,0103
		$\hat{\beta}_{\Delta}$	1	0,0021	0,0008	0,0060	0,0006	0,0036
			2	0,0013	0,0009	0,1310	-0,0004	0,0031
			3	-0,0011	0,0011	0,3000	-0,0032	0,0010
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0015	0,0005	0,0050	-0,0025	-0,0005
			2	-0,0031	0,0007	0,0000	-0,0045	-0,0017
			3	-0,0024	0,0008	0,0020	-0,0040	-0,0009
		$\hat{\beta}_{\Delta}$	1	0,0007	0,0002	0,0000	0,0003	0,0010
			2	0,0009	0,0002	0,0000	0,0005	0,0013
			3	0,0007	0,0002	0,0010	0,0003	0,0012
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0063	0,0030	0,0360	-0,0122	-0,0004
			2	-0,0036	0,0036	0,3100	-0,0106	0,0034
			3	-0,0040	0,0042	0,3420	-0,0122	0,0042
		$\hat{\beta}_{\Delta}$	1	0,0033	0,0009	0,0000	0,0016	0,0051
			2	0,0023	0,0011	0,0280	0,0003	0,0044
			3	0,0026	0,0012	0,0360	0,0002	0,0050
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0007	0,0012	0,5760	-0,0030	0,0017
			2	0,0016	0,0015	0,2710	-0,0013	0,0045
			3	0,0027	0,0018	0,1250	-0,0008	0,0062
		$\hat{\beta}_{\Delta}$	1	-0,0002	0,0004	0,5450	-0,0009	0,0005
			2	-0,0007	0,0004	0,0820	-0,0016	0,0001
			3	-0,0009	0,0005	0,0900	-0,0019	0,0001
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0077	0,0016	0,0000	-0,0108	-0,0045
			2	-0,0060	0,0019	0,0020	-0,0098	-0,0022
			3	-0,0004	0,0024	0,8670	-0,0052	0,0044
		$\hat{\beta}_{\Delta}$	1	0,0024	0,0005	0,0000	0,0015	0,0033
			2	0,0019	0,0005	0,0000	0,0009	0,0030
			3	0,0006	0,0007	0,3560	-0,0007	0,0020
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0454	0,0164	0,0050	0,0134	0,0775
			2	0,0454	0,0136	0,0010	0,0187	0,0720
			3	0,0215	0,0172	0,2110	-0,0122	0,0552
		$\hat{\beta}_{\Delta}$	1	-0,0300	0,0060	0,0000	-0,0418	-0,0183
			2	-0,0243	0,0060	0,0000	-0,0361	-0,0125
			3	-0,0134	0,0088	0,1260	-0,0306	0,0038
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0437	0,0338	0,1970	-0,1100	0,0226
			2	0,1802	0,0301	0,0000	0,1212	0,2393
			3	0,1047	0,0331	0,0020	0,0397	0,1696
		$\hat{\beta}_{\Delta}$	1	-0,0080	0,0098	0,4160	-0,0273	0,0113
			2	-0,0546	0,0093	0,0000	-0,0728	-0,0363
			3	-0,0013	0,0097	0,8920	-0,0204	0,0178

All Firms								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0295	0,0138	0,0320	-0,0564	-0,0025
			2	-0,0474	0,0143	0,0010	-0,0754	-0,0195
			3	-0,0538	0,0147	0,0000	-0,0825	-0,0250
		$\hat{\beta}_{\Delta}$	1	0,0044	0,0040	0,2810	-0,0036	0,0123
			2	0,0090	0,0041	0,0290	0,0009	0,0171
			3	0,0141	0,0044	0,0010	0,0055	0,0226
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0086	0,0029	0,0030	-0,0143	-0,0029
			2	-0,0085	0,0034	0,0130	-0,0152	-0,0018
			3	0,0010	0,0039	0,7940	-0,0066	0,0086
		$\hat{\beta}_{\Delta}$	1	0,0023	0,0009	0,0070	0,0006	0,0040
			2	0,0018	0,0010	0,0640	-0,0001	0,0038
			3	-0,0010	0,0012	0,4080	-0,0032	0,0013
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0011	0,0005	0,0190	-0,0021	-0,0002
			2	-0,0028	0,0006	0,0000	-0,0040	-0,0015
