ON THE EFFECTS OF CORPORATE CREDIT MARKET INTERVENTION ON FIRM BEHAVIOR

A Master Thesis in Financial Economics

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Abstract

This paper investigates the effect of the Secondary Market Corporate Credit Facility on US firms' financing and investment behavior during the Covid-19 crisis. The Federal Reserve created the facility intending to stabilize corporate credit markets following the turmoil caused by lockdowns and economic uncertainty. Existing research has focused on the impact on capital markets, omitting the effect on firms. This paper aims to close this gap in the literature by examining how firms responded to the introduction of the credit facility and bond purchases. Two sub-datasets are created based on the eligibility of firms to the facility and based on the bonds that the facility purchased. A difference-in-differences model is used to identify the effect of the facility on the financing and investment behavior of eligible and purchased firms. The analysis shows that, contrary to evidence from corporate credit facilities in other economies, namely the Corporate Sector Purchase Program in the Eurozone, firms do not increase the share of bond financing in the debt composition for eligible firms. In addition, evidence from the analysis indicates a change in the investment behavior of eligible firms following the introduction of the SMCCF. However, the results from the financing behavior suggest that these results are likely driven by transmission channels other than firms' share of bond market financing. Surprisingly, no effect of purchases beyond those found in the eligible firms is observed. This evidence suggests that, unlike in the Eurozone, the impact on firm behavior was modest, which could be related to the strained market conditions and economic uncertainty.

Key Words: *Unconventional Monetary Policy, Firm Behavior, Capital Structure, Firm Investments*

The Federal Reserve System's Covid-19 response and its impact on corporations

Contents

1. Introduction

During the early stages of the Covid-19 pandemic, governments worldwide implemented lockdowns and contact restrictions. In many instances, everyday activities such as eating at restaurants, shopping, or going to work were not possible anymore. In addition to the challenges brought about by every individual, the restrictions also presented a dire situation for economies worldwide. Lockdowns and the sentiment of uncertainty and caution caused severe drops in output. In the UK, for example, this resulted in a collapse of gross domestic product of 22% in the first half of 2020, the most extreme drop in nearly 400 years (Ramsden, 2020).

From a macroeconomic point of view, these restrictions represent a transient but severe reduction in productivity. Neither human nor physical capital had been lost, but their deployment under the restrictions was far from optimal (Cachanosky et al., 2021). According to theory, one would expect adverse effects from a shock like this, for example, a decrease in real output, lower levels of employment, and a drop in wages.

When evaluating the possible negative impact of an economic shock, two dimensions have to be assessed: the length of the shock and its depth or severity. In the case of Covid-19, the severity of the shock was sudden and heavily impacted the firms' profitability. Firstly, both costs of materials and operating expenses increased, while, secondly, many firms also recorded lower revenues. Regarding the length of the shock, nobody could predict how long this situation would persist. Quickly, concerns were raised regarding the ability of the economy to endure this situation. Some businesses would be able to cushion the impact with cash reserves, but for many others, prolonged lockdowns might lead to bankruptcies. If this happened on a broad scale, the costs of reallocating assets might lead to a substantial and persistent decrease in productivity and output, exacerbating and prolonging the economic downturn (Luther & McElya, 2018; Cachanosky et al., 2021). These concerns were reflected in financial markets, which exhibited rising credit spreads, a flight to quality and risk-free securities, as well as decreased trading and lending volumes (O'Hara & Zhou, 2021).

In the United States, the government enacted economic support policies under the Coronavirus Aid, Relief, and Economic Security Act (hereafter: CARES Act) to stop the unfolding economic crisis from escalating. This act also included provisions for equity funding by the US Treasury of several lending and asset purchase facilities at the US Federal Reserve. Although unconventional monetary policy had been used prior to the Covid-19 crisis, the Federal Reserve made an unprecedented decision during the crisis by establishing the Primary Market Corporate Credit Facility and Secondary Market Corporate Credit Facility (hereafter: SMCCF), mandated with buying investment-grade bonds of US dollar-denominated corporate bonds. Until then, asset purchases had focused on treasuries, asset-backed securities, and corporate debt issued by financial institutions. However, faced with turmoil in corporate credit markets, spreads widening, and liquidity drying up, on 23 of March 2020, the Federal Reserve opted for more direct support of this distressed market. On the 9th of April, the mandate of the facilities

was extended to "fallen angels", firms of investment grade quality before the 23 of March 2020 that had since been downgraded to high-yield grade. These purchase programs aimed to improve liquidity in corporate bonds markets and lower yields, which had risen dramatically over the previous weeks, thereby hoping to improve financial stability and funding conditions (Dorn, 2021). However, this intervention, similar to unconventional monetary policy in general, was met with criticism too. Different arguments against this intervention were raised, ranging from concerns about the mandate of the Fed, its independence from political influence, market distortions and the effectiveness of the measures compared to fiscal measures (Dorn, 2021; Cachanosky et al. 2021).

It is vital to analyze the effectiveness of such interventions and to quantify their impact on the different stakeholders, as this quantification provides a reliable base for comparing the costs and benefits. Based on such analyses, lawmakers can identify strengths and weaknesses of policies and adapt future policies to maximize the cost-benefit relationship. However, this can be a challenging task, especially in situations where the impact of a policy is as complex as in the case of monetary policy. Research has been conducted with regard to the effect of the SMCCF on the functioning of capital markets during the initial unrest during the Covid-19 crisis (O'Hara & Zhou, 2020; Kagar et al., 2021; Bordo & Duca, 2022; Boyarchenko et al., 2022; Gilchrist et al., 2022). Undoubtedly, this is important to gain an understanding of the impact and effectiveness corporate credit market intervention (hereafter: CCMI) has as a response to an economic crisis. Beyond the effects on capital markets, another crucial area to investigate is the effect these policies have on the behavior of firms, as they are an essential stakeholder. Since the funds for these programs originate from public sources, it should be in the interest of the government and the public that firms respond to the program effectively and capitalize on the improved conditions in a productive way. Insights from these analyses can be implemented into the design of future policies to maximize their impact at the market, industry, and firm levels.

In Europe, the corporate sector purchase program (hereafter: CSPP) was introduced in 2016, and research has focused on the transmission channels of unconventional monetary policy and its effects on firms. A similar analysis will be implemented in this paper, however, it is essential to note that the policies differ in some important areas, such as the way in which they determine the eligibility of bonds or firms, as well as their direct purpose. Whereas the SMCCF was a targeted response to an immediate crisis at hand, the CSPP aimed to improve market conditions for firms to strengthen the economy following low output and inflation growth. This paper aims to contribute to the current literature on corporate credit purchase programs by answering the question:

"*How did firms' financing and investment behavior respond to the introduction of the federal reserve's secondary market corporate credit facility?"*

To explore this question, this paper will investigate how firms reacted to the improvements in liquidity and funding conditions by looking at ineligible, eligible non-targeted, and targeted firms' funding and investment behavior. All firms rely on debt capital for various aspects of their business.

With economic and financial market conditions tightening due to the crisis brought about by Covid-19, this likely also impacts firms' financing behavior, for example, their leverage. Obtaining financing will become more costly due to rising spreads, and less liquid markets are likely to lead to a lower supply of financing. Lower leverage is a likely outcome unless firms have attractive alternatives, which they can resort to in these times. Should financing become constrained, this can also impact firms' investment behavior. Constrained funding of investments, in addition to economic uncertainty, could lead to more conservative investment behavior.

The goal is to investigate whether firms impacted by the SMCCF, either through eligibility or actual purchases of bonds, differ from other firms in these dimensions. To test the impact of the SMCCF, a difference-in-differences regression will be implemented.

The remaining paper is structured as follows: Section 2 will provide an overview of the existing literature on unconventional monetary policy, CCMI, and the SMCCF. This literature review forms the base for the development of a set of hypotheses, which will be tested in subsequent sections. Section 3 will deal with the data-gathering process and the constructed variables. Section 4 describes the methodological considerations and the statistical model used in the analysis. The results are presented and discussed in Section 6, and supplementary analysis is performed on some variables. Finally, section 7 concludes the paper, providing an answer to the research question, as well as the limitations and avenues for future research.

2. Literature Review

2.1 Introduction

This section will review the relevant literature on unconventional monetary policy, its transmission channels and more specifically, the important literature covering the effectiveness of CCMI.

2.2 Use and transmission of unconventional monetary policy

Under conventional monetary policy, the Federal Reserve has four tools at their disposal: the federal funds rate target, at which banks lend reserves to one another, minimum reserve requirements to be held by banks, the interest rate on reserves, and the interest rate on its discount window lending. All these tools have an impact on banks' liquidity and their ability to extend credit, as well as interest rates, meaning that changes in these variables will propagate through the economy, and through their impact on mortgages, loans and savings will influence business and household spending and investments (Federal Reserve Bank St. Louis, ND). Monetary policy can be either expansionary or contractionary. By lowering the federal funds rate, for example, lending is stimulated, boosting economic activity through investments and spending, resulting in increased output and prices. Similarly, lowering the minimum reserve requirements or lowering the interest rate on reserves will lead to higher credit volume as banks find more profitable ways to deploy their capital than depositing it at the central bank. On the contrary, increasing the fed fund rate or increasing minimum reserve requirements will reduce the credit supply and demand, reducing firms' and households' abilities to invest, and thereby reducing the growth in output and prices.

There is, however, a limit to the effectiveness of conventional monetary policy to stimulate the economy. The zero lower bound limits expansionary conventional monetary policy (hereafter: ZLB), which is reached when interest rates are close to or at zero percent, where they cannot go much lower. If this is not enough to stimulate the economy, it is said to be in a liquidity trap (Hicks, 1937; Krugman, 1998; Eggertsson & Woodford, 2003, Correira et al., 2013). Following the GFC, this was a critical problem central banks were facing, and consequently, a novel set of expansionary tools was implemented, which expanded into new types of securities and sectors of the economy. To introduce liquidity into markets, lower credit spreads, and boost the economy, the Federal Reserve began its Quantitative Easing program, buying up longer-term government and asset-backed securities (Bernanke, 2020).

Since the GFC, unconventional monetary policy tools have played an integral part in the design of monetary policy responses to economic problems. Most of the central banks of developed economies have implemented tools such as quantitative easing and forward guidance (Bhattarai & Neely, 2016; Rudebusch, 2018; ECB, ND; Ramsden, 2020). Due to the increased reliance of central banks on these tools, two areas of research are of particular significance. Firstly, the fundamental question of whether

unconventional monetary policy is effective in responding to economic crises and improving conditions by fostering a strong and stable economy despite the ZLB constraining monetary policy (Eggertsson & Woodford, 2003; Swanson & Williams, 2014; Ikeda et al. 2021) and secondly, the question through which channels unconventional monetary policy is transmitted to markets and the economy. For the purpose of this paper, the literature review will focus mainly on the effectiveness of asset purchases or quantitative easing, as the SMCCF belongs to this category of unconventional monetary policy rather than negative interest rates or forward guidance.

Regarding evidence of unconventional monetary policy's efficacy, Boeckx et al. (2017) find evidence of substantial positive effects on Eurozone countries from balance sheet expansions of the ECB. Following a balance sheet expansion, bank lending, economic activity and inflation are stimulated. Similarly, in a counterfactual analysis, they show that output and prices would have been 1% lower in 2012 had it not been for the ECBs LTRO program. This evidence is corroborated by other studies, finding an increase in output and prices and increased bank lending response to monetary policy shocks (Burriel & Galesi, 2018; Galesi & Rachedi, 2016). The literature also points out some factors that mitigate the transmission of unconventional monetary policy, such as service deepening (Galesi & Rachedi, 2016). Due to the stickier prices of services, the effect on prices is inhibited in countries that have experienced a structural transformation from a manufacturing-based economy to a services-based economy. Both Boeckx et al. (2017) and Burriel & Galesi (2018) find that an undercapitalized and weakened banking sector inhibits the transmission of unconventional monetary policy, which is visible in the comparison between core and peripheral Eurozone countries. Overall, this weakens the impact on the union as a whole due to adverse spillover effects, suggesting that a well-functioning financial system and a capitalized banking sector are paramount to the transmission of unconventional monetary policy.

Evidence from the US also supports the effectiveness of unconventional monetary policy (Chung et al., 2012; Gertler & Karadi, 2013), especially when the short-term rate is constrained by the lower bound (Sims & Wu, 2021;). Weale & Wieladek (2016) find that asset purchases significantly positively impacted both GDP and inflation in the US and the UK, lowering long-term interest rates and household uncertainty and increasing risk appetite. However, the literature also points to some potential problems with unconventional monetary policy. Evidence shows that unconventional monetary policy's impact decreases under certain conditions, for example, if it is used to combat a non-financial shock to the economy or if short-term interest rates are not constrained downwards (Sims & Wu, 2021; Karadi & Nakov, 2021). Curdia & Woodford (2011) find that broad quantitative easing can fail to provide desired expansionary effects but suggest that targeted asset purchases are likely more impactful in addressing specific problems, especially if financial markets are in turmoil. Karadi & Nakov (2021) also add that unconventional monetary policy could be addictive since it lowers long-term yields, which can be hard to reverse without accepting adverse effects on businesses and households.