			3	-0,0017	0,0007	0,0120	-0,0031	-0,0004
		$\hat{\beta}_{\Delta}$	1	0,0004	0,0001	0,0020	0,0002	0,0007
			2	0,0007	0,0002	0,0000	0,0004	0,0011
			3	0,0004	0,0002	0,0500	0,0000	0,0008
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0077	0,0028	0,0070	-0,0133	-0,0021
			2	-0,0061	0,0033	0,0610	-0,0125	0,0003
			3	-0,0058	0,0038	0,1290	-0,0132	0,0017
		$\hat{\beta}_{\Delta}$	1	0,0040	0,0008	0,0000	0,0023	0,0056
			2	0,0035	0,0009	0,0000	0,0016	0,0053
			3	0,0034	0,0011	0,0020	0,0013	0,0054
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0014	0,0012	0,2550	-0,0039	0,0010
			2	0,0006	0,0015	0,7160	-0,0024	0,0035
			3	0,0021	0,0018	0,2530	-0,0015	0,0056
		$\hat{\beta}_{\Delta}$	1	0,0003	0,0004	0,4650	-0,0004	0,0010
			2	-0,0002	0,0004	0,6750	-0,0010	0,0007
			3	-0,0006	0,0005	0,2500	-0,0016	0,0004
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0087	0,0015	0,0000	-0,0118	-0,0057
			2	-0,0082	0,0019	0,0000	-0,0119	-0,0045
			3	-0,0013	0,0023	0,5710	-0,0059	0,0032
		$\hat{\beta}_{\Delta}$	1	0,0026	0,0005	0,0000	0,0017	0,0035
			2	0,0025	0,0005	0,0000	0,0014	0,0036
			3	0,0007	0,0007	0,2830	-0,0006	0,0020
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0440	0,0128	0,0010	0,0190	0,0691
			2	0,0492	0,0127	0,0000	0,0244	0,0740
			3	0,0498	0,0128	0,0000	0,0247	0,0749
		$\hat{\beta}_{\Delta}$	1	-0,0274	0,0057	0,0000	-0,0386	-0,0162
			2	-0,0242	0,0063	0,0000	-0,0365	-0,0119
			3	-0,0236	0,0059	0,0000	-0,0352	-0,0121
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0028	0,0385	0,9430	-0,0782	0,0727
			2	0,1639	0,0362	0,0000	0,0930	0,2348
			3	0,0895	0,0428	0,0370	0,0056	0,1734
		$\hat{\beta}_{\Delta}$	1	-0,0131	0,0104	0,2080	-0,0336	0,0073
			2	-0,0475	0,0102	0,0000	-0,0675	-0,0276
			3	0,0069	0,0111	0,5310	-0,0148	0,0286

All Firms								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
Leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0295	0,0138	0,0320	-0,0564	-0,0025
			2	-0,0474	0,0143	0,0010	-0,0754	-0,0195
			3	-0,0538	0,0147	0,0000	-0,0825	-0,0250
		$\hat{\beta}_{\Delta}$	1	0,0044	0,0040	0,2810	-0,0036	0,0123
			2	0,0090	0,0041	0,0290	0,0009	0,0171
			3	0,0141	0,0044	0,0010	0,0055	0,0226
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0086	0,0029	0,0030	-0,0143	-0,0029
			2	-0,0085	0,0034	0,0130	-0,0152	-0,0018
			3	0,0010	0,0039	0,7940	-0,0066	0,0086
		$\hat{\beta}_{\Delta}$	1	0,0023	0,0009	0,0070	0,0006	0,0040
			2	0,0018	0,0010	0,0640	-0,0001	0,0038
			3	-0,0010	0,0012	0,4080	-0,0032	0,0013
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0011	0,0005	0,0190	-0,0021	-0,0002
			2	-0,0028	0,0006	0,0000	-0,0040	-0,0015
			3	-0,0017	0,0007	0,0120	-0,0031	-0,0004
		$\hat{\beta}_{\Delta}$	1	0,0004	0,0001	0,0020	0,0002	0,0007
			2	0,0007	0,0002	0,0000	0,0004	0,0011
			3	0,0004	0,0002	0,0500	0,0000	0,0008
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0077	0,0028	0,0070	-0,0133	-0,0021
			2	-0,0061	0,0033	0,0610	-0,0125	0,0003
			3	-0,0058	0,0038	0,1290	-0,0132	0,0017
		$\hat{\beta}_{\Delta}$	1	0,0040	0,0008	0,0000	0,0023	0,0056
			2	0,0035	0,0009	0,0000	0,0016	0,0053
			3	0,0034	0,0011	0,0020	0,0013	0,0054
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0014	0,0012	0,2550	-0,0039	0,0010
			2	0,0006	0,0015	0,7160	-0,0024	0,0035
			3	0,0021	0,0018	0,2530	-0,0015	0,0056
		$\hat{\beta}_{\Delta}$	1	0,0003	0,0004	0,4650	-0,0004	0,0010
			2	-0,0002	0,0004	0,6750	-0,0010	0,0007
			3	-0,0006	0,0005	0,2500	-0,0016	0,0004
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0087	0,0015	0,0000	-0,0118	-0,0057
			2	-0,0082	0,0019	0,0000	-0,0119	-0,0045
			3	-0,0013	0,0023	0,5710	-0,0059	0,0032
		$\hat{\beta}_{\Delta}$	1	0,0026	0,0005	0,0000	0,0017	0,0035
			2	0,0025	0,0005	0,0000	0,0014	0,0036
			3	0,0007	0,0007	0,2830	-0,0006	0,0020
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0440	0,0128	0,0010	0,0190	0,0691
			2	0,0492	0,0127	0,0000	0,0244	0,0740
			3	0,0498	0,0128	0,0000	0,0247	0,0749
		$\hat{\beta}_{\Delta}$	1	-0,0274	0,0057	0,0000	-0,0386	-0,0162
			2	-0,0242	0,0063	0,0000	-0,0365	-0,0119
			3	-0,0236	0,0059	0,0000	-0,0352	-0,0121
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0028	0,0385	0,9430	-0,0782	0,0727
			2	0,1639	0,0362	0,0000	0,0930	0,2348
			3	0,0895	0,0428	0,0370	0,0056	0,1734
		$\hat{\beta}_{\Delta}$	1	-0,0131	0,0104	0,2080	-0,0336	0,0073
			2	-0,0475	0,0102	0,0000	-0,0675	-0,0276
			3	0,0069	0,0111	0,5310	-0,0148	0,0286

All Firms								
Leader Definition	**Dep. Var**	**Coefficient**	**Years**	**Coeff.**	**Std. Err.**	**P>|z|**	**[95% conf. interval]**	
							LB	**UB**
clean control group for leader = firm which is amongst the top 5% by revenues in its industry at a given year	*Borrowing Cost (pp)*	$\hat{\beta}_{ZLB}$	1	-0,0028	0,0385	0,9430	-0,0782	0,0727
			2	0,1639	0,0362	0,0000	0,0930	0,2348
			3	0,0895	0,0428	0,0370	0,0056	0,1734
		$\hat{\beta}_{\Delta}$	1	-0,0131	0,0104	0,2080	-0,0336	0,0073
			2	-0,0475	0,0102	0,0000	-0,0675	-0,0276
			3	0,0069	0,0111	0,5310	-0,0148	0,0286
	Log Debt (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0089	0,0028	0,0010	-0,0144	-0,0034
			2	-0,0091	0,0033	0,0050	-0,0155	-0,0027
			3	0,0016	0,0037	0,6660	-0,0057	0,0089
		$\hat{\beta}_{\Delta}$	1	0,0026	0,0008	0,0020	0,0010	0,0042
			2	0,0022	0,0010	0,0230	0,0003	0,0040
			3	-0,0009	0,0011	0,4400	-0,0030	0,0013
	Leverage	$\hat{\beta}_{ZLB}$	1	-0,0012	0,0005	0,0100	-0,0021	-0,0003
			2	-0,0027	0,0006	0,0000	-0,0040	-0,0015
			3	-0,0018	0,0007	0,0060	-0,0031	-0,0005
		$\hat{\beta}_{\Delta}$	1	0,0005	0,0001	0,0010	0,0002	0,0007
			2	0,0007	0,0002	0,0000	0,0004	0,0010
			3	0,0004	0,0002	0,0370	0,0000	0,0007
	Log Intangibles (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0083	0,0028	0,0040	-0,0138	-0,0027