Thus, although unconventional monetary policy has been shown to be an effective tool in some situations, it faces limitations in addressing some economic problems. These findings might also have

implications for the effectiveness of CCMIs in a crisis. Because these purchase programs are more targeted than general quantitative easing, they might be better equipped to deal with specific issues. However, the finding that unconventional monetary policy's effectiveness is decreased during non-financial crises casts some doubt on the efficacy of the use of CCMI during the Covid-19 crisis.

2.3 Academic research in the field of corporate credit market intervention

In the Eurozone, the CSSP, having been introduced in 2016, allows for more detailed evaluation and analysis. Following the GFC and the European Sovereign Bond Crisis, economic activity had stagnated, with growth and inflation targets having been missed. In line with the mandate of the ECB, the CSPP aimed at creating advantageous financial market conditions, thus improving access to financing and promoting investment, thus increasing output levels and inflation (ECB, 2016). Thus, in order to evaluate its effectiveness, researchers have investigated its impact on both financial markets and the real economy. It has been shown that the CSPP lowered credit spreads and liquidity through stock and flow effects and that eligible firms increased bond debt following the announcement of the CSPP (Grosse-Rueschkamp et al., 2019; Cohen, 2022). Grosse-Rueschkamp et al. (2019) also find positive spill-overs as bank lending to private firms increases, as public firms rely less on it. The effect on financial markets was positive in the Eurozone, but the effect on the real economy is less clear. Cohen (2022) finds that there is little increase in capital spending following purchases of corporate bonds. Instead, he finds increased dividend spending, indicating that firms do not use the improved funding conditions for productive means. Similarly, Korab et al. (2021) investigate the effects of the CSPP on profitability and turnover but fail to find significant evidence of improvement in these areas.

Since the corporate credit facilities introduced in 2020 mark the first time the Federal Reserve made use of such tools, there have been fewer opportunities to analyze its effect compared to the Eurozone. Despite this, research has been aimed at analyzing and quantifying the effect of corporate credit facilities. The primary goals of the Federal Reserve (2021) were to:

"(1) to provide broad support for secondary credit markets to facilitate orderly and timely risk transfer; (2) to support primary issuance for solvent borrowers at borrowing rates that are well aligned with the secondary market reflecting more normalized levels; and (3) to reduce the incidence and severity of market dysfunction*, fire sales, and indiscriminate liquidation".*

In the US, corporate credit intervention also eased financial market conditions in the US, lowering credit spreads by 70 and 20 basis points, respectively (Gilchrist et al., 2022). Similar evidence is presented by O'Hara & Zhou (2020), Kagar et al. (2021), Bordo & Duca (2022), and Boyarchenko et al. (2022). Issuances increased, spreads decreased, and trading volumes picked up, all indicators for improved conditions. However, little research has been done regarding the SMCCF's impact on the real economy. It is not clear how firms responded to these conditions in terms of their capital structure and debt composition, as well as how firms' investment decisions we impacted by the SMCCF.

If companies use the eased conditions in the financial markets by increasing their financing from corporate bond markets and utilizing financing productively, this would be further support for the efficacy of CCMI by central banks. Beyond ameliorating conditions in stressed financial markets, positive effects could also be transferred to the real economy in the form of larger economic output compared to a scenario without intervention.

2.4 Hypotheses

In order to measure these impacts, this paper uses the segmentation of firms created by the eligibility criteria of the SMCCF and the segmentation created by realized purchases by the Fed. Consequently, it also provides insights into the difference between eligible firms and firms that were directly targeted by the SMCCF. Based on the findings of existing literature, the following hypotheses are to be tested to evaluate the effectiveness of the SMCCF:

Hypothesis 1 (H1): *In response to the introduction of the SMCCF, eligible firms will exhibit higher leverage.*

Hypothesis 2 (H2): *In response to being targeted by a purchase by the SMCCF, purchased firms will exhibit significantly higher leverage.*

Hypothesis 3 (H3): *In response to the introduction of the SMCCF, firms eligible under the SMCCF exhibit a shift in their debt composition, moving towards a higher fraction of market debt.*

Hypothesis 4 (H4): *In response to being targeted by a purchase by the SMCCF, targeted firms exhibit a more significant shift in their debt composition, moving towards a higher fraction of market debt compared to eligible firms.*

Next to stabilizing credit markets, it is also important to analyze how firms respond to the SMCCF in terms of their investment behavior, as this has implications for the transmission of the purchase program to the real economy. Traditional theory assumes that restrictions on financing would lead to decreases in firms' investments and growth. Reversing this logic, improvements in funding conditions should lead to increases in investment and growth. Evidence affirming this would support the idea that corporate credit market intervention can impact the real economy positively. It has been demonstrated, however, that firms, in some instances, use the increase in funds to increase dividend spending rather than increase investment spending, contrary to the desired outcome (Todorov, 2020; Cohen, 2022). In a crisis especially, it would be in the interest of central banks, acting on behalf of the economy and society, that the credit lines they are committing and the purchases they make strengthen firms and the economy instead of being used for shareholder distributions. Since share repurchases have a similar effect to that of dividend payouts, they are also of interest. To investigate firms' investment behavior, the following hypotheses are stipulated:

Hypothesis 5 (H5): *Following the introduction of the SMCCF, eligible firms will show significant increases in their investments into assets.*

Hypothesis 6 (H6): *Following the introduction of the SMCCF, purchased firms will show significant increases in their investments into assets***.**

Hypothesis 7 (H7): *Following the introduction of the SMCCF, eligible firms do not increase their dividend distributions.*

Hypothesis 8 (H8): *Following the introduction of the SMCCF, eligible firms do not increase their share repurchases.*

Hypothesis 9 (H9): *The increase in dividend distributions and share repurchases will not be more pronounced in targeted firms.*

2.5 Contribution

In light of the ambiguous impact of the CSPP on firm behavior observed in the Eurozone (Grosse-Rueschkamp et al., 2019; Korab et al., 2021; Cohen, 2022) and the economic turmoil during the Covid-19 crisis, further investigation of unconventional monetary policy's impact is warranted.

This paper contributes to the existing literature on corporate finance and investment by examining the effects of the SMCCF on firms' leverage, debt composition, dividend distributions, share repurchases, and investments into assets. By testing these hypotheses, the study can provide empirical evidence on the response of firms to the introduction of CCMI. Insights into the effectiveness of the SMCCF in mitigating the adverse effects of the pandemic, as well as on potentially undesired firm behavior in response to such a policy, can be gained.

Furthermore, examining the use of CCMI during a crisis allows for the comparison with its use as a tool intended to stimulate economic activity, as it was done in the Eurozone (ECB, 2016). In doing so, a better understanding of CCMI's strengths and weaknesses in addressing specific situations can be gained.

Lastly, by shedding light on the impact of CCMI on the behavior of firms during times of economic uncertainty, this paper complements the research on the SMCCF's impact on corporate bond markets (O'Hara & Zhou, 2020; Kagar et al., 2021; Bordo & Duca, 2022; Boyarchenko et al., 2022; Gilchrist et al., 2022). Next to the policy's effect on stabilizing corporate debt markets, these insights will provide lawmakers with the necessary information to make informed decisions on the future design and use of CCMI. This is important because the SMCCF was a novel intervention introduced during the COVID-19 pandemic, and it is crucial to understand how it affected firms' behavior during this challenging period. With this knowledge at hand, future situations of economic distress can be addressed adequately.

3. Data

3.1 Introduction

In this section, the data collection process, the importance of variables, and descriptive statistics are presented. The data was collected from Compustat North America, Capital IQ, and Refinitiv Eikon Datastream. These sources were chosen for their comprehensive coverage of financial data and the quality of the data they provide.

3.2 Company selection process

The objective of this data collection process is to obtain relevant and reliable data sets to estimate the impact of the SMCCF on eligible and targeted firms while minimizing bias. It is essential to ensure that the data collected is of high quality and comprehensive enough to answer the research questions accurately. Firms with missing data are removed from the data set in order to maintain a balanced panel. To conserve as many individual firms as possible, two separate data sets are constructed to analyze the financing and investment Behavior, respectively. The data set used to analyze the financing behavior contains 340 firms, while the investment behavior contains 414 firms.

3.3 Firms' financial variables

From Datastream, a sample of 877 public North American companies and their identifiers is collected. These will be used in subsequent data retrieval steps. Using the companies' CUSIP numbers, the variables Market Value, Book Value Per Share, Assets, Cash, PPE, Intangible Assets, Capex, R&D Expenses, Total Liabilities, Dividends, Shares Outstanding, EBITDA, EBIT, Adjusted Net Income, and the companies' Sectors are retrieved on an annual basis from Compustat North America for the time period between 01.01.2009 and 31.12.2022. From Compustat's quarterly database, the number of repurchased shares and the average price are retrieved. These variables are necessary to compute the variables used in the analysis, consisting of *Asset Growth*, Δ*EBIT/Assets*, Δ*Cash/Assets*, *Investment Expenditure/Assets*, *Dividend Payout Ratio*, and *Repurchase Yield*, following similar approaches to those of Grosse-Rueschkamp et al. (2019) and Joeman (2020). Investment Expenditure is the combination of capital expenditure and research and development expenses in a given period, divided by the lagged assets. These variables were adjusted for the lagged asset denominator, which allows for a more accurate representation of the company's financial performance.

Various control variables are included to account for variability within firms. To account for the size of the companies in the sample, the natural logarithm of assets (*LnAssets*) is included as a control variable. *Market-to-book ratio*, *Investment Grade Rating*, and *Profitability* (*EBITDA/Assets*), as well as *Tangibility* (*PPE/Assets*) and *Intangibility* ($Intangible\ Assets/Assets$) are added to account for firms' access to and demand for debt.

Capital IQ's Capital Structure Summary database provides the following data points: Outstanding Commercial Paper, Outstanding Revolving Credit, Outstanding Term Loans, Senior Bonds and Notes, Subordinated Bonds and Notes, Capital Leases, and other Debt. These seven mutually exclusive components comprise the total debt of a given company in this database, allowing for a comprehensive analysis of the debt composition and its changes over time (Grosse-Rueschkamp et al., 2019). The variables Bond Debt/Total Debt, Bank Debt/Total Debt, and Total Debt/Assets are computed from this data. A central question this paper aims to answer is how firms respond to the introduction of the SMCCF in terms of their sources of financing. Improved liquidity through an asset purchase program facilitates financing through debt markets as opposed to financing from banks. The variables constructed are meant to capture this potential effect.

3.4 Eligibility and SMCCF bond purchases

In order to assign the companies to the 'Eligible' and 'Purchased' groups, data is gathered from Datastream and the Federal Reserve. Eligible firms are those that have an investment-grade rating on the firm level. To that end, credit-ratings data from Moody's and Fitch is obtained from Datastream. To determine which bonds were purchased by the Federal Reserve, their purchases and holdings are retrieved from the website. This resource is beneficial as it specifies when certain bonds were bought. A challenge in identifying which companies are part of the 'Purchased' group is that some companies sell bonds through financing subsidiaries. A matching procedure based on names and company codes was implemented to solve this problem. The few remaining bonds were matched by hand.

3.5 Relevance of the variables

The variables were selected based on their relevance in answering the research question and analyzing the hypotheses. The financing variables will provide insights into the debt composition of eligible and purchased firms. An increase in the ratio *Bond Debt/Total Debt* following the introduction of the SMCCF or the beginning of bond purchases could support the hypothesis that firms will use improved market conditions through improved liquidity and lower costs. Similarly, we would not expect a significant increase in *Bank Debt/Total Debt*. Ineligible firms, on the other hand, might be forced to increase their share of bank debt in their debt composition in order to offset the worsened debt market conditions. One might expect this effect on bond debt to be amplified for purchased firms because the Federal Reserve is specifically creating liquidity in their securities. Overall, given that eligible firms might have had better access to debt financing following the introduction of the SMCCF, one would expect to observe leverage in these firms, which will be tested through the *Total Debt/Assets* variable.

Analyzing *Asset Growth* will provide insights into firms' investment behavior as higher investments would typically be associated with higher increases in assets, and Δ*EBIT/Assets* relate to the firms' efficiency. Through investments into processes and factors of production, a firm should

theoretically be able to increase its operational efficiency, leading to an increase in profitability. Δ*EBIT/Assets* is meant to capture such effects. Δ*Cash/Assets* and *Investment Expenditure/Assets* will capture how a company uses financing. An increase in cash would indicate that funds are not put to use productively. This might be due to the anticipated need for cash in the future or because there are no sensible investment opportunities at that time. Increased investment expenses show the contrary. A final option for firms to use funds would be to increase payouts to shareholders in the form of dividends or share repurchases. Together these variables will provide a comprehensive overview of how firms use funds and whether they are used productively.

3.6 Descriptive Statistics

3.6.1 Descriptive statistics of firms' financing behavior

Table 3.5.1 shows the descriptive statistics of the financing behavior dataset for eligible and ineligible firms. The timeframe under consideration is from 2010 until 2022. The reported statistics are the mean, standard deviation, minimum, maximum, and median. For the minimum and maximum columns, the values are identical due to the winsorization of the panel before the groups are split for the purpose of comparison. Looking at the two groups, it is notable that eligible firms have, on average, a higher fraction of bond debt in their debt composition, with 83% of the total debt coming from corporate bonds. Ineligible firms, on the other hand, rely on a more balanced debt composition, with around 57% coming from corporate bonds and 33% stemming from bank debt in the form of credit lines and term loans. There is only a slight difference in the overall leverage of the two groups.

Turning toward the control variables, one can see that eligible firms are larger when measured by the size of their assets, and they are more profitable too. In terms of the share of tangible and intangible capital, both groups are very similar. The Investment Grade dummy variable shows that, on average eligible firms have stronger creditworthiness, which is reasonable, considering that an investment grade credit rating is the fundamental condition for eligibility. In relation to the debt composition variables, this could also suggest a potential relationship between investment grade rating and debt composition. This might be explained by the fact that many investors are constrained in their ability to invest in high-yield bonds. These bonds have higher credit risk and are less liquid, resulting in higher yields and as such, higher financing costs for these firms, making the bond market less attractive to these firms.

	Average		Standard Deviation		Min		Median		Max	
	Eligible	Ineligible	Eligible	Ineligible	Eligible	Ineligible	Eligible	Ineligible	Eligible	Ineligible
Bond Debt/Total Debt	0.830	0.567	0.222	0.356	0.000	0.000	0.914	0.637	1.000	1.000
Bank Debt/ Total Debt	0.097	0.327	0.181	0.329	0.000	0.000	0.015	0.219	1.000	1.000
Total Debt/Assets	0.336	0.376	0.149	0.219	0.013	0.013	0.328	0.355	0.850	0.850
LnAssets	9.867	8.553	1.144	1.201	6.023	6.023	9.900	8.546	12.188	11.912
Price-Book Ratio	3.978	4.609	6.364	7.807	-12.923	-12.923	2.644	2.875	33.679	33.679
PE Ratio	19.789	17.161	29.141	44.019	-113.101	-113.101	18.373	18.456	155.562	155.562
Profitability	0.136	0.120	0.067	0.087	-0.162	-0.162	0.125	0.124	0.321	0.321
Tangibility	0.377	0.355	0.270	0.275	0.019	0.019	0.303	0.279	0.885	0.885
Intangibility	0.071	0.080	0.090	0.089	0.000	0.000	0.033	0.055	0.370	0.370
Investment Grade	0.903	0.040	0.296	0.196	0.000	0.000	1.000	0.000	1.000	1.000

Table 3.1: Descriptive Statistics of financing behavior variables for eligible and ineligible firms*. This table shows the mean, standard deviation, minimum, median and maximum of all variables used in the analysis of eligible and ineligible firms' financing behavior.*

Table 3.5.2 shows the results of the descriptive statistics for purchased firms compared to those firms whose bonds were not purchased by the SMCCF. As many of the eligible companies in the sample are also part of the purchased companies, the descriptive statistics look similar to those of the purchased group. As some of the firms from the eligible group are also part of the non-purchased group, we see some changes in the debt composition variables, with a higher share of bond debt financing by non-purchased firms compared to ineligible firms. The average firm size of the purchased group is also bigger than that of the eligible group, while interestingly, the expected value of the Investment Grade variable is lower than for the eligible group.

	Average		Standard Deviation		Min		Median		Max	
	Purchased	Non-Purchased	Purchased	Non-Purchased	Purchased	Non-Purchased	Purchased	Non-Purchased	Purchased	Non-Purchased
Bond Debt/Total Debt	0.850	0.625	0.201	0.344	0.000	0.000	0.923	0.730	1.000	1.000
Bank Debt/ Total Debt	0.080	0.276	0.158	0.313	0.000	0.000	0.010	0.146	1.000	1.000
Total Debt/Assets	0.346	0.353	0.146	0.204	0.013	0.013	0.340	0.325	0.850	0.850
LnAssets	10.031	8.771	1.128	1.185	6.023	6.023	10.031	8.734	12.188	11.912
Price-Book Ratio	4.307	4.040	6.911	6.822	-12.923	-12.923	2.778	2.628	33.679	33.679
PE Ratio	20.074	17.647	28.486	40.561	-113.101	-113.101	18.440	18.250	155.562	155.562
Profitability	0.138	0.123	0.069	0.080	-0.162	-0.162	0.125	0.124	0.321	0.321
Tangibility	0.370	0.371	0.262	0.283	0.019	0.019	0.298	0.289	0.885	0.885
Intangibility	0.072	0.076	0.090	0.089	0.000	0.000	0.033	0.048	0.370	0.370
Investment Grade	0.886	0.326	0.318	0.469	0.000	0.000	1.000	0.000	1.000	1.000

Table 3.2: Descriptive Statistics of financing behavior variables for purchased and non-purchased firms*. This table shows the mean, standard deviation, minimum, median and maximum of all variables used in the analysis of eligible and ineligible firms' financing behavior.*

3.6.2 Descriptive statistics of firms' investment behavior

Tables 3.3 and 3.4 report the descriptive statistics for the investment behavior dataset. The average assets growth of eligible firms is 9%, smaller than the 15.4% of ineligible firms. This might be related to their size. Larger firms are more likely to be found in established markets, where increases in scale are more difficult due to established competitors and lack of additional market share to capture. Eligible firms' changes in cash are also considerably smaller than those of ineligible firms, at around 6% and 19% percent, respectively. Investment into tangible assets and R&D is also larger in the ineligible group, which on average invests 10.7% of assets, compared to the 7.6% percent of eligible firms. The distribution behavior of the two groups also shows sizable differences. The dividend payout ratio of eligible firms is more than twice as large as that of ineligible firms, while the average repurchase yield of eligible firms is 33% larger than that of ineligible firms. A similar picture emerges from the comparison of the purchased and non-purchased groups. Overall, this could suggest a difference in investment and spending behavior between the two groups, which should be accounted for in the analysis, hence the addition of the control variables, which should be able to capture these differences.

	Average		**Standard Deviation**		**Min**		**Median**		**Max**	
	Eligible	**Ineligible**	**Eligible**	**Ineligible**	**Eligible**	**Ineligible**	**Eligible**	**Ineligible**	**Eligible**	**Ineligible**
Asset Growth	0.090	0.154	0.192	0.277	-0.182	-0.182	0.052	0.078	1.306	1.306
ΔEBIT/Assets	0.012	0.017	0.040	0.057	-0.135	-0.135	0.007	0.013	0.165	0.165
ΔCash/Assets	0.006	0.019	0.057	0.086	-0.149	-0.149	0.001	0.004	0.367	0.367
Investment Expenditure/Assets	0.076	0.107	0.057	0.100	0.009	0.009	0.062	0.072	0.425	0.425
Dividend Payout Ratio	0.373	0.179	0.406	0.376	-0.347	-0.347	0.312	0.000	1.836	1.836
Repurchase Yield	0.024	0.018	0.029	0.029	0.000	0.000	0.013	0.004	0.119	0.119
LnAssets	9.723	7.991	1.161	1.196	6.020	5.796	9.756	7.971	12.088	11.912
Price-Book Ratio	4.360	5.194	6.403	7.883	-13.673	-13.673	2.985	3.471	33.720	33.720
PE Ratio	21.756	21.815	31.045	45.298	-113.101	-113.101	18.880	21.261	162.645	162.645
Profitability	0.146	0.139	0.072	0.106	-0.173	-0.173	0.135	0.138	0.344	0.344
Tangibility	0.329	0.278	0.254	0.243	0.021	0.021	0.235	0.192	0.855	0.855
Intangibility	0.073	0.078	0.087	0.087	0.000	0.000	0.040	0.051	0.356	0.356
Investment Grade	0.906	0.017	0.292	0.131	0.000	0.000	1.000	0.000	1.000	1.000

Table 3.3: Descriptive Statistics of investment behavior variables for eligible and ineligible firms*. This table shows the mean, standard deviation, minimum, median and maximum of all variables used in the analysis of eligible and ineligible firms' investment behavior.*

	Average		Standard Deviation		Min		Median		Max	
	Purchased	**Non-Purchased**	**Purchased**	**Non-Purchased**	**Purchased**	**Non-Purchased**	**Purchased**	**Non-Purchased**	**Purchased**	**Non-Purchased**
Asset Growth	0.085	0.144	0.185	0.265	-0.182	-0.182	0.050	0.074	1.306	1.306
ΔEBIT/Assets	0.011	0.016	0.040	0.053	-0.135	-0.135	0.007	0.012	0.165	0.165
ΔCash/Assets	0.006	0.016	0.056	0.081	-0.149	-0.149	0.001	0.003	0.367	0.367
Investment Expenditure/Assets	0.076	0.100	0.054	0.094	0.009	0.009	0.063	0.067	0.425	0.425
Dividend Payout Ratio	0.401	0.197	0.415	0.370	-0.347	-0.347	0.337	0.000	1.836	1.836
Repurchase Yield	0.024	0.019	0.029	0.029	0.000	0.000	0.015	0.005	0.119	0.119
LnAssets	9.933	8.198	1.124	1.187	6.020	5.796	9.972	8.250	12.088	11.912
Price-Book Ratio	4.570	4.788	6.823	7.206	-13.673	-13.673	3.086	3.215	33.720	33.720
PE Ratio	21.589	21.964	30.323	42.836	-113.101	-113.101	18.796	20.771	162.645	162.645
Profitability	0.148	0.139	0.073	0.099	-0.173	-0.173	0.135	0.137	0.344	0.344
Tangibility	0.341	0.278	0.253	0.246	0.021	0.021	0.262	0.189	0.855	0.855
Intangibility	0.072	0.077	0.087	0.086	0.000	0.000	0.037	0.049	0.356	0.356
Investment Grade	0.888	0.248	0.316	0.432	0.000	0.000	1.000	0.000	1.000	1.000

Table 3.4: Descriptive Statistics of investment behavior variables for purchased and non-purchased firms*. This table shows the mean, standard deviation, minimum, median and maximum of all variables used in the analysis of eligible and ineligible firms' financing behavior.*

3.6.3 Stationarity

In another step, the variables' stationarity is investigated through a Harris-Tzavalis unit root test. This test allows for larger numbers of individuals in the panel, N, and a fixed time dimension, T. This applies to the groups in this data set, each containing more than 100 companies. Tables 3.5 and 3.6 report the results statistic, ρ, z-statistic, and p-value of the variables for the different groups. The Harris-Tzavalis test examines the null hypothesis that panels contain a unit root, more formally: $H_0: \rho = 1$, suggesting non-stationarity. The corresponding alternative hypothesis is that all panels are stationary. A sufficiently small p-value suggests significant evidence against the null hypothesis, leading to the rejection of the null hypothesis in favor of the alternative hypothesis. A strongly negative z-statistic is a sign against the null hypothesis of a unit root. For all groups, the null hypothesis of non-stationarity can be rejected at all conventional levels for all variables except for firm size proxied by the natural logarithm of assets. Usually, non-stationarity warrants variable adjustment, like taking the first difference. However, the purpose of the variable is to account for the effect of firm size on the investment and financing behavior, whereas taking a first difference would result in a variable proxying for the change in size. Consequently, the variable is not adjusted.

	Eligible			Ineligible			Purchased			Non-Purchased		
	Statistic	z	P-value	Statistic	z	P-value	Statistic	z	P-value	Statistic	z	P-value
Bond Debt/Total Debt	0.527	-17.054	0.000	0.608	-8.522	0.000	0.532	-15.596	0.000	0.582	-11.729	0.000
Bank Debt/ Total Debt	0.554	-16.084	0.000	0.558	-10.913	0.000	0.556	-14.109	0.000	0.556	-13.223	0.000
Total Debt/Assets	0.709	-5.336	0.000	0.701	-4.078	0.000	0.723	-3.834	0.000	0.690	-5.523	0.000
LnAssets	0.883	6.731	1.000	0.891	5.037	1.000	0.875	5.500	1.000	0.893	6.187	1.000
Price-Book Ratio	0.415	-25.711	0.000	0.362	-20.292	0.000	0.405	-23.407	0.000	0.377	-23.567	0.000
PE Ratio	0.013	-53.506	0.000	0.145	-30.721	0.000	0.004	-48.030	0.000	0.124	-38.112	0.000
Profitability	0.449	-23.299	0.000	0.510	-13.226	0.000	0.460	-19.992	0.000	0.486	-17.269	0.000
Tangibility	0.698	-6.083	0.000	0.733	-2.544	0.006	0.703	-5.082	0.000	0.723	-3.591	0.000
Intangibility	0.690	-6.661	0.000	0.601	-8.833	0.000	0.685	-6.214	0.000	0.627	-9.142	0.000

Table 3.5: Stationarity analysis of financing data set*. This table shows the statistics, z-scores and p-values of the Harris-Tzavalis Unit Root Test for the dependent and independent variables of the financing data set. A highly negative z-score is associated with a low p-value, presenting strong evidence against the null-hypothesis of a unit root and thus a non-stationary process.*

	Eligible			Ineligible			Purchased			Non-Purchased		
	Statistic	z	P-value	Statistic	z	P-value	Statistic	z	P-value	Statistic	z	P-value
Asset Growth	-0.094	-64.161	0.000	0.010	-44.691	0.000	-0.092	-57.398	0.000	-0.007	-52.376	0.000
ΔEBIT/Assets	-0.028	-59.362	0.000	-0.060	-48.689	0.000	-0.005	-51.723	0.000	-0.067	-56.342	0.000
ΔCash/Assets	-0.318	-80.517	0.000	-0.221	-57.969	0.000	-0.309	-71.574	0.000	-0.239	-67.696	0.000
Investment Expenditure/Assets	0.539	-17.977	0.000	0.504	-16.227	0.000	0.520	-17.399	0.000	0.513	-18.018	0.000
Dividend Payout Ratio	0.109	-49.377	0.000	0.157	-36.204	0.000	0.109	-44.294	0.000	0.148	-42.145	0.000
Repurchase Yield	0.304	-35.109	0.000	0.244	-31.218	0.000	0.331	-29.770	0.000	0.234	-36.455	0.000
LnAssets	0.897	8.096	1.000	0.929	8.258	1.000	0.879	6.090	1.000	0.932	9.686	1.000
Price-Book Ratio	0.471	-22.939	0.000	0.330	-26.246	0.000	0.462	-21.199	0.000	0.346	-29.043	0.000
PE Ratio	0.076	-51.787	0.000	0.154	-36.362	0.000	0.067	-47.009	0.000	0.148	-42.124	0.000
Profitability	0.486	-21.861	0.000	0.518	-15.450	0.000	0.505	-18.375	0.000	0.502	-18.759	0.000
Tangibility	0.691	-6.948	0.000	0.712	-4.238	0.000	0.700	-5.606	0.000	0.704	-5.416	0.000
Intangibility	0.703	-6.027	0.000	0.597	-10.859	0.000	0.691	-6.182	0.000	0.632	-10.137	0.000

Table 3.6: Stationarity analysis of investment data set*. This table shows the statistics, z-scores and p-values of the Harris-Tzavalis Unit Root Test for the dependent and independent variables of the investment data set. A highly negative z-score is associated with a low p-value, presenting strong evidence against the null-hypothesis of a unit root and thus a non-stationary process.*

4. Methodology

4.1 Research approach

The focus of this study is to analyze the impact of the Secondary Market Corporate Credit Facility (SMCCF) on the financing and investment of US firms. Due to the clearly defined requirements for eligibility and concrete start date of the policy, the SMCCF can be analyzed using treatment effect analysis. A difference-in-differences regression will be performed. Difference-in-differences regressions are one of the most commonly used methods in the field of causal inference.