			2	-0,0068	0,0033	0,0380	-0,0131	-0,0004
			3	-0,0037	0,0038	0,3240	-0,0112	0,0037
		$\hat{\beta}_{\Delta}$	1	0,0041	0,0008	0,0000	0,0025	0,0057
			2	0,0036	0,0009	0,0000	0,0018	0,0055
			3	0,0029	0,0011	0,0050	0,0009	0,0050
	Log Assets (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0013	0,0012	0,2870	-0,0037	0,0011
			2	0,0006	0,0015	0,6870	-0,0023	0,0035
			3	0,0015	0,0019	0,4070	-0,0021	0,0052
		$\hat{\beta}_{\Delta}$	1	0,0003	0,0004	0,4490	-0,0004	0,0010
			2	-0,0001	0,0004	0,7220	-0,0010	0,0007
			3	-0,0004	0,0005	0,4550	-0,0014	0,0006
	Log PPE (Millions)	$\hat{\beta}_{ZLB}$	1	-0,0086	0,0016	0,0000	-0,0117	-0,0056
			2	-0,0082	0,0019	0,0000	-0,0118	-0,0045
			3	-0,0012	0,0023	0,6170	-0,0057	0,0034
		$\hat{\beta}_{\Delta}$	1	0,0026	0,0005	0,0000	0,0017	0,0035
			2	0,0026	0,0005	0,0000	0,0015	0,0036
			3	0,0008	0,0006	0,2370	-0,0005	0,0020
	CAPEX (pp)	$\hat{\beta}_{ZLB}$	1	0,0412	0,0132	0,0020	0,0154	0,0670
			2	0,0509	0,0124	0,0000	0,0267	0,0751
			3	0,0468	0,0129	0,0000	0,0216	0,0720
		$\hat{\beta}_{\Delta}$	1	-0,0263	0,0055	0,0000	-0,0371	-0,0154
			2	-0,0241	0,0060	0,0000	-0,0359	-0,0124
			3	-0,0219	0,0057	0,0000	-0,0329	-0,0108
	RI Returns (pp)	$\hat{\beta}_{ZLB}$	1	-0,0315	0,0410	0,4420	-0,1118	0,0488
			2	0,1811	0,0411	0,0000	0,1007	0,2616
			3	0,0994	0,0445	0,0260	0,0121	0,1866
		$\hat{\beta}_{\Delta}$	1	-0,0092	0,0114	0,4200	-0,0315	0,0131
			2	-0,0563	0,0130	0,0000	-0,0819	-0,0308
			3	0,0025	0,0120	0,8320	-0,0209	0,0260

Table 10: *Variables retrieved from Datastream*

Variable	Symbol	Frequency	Description
Total Return Index	RI	Quarterly	RI represents a theoretical growth in value of a share starting from base date where RI=100. RI assumes that dividends are reinvested to buy additional units of equity.
Interest Expense on Debt	WC01251	Annual	Interest expense on short and long term debt
Net Debt	WC18199	Annual	Net debt = total debt - cash and thus represents all interest bearing debt (in thousands)
Leverage	WC08221	Annual	Leverage= debt/total capital in (%)
CAPEX	WC04601	Annual	Capital Expenditures additional to fixed assets
Total Assets	WC02999	Annual	Total Assets (in thousands)
PPE Net	WC02501	Annual	Property, Plant and Equipment – Net (in thousands)
Revenue	WC01001	Annual	Net sales or revenues
Market Capitalization	WC08001	Quarterly	Market capitalization is calculated annually for a company at the fiscal year and date and represents the closing price of the company's stock on that day multiplied by the number of common shares outstanding.
Net Income	WC01706	Annual	Net income refers to the total profit a company earns after subtracting all its expenses from the overall revenues.
Acquisitions	WC04355	Annual	Net Assets from Acquisitions
Current Assets	WC02201	Annual	Total Current Assets
Current Liabilities	WC03101	Annual	Total Current Liabilities