Where feasible, researchers would ideally want to use randomized experiments because these provide a reliable counterfactual outcome to which the treatment can be compared. However, in practice, there are different reasons why this method might not be possible to implement. Ethical, financial, and political considerations might play a role, as well as specific characteristics of the treated population itself (Athey & Imbens, 2017). Difference-in-differences analysis approaches these problems by using a control group that is similar to the treatment group in terms of pre-treatment trends to derive the counterfactual outcome. In a difference-in-differences regression model, the effect of the treatment and its significance is estimated through an interaction term between the post-treatment dummy and the treatment group dummy variable. The coefficient of this interaction term functions as the ATET estimator.

It is possible that different confounding variables may drive results instead of the treatment, thus potentially falsely indicating a significant treatment effect. Thus, when employing a difference-in-differences analysis, it is crucial to ensure that the estimator can reliably identify the effect of the treatment. To ensure this, the time period used for the analysis has to be selected carefully, and a thorough and diligent analysis of the data has to be performed. This way, potential confounders can be ruled out, and the data can be split into comparable treatment and control groups. In the case of this study, firstly, the period of observation has been selected in such a way that it avoids the immediate effects of the GFC. Secondly, both a visual analysis of the data and a parametric test will be performed to ensure that the assumption of parallel trends between the control and treatment groups is met. Control variables and fixed effects are included in the regression model to account for heterogeneity between the firms.

4.2 Analysis of parallel trends

When implementing a difference-in-differences analysis, the assumption of parallel trends between the control and treatment groups must be fulfilled. There are different approaches to this, such as graphical analysis and regression analysis of the pre-treatment periods. Figures 7.1.1 through 7.1.9 illustrate the trend comparison between eligible and ineligible firms from 2010 until 2020 for financing and investment behavior variables. In a similar fashion, Figures 7.2.1 through 7.2.9 illustrate the comparison

between purchased and non-purchased firms. A parametric test of the pre-treatment trends is conducted to supplement the graphical analysis:

$$Y_{i,t} = \alpha_i + \alpha_t + \alpha_s + \beta_1 Treatment_i * 2010 + \cdots + \beta_2 Treatment_i * 2022 + \theta' X_{i,t} + \varepsilon_{i,t} \quad (4.2.1)$$

Where $Y_{i,t}$ represents one of the independent variables described in Section 3. The $Treatment_i * Time$ interaction terms are a set of interaction dummy variables taking the value of 1, for firms in the treatment group, either $Eligible\ Group$ or $Purchased\ Group$, in the respective year. The regression also includes entity, time, and sector fixed effects ($\alpha_i, \alpha_t, \alpha_s$), as well as a set of control variables $X_{i,t}$ (Autor et al., 2003; Pischke, 2005; Grosse-Rueschkamp et al., 2019). This method allows for the identification of parallel trends through the analysis of the coefficients of $Treatment_i * Time$ parameters. In the pre-treatment period, these should be small and not statistically significant. Evidence to the contrary would indicate that the trend between the treated and the control groups is non-parallel, as there seem to be time-variable differences between the groups even before the treatment.

4.3 The difference-in-differences model

The dataset's firms are divided into four different groups: (1) ineligible firms, (2) eligible firms, (3) non-purchased firms, and (4) purchased firms. Eligible firms refer to companies that meet the eligibility criteria for the SMCCF, while purchased firms are those whose bonds have been purchased by the Federal Reserve under the SMCCF. Non-purchased firms, on the other hand, are companies whose bonds have not been purchased by the Federal Reserve. The SMCCF was announced on the 23 of March 2020. Since annual data is used in this analysis, the breaking point is set to 2020.

$$Announcement_t = \begin{cases} 1, & t \geq 2020 \\ 0, & t < 2020 \end{cases} \quad (4.1.1)$$

The groups can be represented in the following form: Companies that were of investment-grade quality at the time of introduction of the SMCCF are part of the 'Eligible' group, and firms whose bonds are purchased by the Federal Reserve under the SMCCF are part of the 'Purchased Group'.

$$Eligible\ Group_i = \begin{cases} 1, & Company\ fulfils\ SMCCF\ citeria \\ 0, & Company\ does\ fulfils\ SMCCF\ citeria \end{cases} \quad (4.1.2)$$

$$Purchased\ Group_i = \begin{cases} 1, & Bond\ purchased\ by\ SMCCF \\ 0, & Bond\ not\ purchased\ by\ SMCCF \end{cases} \quad (4.1.3)$$

Finally, the interaction term between the post-treatment and treatment group variables is created.

$$Eligible_{i,t} = \begin{cases} 1, & If\ \ Announcement = 1\ and\ Eligible\ Group = 1 \\ 0, & If\ \ otherwise \end{cases} \quad (4.1.4)$$

$$Purchased_{i,t} = \begin{cases} 1, \ If \ \ Announcement = 1 \ and \ Purchased \ Group = 1 \\ 0, \ If \ \ otherwise \end{cases} \quad (4.1.5)$$

4.4 Difference-in-differences regressions

This section will provide an overview of the statistical models used to evaluate the hypotheses. First, it will introduce the model for analyzing firms' financing behavior, followed by the investment behavior model. Both instances include specifications for eligible firms and purchased firms.

4.4.1 Difference-in-differences regression model for eligible firms

To analyze the treatment effect of the SMCCF on the financing behavior of $Eligible$ firms, the following difference-in-differences regression is constructed:

$$Y_{i,t} = \alpha_i + \alpha_t + \beta_1 Post_t + \beta_2 Eligible \ Group_i + \beta_3 Eligible_{i,t} + \theta' X_{i,t} + \varepsilon_{i,t} \quad (4.3.1)$$

The dependent variable $Y_{i,t}$ can be 1) the ratio of bond debt to total debt (*Bond Debt/Total Debt*), 2) the ratio of bank debt to total debt (*Bank Debt/Total Debt*), or 3) the ratio of total debt to total assets (*Total Debt/Assets*). As described in the previous section, the dummy variable $Post_t$ creates a breaking point in the data and indicates the announcement of the SMCCF in the case of the eligibility model and the beginning of purchases in the purchased model. E$ligible \ Group_i$ is a dummy variable that equals 1 for firms that fulfill the eligibility criteria and 0 otherwise. $Eligible_{i,t}$ is an interaction term of the form $Post * Treatment_{i,t}$. It is set to 1 for firms in the Eligible Group in the post-treatment period. The interaction term in a difference-in-differences setup is central to the analysis as it captures the effect of the treatment together with its significance.

Multiple control variables are included in the model, represented by $X_{i,t}$. Included in the controls are the size of the firms (*lnAssets*), their profitability (*EBITDA/Assets*), their PE ratio (*Market Capitalization/Earnings*), their market-to-book ratio (*Market Capitalization/Book Value*), their tangibility (*PPE/Assets*), intangibility (*Intangible Assets/Assets*) and investment grade status ($IG_{i,t}$). These are meant to account for heterogeneity in firms' access and demand for debt. Firm- and time-fixed effects (α_i and α_t), together with sector dummy variables are included too, which are meant to capture time-invariant heterogeneity.

For the analysis of the investment behavior of eligible firms, the right-hand side of the equation remains unchanged. In this specification, however, the dependent variable, $Y_{i,t}$, can take on one of the following measures 1) Asset Growth (*Percentage Change in Assets*), 2) change in EBIT to Assets ($\Delta Cash/Assets$), 3) the change in cash to assets ($\Delta Cash/Assets$), 4) the change in investment expenditure (*Investment Expenditure/Assets*), 5) Dividend Payout Ratio (*Dividends/Adjusted*

Net Income) and 6) Repurchase Yield (*Repurchase Amount/Market Capitalization*). Again, the control variables and fixed effects described are included, as well as the sector dummy variables.

4.4.2 Difference-in-differences regression model for purchased firms

In the analysis of financing and investment behavior of the purchased firm difference-in-differences, the following model is used:

$$Y_{i,t} = \alpha_i + \alpha_t + \beta_1 Post_t + \beta_2 Purchased\ Group_i + \beta_3 Purchased_{i,t} + \theta' X_{i,t} + \varepsilon_{i,t} \quad (4.3.2)$$

$Y_{i,t}$ will be one of the dependent variables related to firm financing or firm investments described above. Control variables, fixed effects, and sector dummy variables are included again to account for time-varying and time-invariant heterogeneity.

5. Results

5.1 Overview

In this section, the results of this research will be presented and discussed. The findings will be related to this paper's research question. The evaluation of the results on eligible firms will be presented first, followed by that of the empirical results on purchased firms.

Multiple specifications of the standard difference-in-differences model are implemented and analyzed, starting with a simple model, which only includes an intercept and the parameters Post, Group, and Treatment for each of the dependent variables. The model is saturated successively, where the control variables are added in the second iteration, and lastly, the firm, time and sector fixed effects are added. The addition of firm- and time-fixed effects completely absorbs the sector dummy variables and the Post and Group dummies, which is why they do not appear in the results tables.

5.2 The effect of the SMCCF on eligible firms' debt composition

Table 5.1 provides an overview of all model specifications and their results. Multiple specifications of the model are implemented to identify which of them best explains the data. Columns (1), (2), and (3) show the results of the difference-in-differences regressions with *Bond Debt/Total Debt* as the dependent variable. In all instances, we observe a positive coefficient on the interaction term, *Eligible*, indicating that there is some effect. However, none of these effects are statistically significant at conventional levels, shown by the p-values below the coefficients. This also becomes evident from the graphs in Figure 7.1.1. Note that since the SMCCF was introduced in March 2020, the visual representation of the treatment beginning is set at the end of 2019 because annual data is used. The graphs of the treatment and control groups show no discernable, significant difference. Following the introduction of the SMCCF, the share of bond debt rose for both groups initially but decreased again in subsequent periods.

Turning to the share of bank debt in eligible firms' debt composition, we see across all specifications of the difference-in-differences model that the coefficient of the eligibility term is positive and significant at conventional levels, shown in columns (4), (5), and (6). Figure 7.1.2 shows a visibly steeper drop in the share of bank debt for the control group from 2019 to 2020. This is a somewhat surprising finding as we would not expect an effect of the SMCCF on bank debt financing. Based on conventional financial and economic literature, we would expect the SMCCF to positively affect the share of bank debt as it is a measure directed at bond debt. This could suggest that another mechanism is driving these results.

Lastly, we turn to the leverage of eligible firms. Columns (7), (8), and (9) show a positive coefficient. However, only under the second model specification, with controls and without fixed effects, is the coefficient of the interaction term statistically significant at the 10% level. Contrary to the hypothesized outcome, these results do not suggest that eligible firms significantly increase their

leverage compared to ineligible firms. Comparing the graphs of the two groups in Figure 7.1.3, we also see that there is no increase in leverage by eligible firms. The decrease in leverage is smaller than that of the control group, in line with the results we obtain from the interaction term but the difference does not seem large enough to yield a significant effect.

In light of prior research, these findings are unexpected. Gilchrist et al. (2022) find that the SMCCF had a positive effect on corporate bond markets, showing that it lowered bid-ask spreads. Based on results from the CSPP in Europe, these results are somewhat surprising. Todorov (2020) and Grosse-Rueschkamp et al. (2019) both report significant effects on the share of bond debt. The interaction term coefficient of the fully saturated specification in column (6) would imply that the SMCCF positively affected the share of bank debt of eligible firms of about 4.6% compared to ineligible firms. However, since there is no primary channel through which the SMCCF could impact this. Thus, simply attributing this result to the introduction of the SMCCF would be questionable.

	Bond Debt/Total Debt			**Bank Debt/Total Debt**			**Total Debt/Assets**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Eligible	0.019	0.020	0.021	**0.056**	**0.048**	**0.046**	0.012	0.017	0.000
	0.450	*0.413*	*0.379*	*0.007*	*0.017*	*0.027*	*0.400*	*0.206*	*0.991*
Eligible Group	**0.259**	0.054		**-0.243**	-0.039		**-0.043**	0.037	
	0.000	*0.218*		*0.000*	*0.310*		*0.036*	*0.220*	
Post	-0.032	**-0.059**		**-0.097**	**-0.063**		**0.036**	**0.026**	
	0.169	*0.009*		*0.000*	*0.001*		*0.005*	*0.033*	
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes

***5.1 Difference-in-differences regression of financing behavior variables for eligible and ineligible firms**. Columns (1), (4) and (7) are the baselines specification without controls and fixed effects. Note that for the most saturated specification the "Eligible Group" and "Post" variables, together with the sector fixed effects, are fully absorbed. The p-values of the are shown below their respective coefficient. Statistically significant coefficients are highlighted in bold font.*

A potential explanation might lie in the severity of the turmoil created in capital markets and the economy caused by the economic disruptions brought on by the Covid-19 crisis. Gilchrist et al. (2022) state that although the SMCCF had an immediate alleviating effect on bond markets, conditions remained tight. With this in mind, it would make sense for firms to turn to banks to secure the financing they require. An important observation one has to make here is that eligible firms are more likely to have high creditworthiness, as an investment grade rating is one of the requirements for eligibility under the SMCCF. However, this superior creditworthiness is not restricted to debt capital markets but also plays an essential role in bank financing. The effect we observe might thus be driven by eligible firms' decision to increase their share of bank financing to offset the worsened conditions in capital markets brought about by Covid-19. Due to increased scrutiny by banks during an economic crisis, firms of inferior creditworthiness would not have access to such options because they are less stable and resilient and thus present a high risk to banks, which in turn restricts the supply of bank financing to these firms.

These findings can be related to the overall leverage too. If credit supply was tightened during COVID-19, this might we explain why no increase was observed.

Alternatively, the SMCCF might have affected eligible firms' creditworthiness positively. With the support of the Federal Reserve, lenders were more comfortable with extending credit to eligible firms, which creates liquidity, thus reducing spreads. This would result in an improvement in their overall borrowing conditions. Ineligible firms would not benefit from the SMCCF in this way. This theory would also align with the evidence presented by Gilchrist et al. (2022).

These findings present an important difference to the CSPP in Europe, which was not introduced as an emergency measure. There was no negative shock to bond markets at the time, resulting in the observed differences in effects between the two credit market interventions.

5.3 The effect of the SMCCF on eligible firms' investment behavior

Table 5.2 reports the difference-in-differences regression results for the investment behavior. Column (1) shows a positive coefficient for the interaction terms of *Asset Growth.* However, the p-value of the interaction term is 0.08, indicating that the statistical significance is relatively weak. This increase is not robust with regard to the inclusion of the control variables. In the most saturated specification of the model, the coefficient of 0.053 is highly significant. This implies an *Asset Growth* increase of eligible firms by 5.3% compared to ineligible firms.

The change in EBIT shows a negative coefficient in the first specification in column (4). For columns (5) and (6), however, the coefficients turn change sign and become significant at the 5% level. From an economic perspective, a positive effect from SMCCF on the change in profitability would make sense, as these firms would have better access to financing and would thus have an advantage compared to ineligible firms regarding the investment into profitable investment opportunities. However, given the weak significance of the coefficient and the insignificant impact of the SMCCF on financing through the bond market, this effect cannot be directly attributed to the eligibility of firms to the SMCCF. Similarly, the positive effect on *Investment Expenditure* is observed, which is robust to the inclusion of controls and fixed effects and highly statistically significant should be interpreted with caution. A direct link between the SMCCF, financing behavior, and the investment behavior is difficult to establish from these results, but it is possible that the SMCCF affected the investment behavior of eligible firms through other channels, as described in the previous section.

On the other hand, the effect on change in cash is not significant in any of the three specifications, combined with the evidence from *Asset Growth* and *Investment Expenditure*, suggesting that eligible firms invested rather than bolstering their cash reserves.

Examining the *Dividend Payout Ratio* of eligible firms, we find positive and statistically significant coefficients on the interaction term in the model with control variables (14). Although the significance of the coefficient decreases by adding the fixed effects, the P-value is still below 0.05. Together this presents strong evidence that eligible firms increased their dividend distributions

following the introduction of the SMCCF. On the contrary, coefficients on the interaction term for share repurchases are negative in all specifications. Only the coefficient of the baseline model is significant at the 5% level. Thus, there is no evidence to support the hypothesis that eligible firms increase repurchases after the introduction of the SMCCF.

Although we observe some evidence suggesting that the SMCCF influenced firms' investment behavior, it has to be considered that there no reliable evidence suggesting that eligible firms made use of improved bond market conditions following the SMCCF was found. Thus, if we assume that the SMCCF affects firm investment behavior through the firm's financing, we cannot attribute these observed effects directly to the SMCCF. It is very much possible that the previously described channel of better access to bank debt in times of crisis fueled the investment behavior of eligible firms. Alternatively, they might have been less affected by the adverse effect of the economic downturn. As a result, these firms could continue their operations with less negative impacts on their investment behavior. This might also be related to the significant effect observed in the dividend payout behavior. Although firms are generally hesitant to miss dividend payments because this sends signals of instability and financial problems, when a firm is actually experiencing a cash crunch, cutting back on dividends is a fast and effective way to conserve cash. If eligible firms were to be impacted by the market conditions less, they would not have to cut dividend payments, resulting in a positive effect.

	Asset Growth			**ΔEBIT/Assets**			**ΔCash/Assets**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Eligible	**0.028**	0.024	**0.053**	-0.004	0.001	**0.007**	-0.002	-0.002	0.002
	0.080	*0.129*	*0.002*	*0.195*	*0.599*	*0.024*	*0.557*	*0.604*	*0.622*
Eligible Group	**-0.070**	**-0.044**		**-0.005**	0.000		**-0.012**	**-0.007**	
	0.000	*0.006*		*0.008*	*0.974*		*0.000*	*0.011*	
Post	**-0.027**	**-0.030**		**0.007**	**0.004**		0.003	0.003	
	0.051	*0.034*		*0.020*	*0.078*		*0.423*	*0.335*	
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes
	Investment Exp./Assets			**Dividend Payout Ratio**			**Repurchase Yield**		
	(10)	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**	**(15)**	**(18)**
Eligible	**0.015**	**0.012**	**0.015**	0.036	**0.085**	**0.056**	**-0.008**	**-0.005**	**-0.007**
	0.002	*0.012*	*0.001*	*0.188*	*0.002*	*0.043*	*0.001*	*0.011*	*0.003*
Eligible Group	-0.034	-0.015		**0.186**	0.018		**0.007**	0.002	
	0.000	*0.197*		*0.000*	*0.775*		*0.000*	*0.436*	
Post	**-0.027**	**-0.020**		-0.021	**-0.109**		0.002	0.001	
	0.000	*0.000*		*0.301*	*0.000*		*0.280*	*0.660*	
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes

5.2 Difference-in-differences regression of investment behavior variables for eligible and ineligible firms*. Columns (1), (4), (7), (10), (13) and (16) are the baselines specification without controls and fixed effects. Note that for the most saturated specification the "Eligible Group" and "Post" variables, together with the sector fixed effects, are fully absorbed. The p-values of the are shown below their respective coefficient. Statistically significant coefficients are highlighted in bold font.*

5.4 Effect of SMCCF purchases on purchased firms' financing behavior

Table 5.3 reports the results of the difference-in-differences analysis of purchased firms. The results for the three dependent variables are very similar to those of the eligibility model. The coefficients of the interaction term in the bond debt model are still positive and insignificant, albeit smaller than in the eligibility model. Similarly, for the *Bank Debt/Total Debt* and *Total Debt/Assets* models, the coefficients of the interaction terms are smaller than those in the eligibility model and, in the case of the bank debt model, still significant. The intuition behind this is quite logical in that many of the eligible firms are also part of the group of firms that were targeted by SMCCF purchases. Thus, the two analyses are very similar, with the exception that the firms that were eligible for the SMCCF but were not purchased now contribute to the control group, which causes the difference between the two groups to shrink, explaining the smaller coefficients. Overall, this suggests that the actual purchases made by the SMCCF had little effect on the purchased firms' behavior.

	Bond Debt/Total Debt			**Bank Debt/Total Debt**			**Total Debt/Assets**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Purchased	0.010	0.012	0.014	**0.048**	**0.039**	**0.038**	**0.023**	**0.024**	0.012
	0.631	*0.566*	*0.495*	*0.005*	*0.020*	*0.027*	*0.046*	*0.035*	*0.267*
Purchased Group	**0.223**	**0.073**		**-0.207**	**-0.057**		-0.013	**0.037**	
	0.000	*0.010*		*0.000*	*0.022*		*0.467*	*0.058*	
Post	-0.024	**-0.048**		**-0.084**	**-0.054**		**0.031**	**0.026**	
	0.175	*0.007*		*0.000*	*0.000*		*0.001*	*0.005*	
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes

5.3 Difference-in-differences regression of financing behavior variables for purchased and non-purchased firms*. Columns (1), (4) and (7) are the baselines specification without controls and fixed effects. Note that for the most saturated specification the "Purchased Group" and "Post" variables, together with the sector fixed effects, are fully absorbed. The p-values of the are shown below their respective coefficient. Statistically significant coefficients are highlighted in bold font.*

5.5 Effect of SMCCF purchases on purchased firms' investment behavior

The similarity in treatment effects between eligible and purchased that is visible from the analysis of the firms' financing behavior is also present in the investment behavior analysis for the most part. However, two of the dependent variables show significant differences: *Asset Growth* and the *Dividend Payout Ratio.* In both cases, the previously significant results disappear, and in the case of *Asset Growth*, the coefficient even turns negative until the fixed effects are entered into the model. This effect is not very sensible from both a statistical and economic perspective and warrants further research.

	Asset Growth			ΔEBIT/Assets			ΔCash/Assets		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Purchased	-0.019	-0.023	0.009	-0.003	0.001	**0.006**	-0.004	-0.005	-0.001
	0.184	*0.107*	*0.574*	*0.318*	*0.554*	*0.017*	*0.186*	*0.127*	*0.715*
Purchased Group	**-0.054**	**-0.024**		**-0.004**	-0.003		**-0.009**	-0.001	
	0.000	*0.025*		*0.006*	*0.142*		*0.000*	*0.805*	
Post	0.000	-0.004		**0.006**	**0.004**		0.004	**0.005**	
	0.979	*0.740*		*0.018*	*0.028*		*0.207*	*0.091*	
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes
	Investment Exp./Assets			**Dividend Payout Ratio**			**Repurchase Yield**		
	(10)	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**	**(15)**	**(18)**
Purchased	**0.013**	**0.008**	**0.012**	0.006	0.033	0.006	-0.005	-0.003	-0.004
	0.002	*0.051*	*0.003*	*0.820*	*0.205*	*0.821*	*0.018*	*0.164*	*0.055*
Purchased Group	**-0.027**	-0.002		**0.203**	**0.078**		**0.007**	0.003	
	0.000	*0.805*		*0.000*	*0.024*		*0.000*	*0.180*	
Post	**-0.024**	**-0.017**		-0.002	**-0.067**		**0.000**	-0.001	
	0.000	*0.000*		*0.923*	*0.001*		*0.820*	*0.445*	
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes

5.4 Difference-in-differences regression of investment behavior variables for purchased and non-purchased firms*. Columns (1), (4), (7), (10), (13) and (16) are the baselines specification without controls and fixed effects. Note that for the most saturated specification the "Purchased Group" and "Post" variables, together with the sector fixed effects, are fully absorbed. The p-values of the are shown below their respective coefficient. Statistically significant coefficients are highlighted in bold font.*

5.6 Robustness

In order for the results to be reliable, the common or parallel trends assumption between the treatment and control group must not be violated. Only if this assumption is upheld can the control group be reliably used as a counterfactual to the treated group. Graphical analysis of the trends in the dependent variable is a common method to analyze the parallelity of the trends. Figures 7.1.1 to 7.1.9 show the graphs comparing the eligible group and the ineligible group with regards to the three debt variables, *Bond Debt/Total Debt*, *Bank Debt/Total Debt*, and *Total Debt/Assets*, as well as the six investment behavior variables. Similarly, Figures 7.2.1 to 7.2.9 show the comparisons of variables between purchased and non-purchased firms. In both cases, almost every variable shows some sign of non-parallelity. In order to better assess if the assumption is met or not, the parametric test in equation (4.2.1) is applied to the variables. The results are shown in Section 7.3. The interaction term for 2020 is taken as the baseline and thus left out in order to avoid the dummy variable trap. After accounting for heterogeneity between firms, through the use of control variables and fixed effects, we see that most interaction variables have very small and statistically insignificant coefficients. In some cases, some interaction variables are significant but only in one or two earlier periods, leaving enough periods with parallel trends before the introduction of the SMCCF to move forward with confidence in the assumption

being met. Two variables are still showing signs of the assumption being violated, namely *Bank Debt/Total Debt* and *Investment Expenditure*. In order to still evaluate the impact of the SMCCF on these variables, the Synthetic Control Method (Abadie et al., 2015) is applied to these two variables.

5.6.1 Synthetic Control Method

A common problem faced by researchers applying difference-in-differences analysis is the violation of parallel trends. If this assumption is violated, the control group is likely to be not closely the treated group in the pre-treatment period. This can introduce bias into the analysis, making the results and, consequently, the estimation of the treatment effect unreliable. The underlying assumption for the control group is equal weighting of all individuals in the group by means of taking a simple average across the individuals.

The synthetic control method was designed to deal with situations where a direct control group is unavailable. It has gained much popularity over the last year, with Athey & Imbens (2017) calling it the "most important innovation in the policy evaluation literature in the last 15 years". Abadie & Gardeazabal (2003) and Abadie et al. (2015) did seminal work on this statistical tool. The approach of Abadie et al. (2015) is used, which relies on the comparison of the ratios of post-treatment and pre-treatment residual mean squared errors (RMSE) between different placebo synthetic controls for the untreated units for the identification of a treatment effect. If the RMSE ratio of the treated unit is more extreme than that of the placebos, it is likely that the treatment effect is statistically significant.

Generally, synthetic controls are designed to research one treated unit. However, different methods have been proposed to investigate aggregated units, such as Kreif et al. (2016). In their paper, they investigate the effect of a policy on different hospitals. There are 24 treated units, which are aggregated into one treated region and then construct a synthetic control region from a donor pool of 132 untreated hospitals. A similar approach is applied in this paper. An aggregated treated unit is created from the firms in the respective treatment groups, Eligible Group and Purchased Group. The remaining firms form the donor pool of untreated companies.

Instead of relying on an evenly weighted control group, the synthetic control method makes use of adjustable weights. The weights by which individuals enter into the control group are determined through a minimization process that takes into account the importance of the covariates used in the analysis and minimizes the distance in the pretreatment values between the synthetic control and the treated unit. The distance metric is of the following form:

$$\sqrt{(\mathrm{X_1} - \mathrm{X_0W})'\mathrm{V_i}(\mathrm{X_1} - \mathrm{X_0W})} \tag{5.6.1}$$

X_1 is a vector with the covariate values for the aggregated treated firms, either eligible or purchased, X_0 is a matrix containing the covariate values of the untreated firms, W is the weight vector of the untreated firms and V_i is the matrix that determines the relative importance of the covariates included in the computation (Kreif et al., 2016).

This will allow for the creation of a synthetic control unit for the two dependent variables, *Investment Expenditure* and *Bank Debt/Total Debt.* Since the assumption of parallel trends was not met in both the visual and parametric analysis, the reliability of the difference-in-differences regression is not given in these two cases. The lack of a comparable control group can be addressed by employing the synthetic control method.

For the implementation of the synthetic control method, the Python package 'SyntheticControlMethods' created by Oscar Engelbrektson is used. Next to the calculation and plotting functions this package provides, it also comes with a novel method, 'DiffSynth', which not only allows for more flexibility but also help to reduce bias originating from non-linear relationships between the outcome variable and covariates (Engelbrektson, 2021). A random sample from respective control groups is obtained to construct the placebos. This is necessary in order to make the calculations feasible. The sample is left large enough to ensure that the optimization is not adversely affected. Through randomization, it is ensured that no bias is introduced.

5.6.2 Analysis of Synthetic Controls for eligible firms

Figure 7.4.1 reports the RMSE-Ratios of the differenced synthetic controls for the variable *Bank Debt/Total Debt* of the Average-Eligible Firm, representing the aggregated firms in the Eligible Group, shown as Avg_ELEG, against a range of placebo controls. The Average-Eligible Firm exhibits the highest RMSE ratio indicating a high outcome difference between pre-treatment and post-treatment periods. The RMSE ratio is twice as large as that of the next largest placebo, which suggests a significant treatment effect. Furthermore, a clear divergence between the two graphs in Figure 7.4.2 is visible. As outlined in the manual accompanying the SyntheticControlMethods package, we look for small deviations between the control group and the treated group in the pre-treatment period, as this indicates a representative control group, while large differences in the post-treatment period would support the hypothesis for a significant treatment effect. It is important to note that the negative values in the graph are caused by taking the first difference of the variables, which would not be possible otherwise.

As in the case of the share bank debt, the Investment Expenditure of the Average Eligible firm shows the highest RMSE ratio too, shown in Figure 7.4.3. However, the difference to the next largest placebo is much smaller than in the previous case, which is also apparent in Figure 7.4.4. This suggests an effect on Investment Expenditures, but its size and significance not very strong.

5.6.3 Analysis of Synthetic Controls for purchased firms

Compared to the analysis of eligible firms, purchased firms do not show large differences in the post-treatment periods. Figures 7.5.1 to 7.5.4 show the RMSE ratios and plotted trends for *Bank Debt/Total Debt* and *Investment Expenditure/Assets* for purchased firms. Overall, the figures show that the change between pre-treatment RMSE and post-treatment RMSE is less extreme compared to the placebos. These findings cast some doubts regarding the significance of a treatment effect in these variables.

Looking at the plotted trends we also see that the fit between pre-treatment periods is rather weak, which is especially visible for the share of bank debt financing, shown in Figure 7.5.2. Overall, these findings do not suggest an effect by the SMCCF on the treated variables.

6. Conclusion

This paper examines the effect of the eligibility to and bond purchases from the SMCCF on the financing and investment behavior of eligible and purchased firms. Based on existing literature, it hypothesized that, in response to reduced yields and improved liquidity in bond markets, eligible firms substitute their share of bank financing through increases in their share of bond market financing. Furthermore, it is hypothesized that firms increase their investment into productive assets and growth. Given the evidence by Todorov (2020), Korab et al. (2021), and Cohen (2022), a set of hypotheses on the distribution behavior of eligible and purchased firms is formed.

The results of the analysis present an interesting picture of the effect of the SMCCF, which supplement the literature on the utilization and effectiveness of corporate credit market intervention while also forming a base for further research. Given the evidence from Europe on the CSPP (Grosse-Rueschkamp et al. 2019), increases in the share of bond market financing would have been expected instead of a significant increase in the share of bank financing by eligible firms. Furthermore, it is found that firms invest more after the introduction of the SMCCF. Although this aligns with general economic theory, it differs from the findings presented in the literature on the CSPP. However, it is important to consider that the purpose of the two facilities was different. Whereas the SMCCF sought to stabilize markets and provide liquidity, the CSPP in Europe was intended to increase real output and prices by mobilizing the economy, which had stagnated due to the Global Financial Crisis and the Sovereign Debt Crisis. Therefore, given the different scope and context of the facilities, differences in their effects are to be expected. Interestingly, the purchases by the SMCCF of bonds do not seem to have enhanced the effects observed in firms compared to merely being eligible for a purchase. Further research should be aimed at identifying the reason for the lack of such a difference.

There are some limitations to these findings, however. From the results of the analysis, it is not possible to determine with certainty what drove the increase in the share of bank financing, which makes the interpretation of the investment behavior more complex too. It is possible that the SMCCF was responsible for this effect, but further evidence would be valuable. Through further investigation, other transmission channels of the effects of credit market intervention on the real economy could be found, further enhancing the knowledge base for researchers and lawmakers alike.

7. Figures and Tables

7.1 Eligible Firms

Figure 7.1.1: Bond Debt / Total Debt

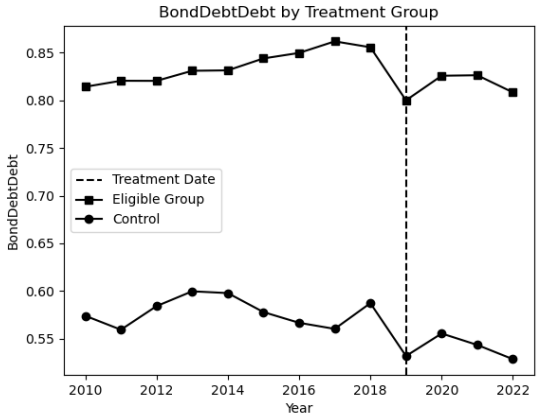


Figure 7.1.2: Bank Debt / Total Debt

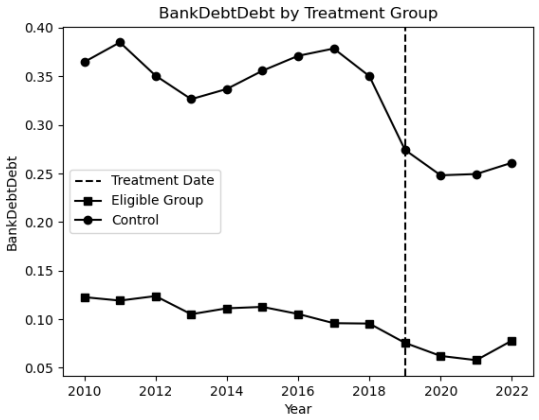


Figure 7.1.3: Total Debt/Assets

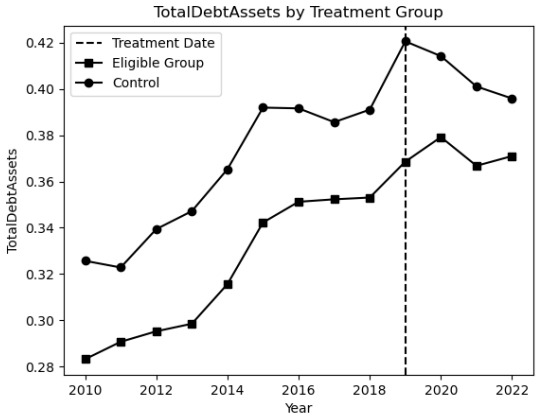


Figure 7.1.4: Asset Growth

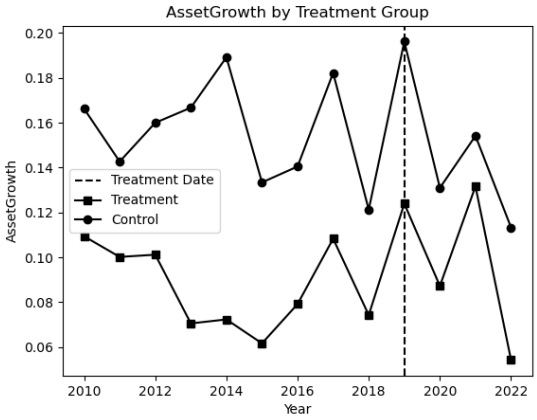


Figure 7.1.5 Change in EBIT/Assets

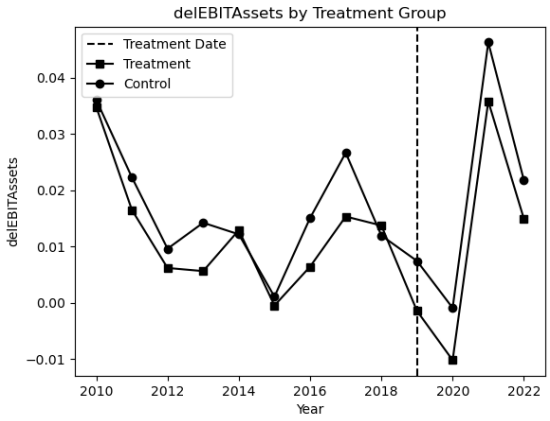


Figure 7.1.6: Chang in Cash/Assets

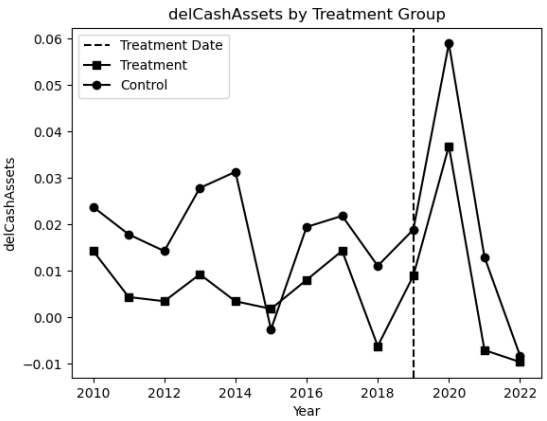


Figure 7.1.7: Investment Expenditure/Assets

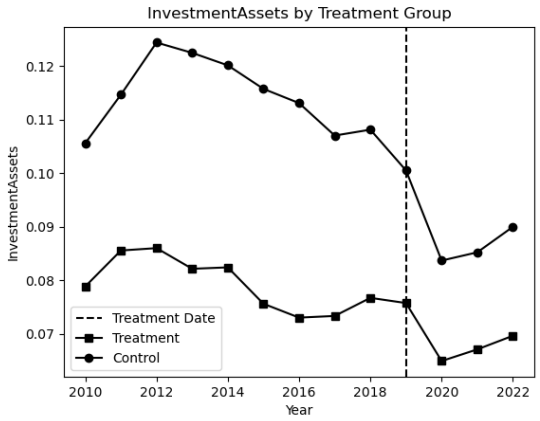


Figure 7.1.8: Dividend Payout Rate

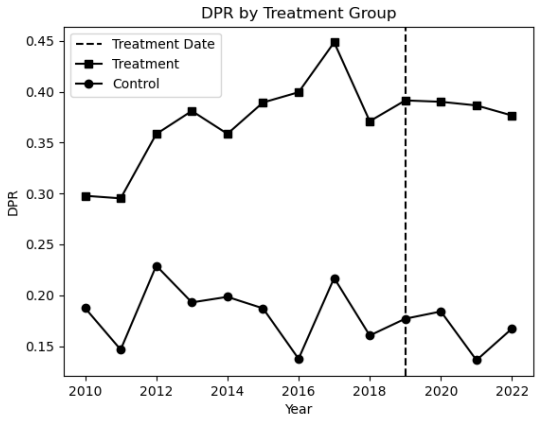
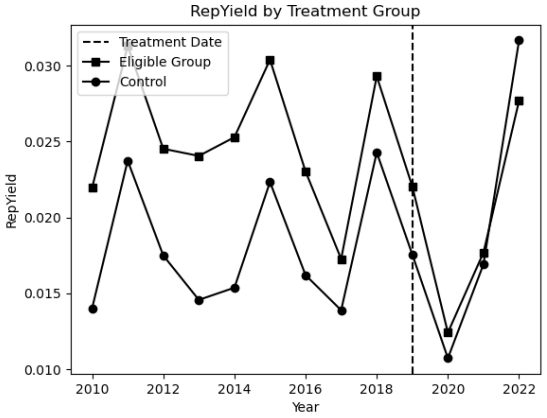


Figure 7.1.9: Repurchase Yield



7.2 Purchased Firms

Figure 7.2.1: Bond Debt / Total Debt

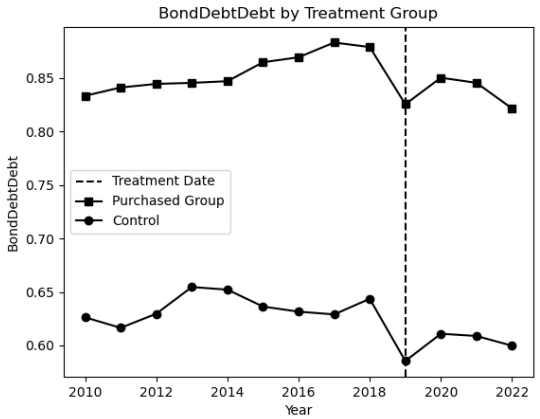


Figure 7.2.2: Bank Debt / Total Debt

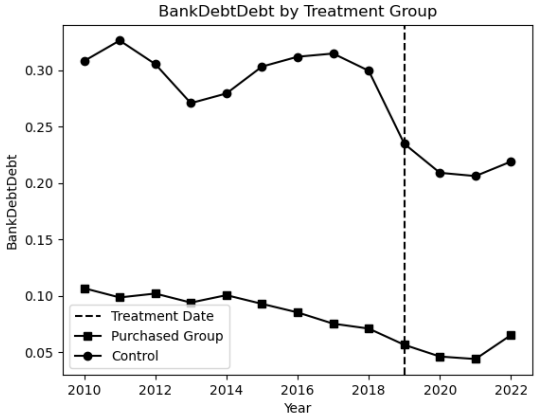


Figure 7.2.3: Total Debt/Assets

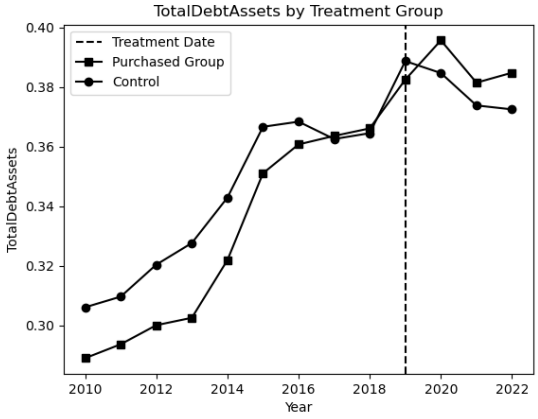


Figure 7.2.4: Asset Growth

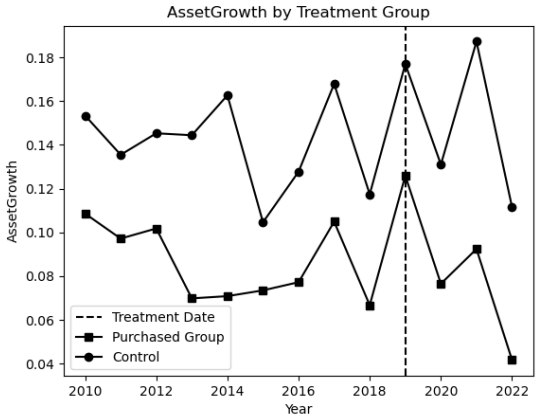


Figure 7.2.5 Change in EBIT/Assets

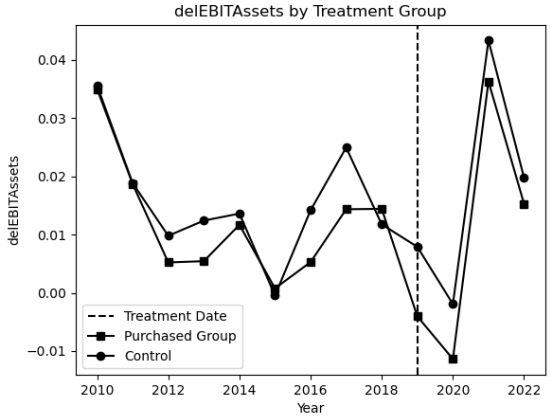


Figure 7.2.6: Chang in Cash/Assets

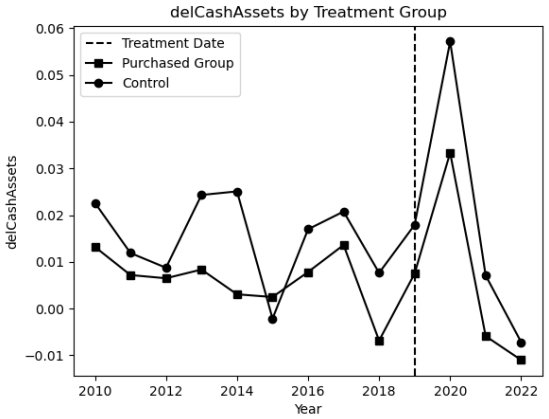


Figure 7.2.7: Investment Expenditure/Assets

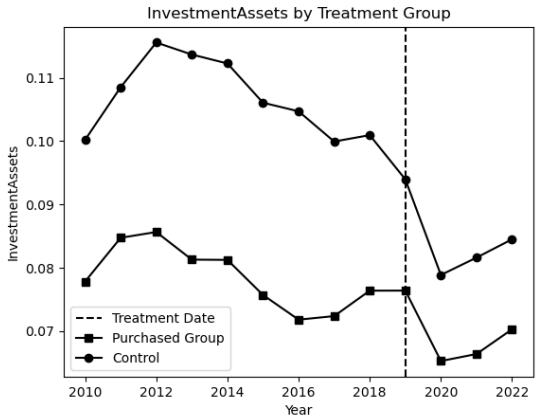


Figure 7.2.8: Dividend Payout Rate

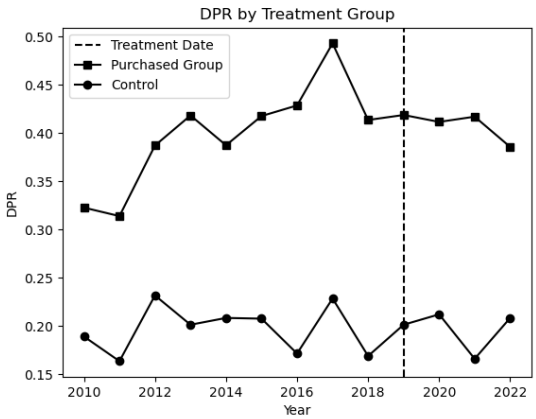
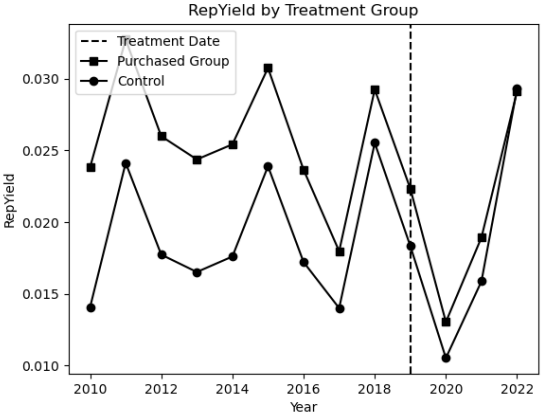


Figure 7.2.9: Repurchase Yield



7.3 Pre-treatment Analysis

7.3.1 Financing Variables Eligible Firms

Parameter	Bond Debt / Total Debt		Bank Debt / Total Debt		Total Debt / Assets	
	Coefficient	*P-value*	*Parameter*	*P-value*	*Parameter*	*P-value*
*2010*Eligible*	-0.035	0.388	-0.041	0.251	0.006	0.767
*2011*Eligible*	-0.013	0.740	-0.066	**0.058**	0.016	0.431
*2012*Eligible*	-0.036	0.351	-0.028	0.427	0.002	0.922
*2013*Eligible*	-0.036	0.306	-0.028	0.378	-0.006	0.759
*2014*Eligible*	-0.034	0.306	-0.032	0.330	-0.007	0.720
*2015*Eligible*	-0.006	0.855	-0.050	**0.098**	-0.007	0.671
*2016*Eligible*	0.016	0.558	-0.076	**0.004**	0.002	0.889
*2017*Eligible*	0.032	0.223	-0.093	**0.000**	0.006	0.623
*2018*Eligible*	-0.003	0.899	-0.065	**0.008**	0.001	0.949
*2019*Eligible*	-0.003	0.781	-0.013	0.265	-0.013	0.167
*2021*Eligible*	0.018	0.129	-0.009	0.626	-0.004	0.605
*2022*Eligible*	0.014	0.381	-0.001	0.951	0.003	0.760

7.3.2 Investment Variables Eligible Firms

Parameter	Asset Growth		ΔEBIT/Assets		ΔCash/Assets	
	Coefficient	*P-value*	*Coefficient*	*P-value*	*Coefficient*	*P-value*
*2010*Eligible*	-0.058	0.093	-0.008	0.291	0.007	0.579
*2011*Eligible*	-0.038	0.193	-0.010	0.138	0.003	0.798
*2012*Eligible*	-0.052	0.123	-0.006	0.341	0.005	0.698
*2013*Eligible*	-0.084	**0.006**	-0.008	0.207	-0.001	0.937
*2014*Eligible*	-0.093	**0.002**	-0.001	0.830	-0.008	0.479
*2015*Eligible*	-0.045	0.184	-0.005	0.433	0.024	**0.046**
*2016*Eligible*	-0.031	0.314	-0.009	0.174	0.006	0.604
*2017*Eligible*	-0.035	0.272	-0.008	0.191	0.012	0.307
*2018*Eligible*	-0.006	0.858	0.005	0.432	0.003	0.766
*2019*Eligible*	-0.032	0.282	-0.003	0.547	0.010	0.404
*2021*Eligible*	0.026	0.343	0.001	0.883	0.005	0.724
*2022*Eligible*	-0.005	0.868	0.004	0.524	0.021	0.063
Parameter	**Investment Exp./Assets**		**Dividend Payout Ratio**		**Repurchase Yield**	
	Coefficient	*P-value*	*Coefficient*	*P-value*	*Coefficient*	*P-value*
*2010*Eligible*	-0.008	0.308	-0.135	0.013	0.006	0.101
*2011*Eligible*	-0.010	0.172	-0.075	0.145	0.005	0.202
*2012*Eligible*	-0.019	**0.015**	-0.110	**0.045**	0.005	0.167
*2013*Eligible*	-0.022	**0.005**	-0.079	0.102	0.008	**0.015**
*2014*Eligible*	-0.020	**0.003**	-0.089	**0.039**	0.007	**0.025**
*2015*Eligible*	-0.023	**0.001**	-0.027	0.593	0.005	0.104
*2016*Eligible*	-0.023	**0.001**	-0.015	0.756	0.005	0.101
*2017*Eligible*	-0.016	**0.001**	-0.008	0.863	0.001	0.589
*2018*Eligible*	-0.015	**0.003**	-0.005	0.908	0.003	0.409
*2019*Eligible*	-0.006	0.116	-0.018	0.648	0.003	0.337
*2021*Eligible*	0.000	0.927	0.027	0.485	-0.001	0.768
*2022*Eligible*	-0.003	0.462	-0.012	0.739	-0.005	0.128

7.3.3 Financing Variables Purchased Firms

Parameter	Bond Debt / Total Debt		Bank Debt / Total Debt		Total Debt / Assets	
	Coefficient	*P-value*	*Parameter*	*P-value*	*Parameter*	*P-value*
*2010*Purchased*	-0.037	0.258	-0.025	0.392	-0.016	0.339
*2011*Purchased*	-0.020	0.528	-0.050	**0.068**	-0.015	0.358
*2012*Purchased*	-0.028	0.369	-0.029	0.298	-0.021	0.167
*2013*Purchased*	-0.048	0.101	-0.007	0.789	-0.029	**0.050**
*2014*Purchased*	-0.045	0.105	-0.008	0.756	-0.025	0.094
*2015*Purchased*	-0.014	0.574	-0.040	0.100	-0.018	0.155
*2016*Purchased*	-0.001	0.953	-0.057	**0.008**	-0.011	0.368
*2017*Purchased*	0.013	0.566	-0.072	**0.001**	-0.005	0.646
*2018*Purchased*	-0.005	0.797	-0.061	**0.002**	-0.005	0.560
*2019*Purchased*	-0.001	0.954	-0.014	0.192	-0.014	0.641
*2021*Purchased*	0.001	0.904	-0.002	0.867	-0.007	0.304
*2022*Purchased*	-0.014	0.379	0.006	0.711	-0.005	0.597

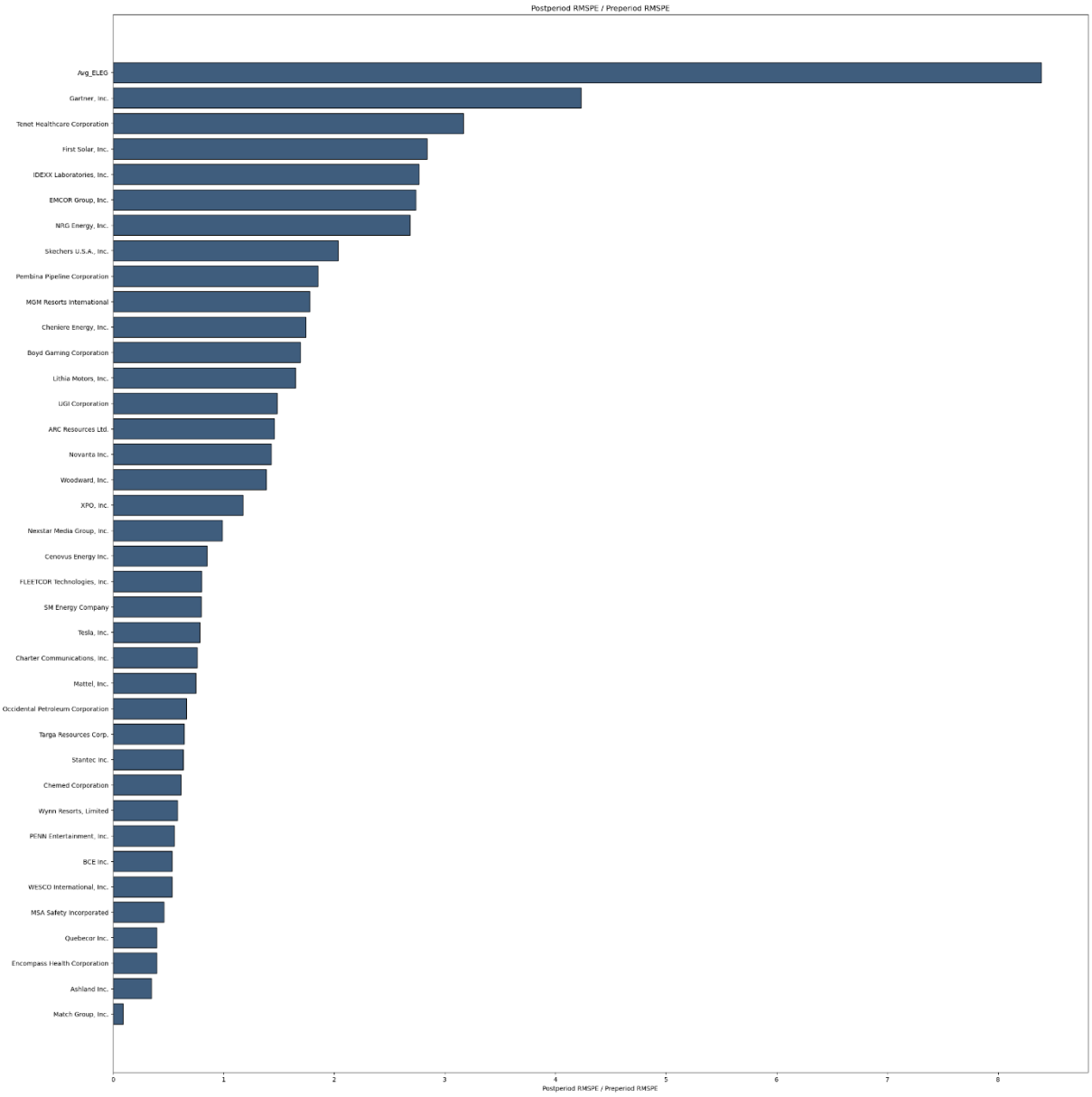
7.3.4 Investment Variables Purchased Firms

Parameter	Asset Growth		ΔEBIT/Assets		ΔCash/Assets	
	Coefficient	*P-value*	*Coefficient*	*P-value*	*Coefficient*	*P-value*
*2010*Purchased*	-0.022	0.454	-0.006	0.391	0.011	0.336
*2011*Purchased*	-0.011	0.682	-0.005	0.381	0.015	0.145
*2012*Purchased*	-0.015	0.603	-0.006	0.295	0.017	0.110
*2013*Purchased*	-0.042	0.111	-0.006	0.268	0.005	0.660
*2014*Purchased*	-0.051	**0.054**	-0.003	0.618	0.001	0.951
*2015*Purchased*	0.009	0.755	-0.001	0.829	0.027	**0.012**
*2016*Purchased*	-0.006	0.817	-0.008	0.160	0.010	0.298
*2017*Purchased*	-0.013	0.636	-0.007	0.202	0.014	0.196
*2018*Purchased*	0.004	0.900	0.006	0.299	0.007	0.467
*2019*Purchased*	0.001	0.966	-0.005	0.267	0.011	0.309
*2021*Purchased*	-0.025	0.362	0.003	0.720	0.012	0.292
*2022*Purchased*	0.008	0.738	0.004	0.496	0.019	0.060

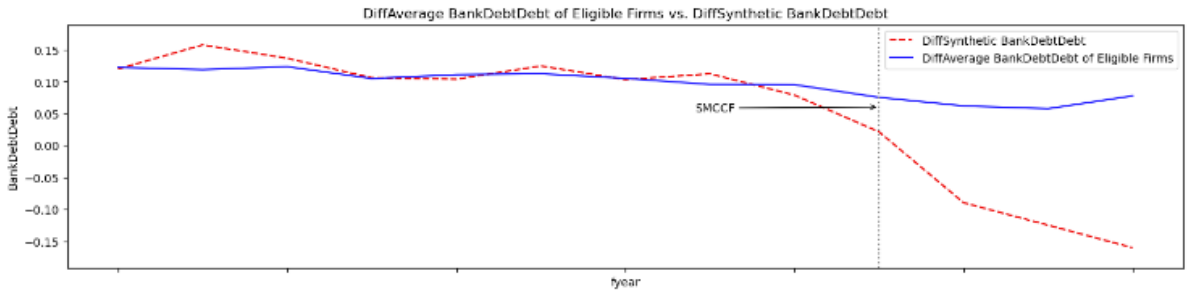
Parameter	Investment Exp./Assets		Dividend Payout Ratio		Repurchase Yield	
	Coefficient	*P-value*	*Coefficient*	*P-value*	*Coefficient*	*P-value*
*2010*Purchased*	-0.008	0.220	-0.078	0.120	0.006	0.073
*2011*Purchased*	-0.009	0.129	-0.034	0.483	0.004	0.274
*2012*Purchased*	-0.015	**0.021**	-0.047	0.370	0.005	0.172
*2013*Purchased*	-0.018	**0.004**	-0.012	0.796	0.005	0.159
*2014*Purchased*	-0.018	**0.002**	-0.030	0.470	0.004	0.220
*2015*Purchased*	-0.017	**0.001**	0.006	0.905	0.003	0.376
*2016*Purchased*	-0.020	**0.000**	0.024	0.596	0.003	0.316
*2017*Purchased*	-0.015	**0.001**	0.045	0.337	0.001	0.811
*2018*Purchased*	-0.012	**0.004**	0.041	0.331	0.000	0.997
*2019*Purchased*	-0.004	0.277	0.013	0.739	0.001	0.734
*2021*Purchased*	-0.003	0.379	0.033	0.382	0.000	0.924
*2022*Purchased*	-0.003	0.430	-0.028	0.442	-0.004	0.280

7.4 Synthetic Controls Eligible

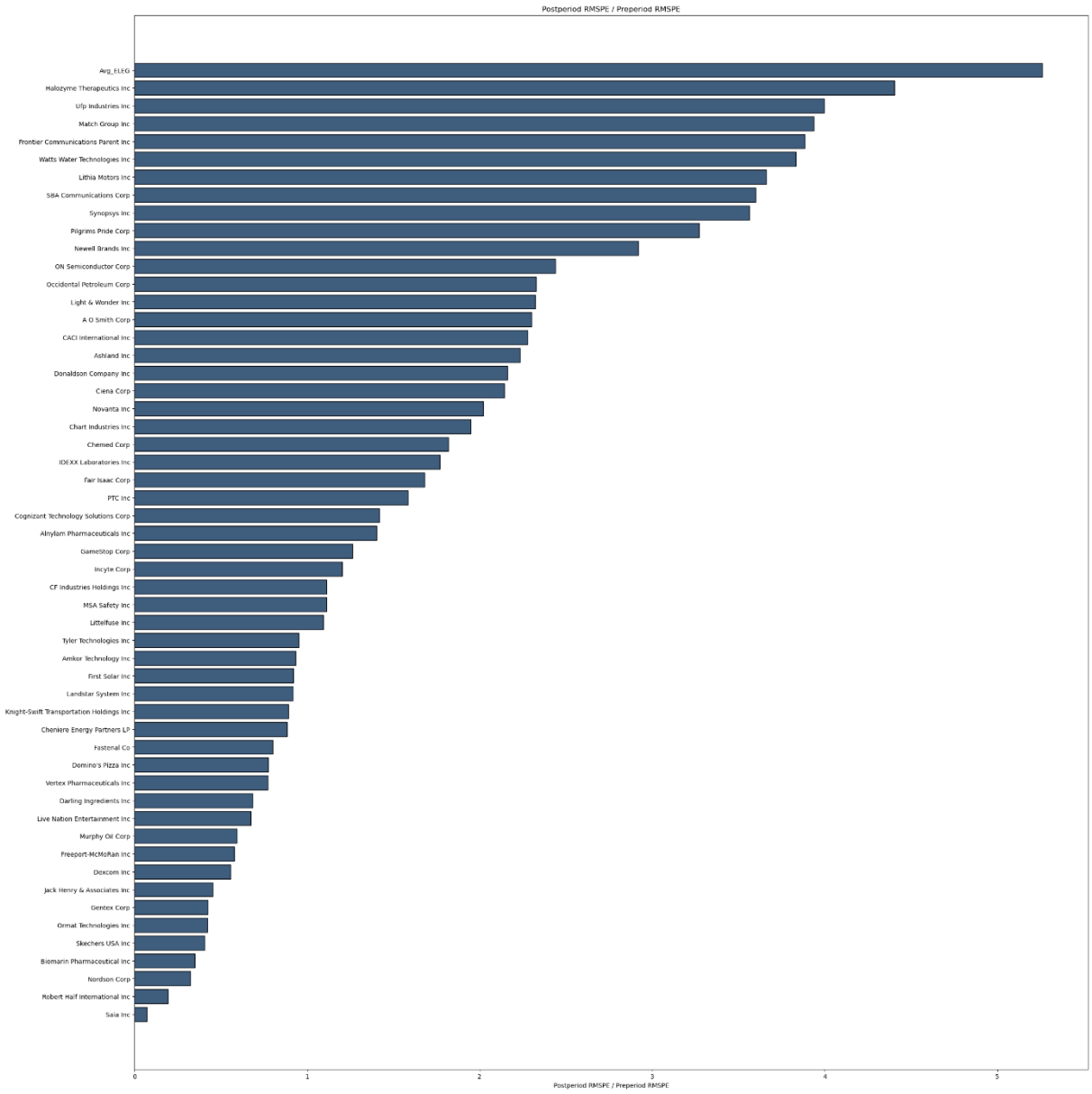
7.4.1 RMSE-ratios for Bank Debt/Total Debt



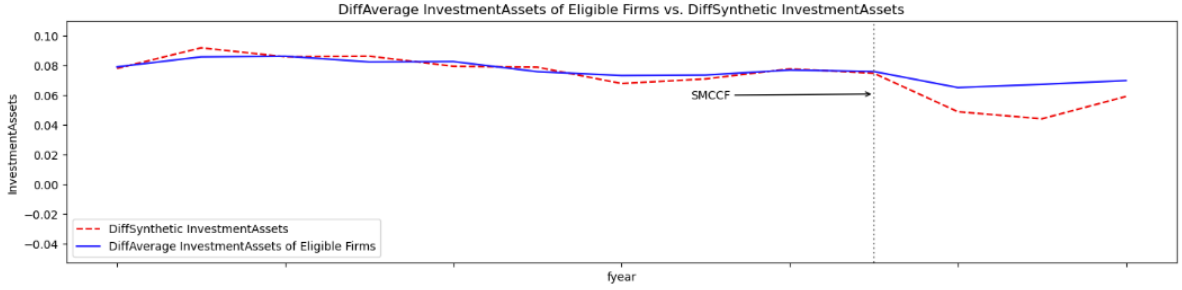
7.4.2 Bank Debt/Total Debt: Plotted trends from differenced synthetic controls



7.4.3 RMSE-ratios for Invested Capital

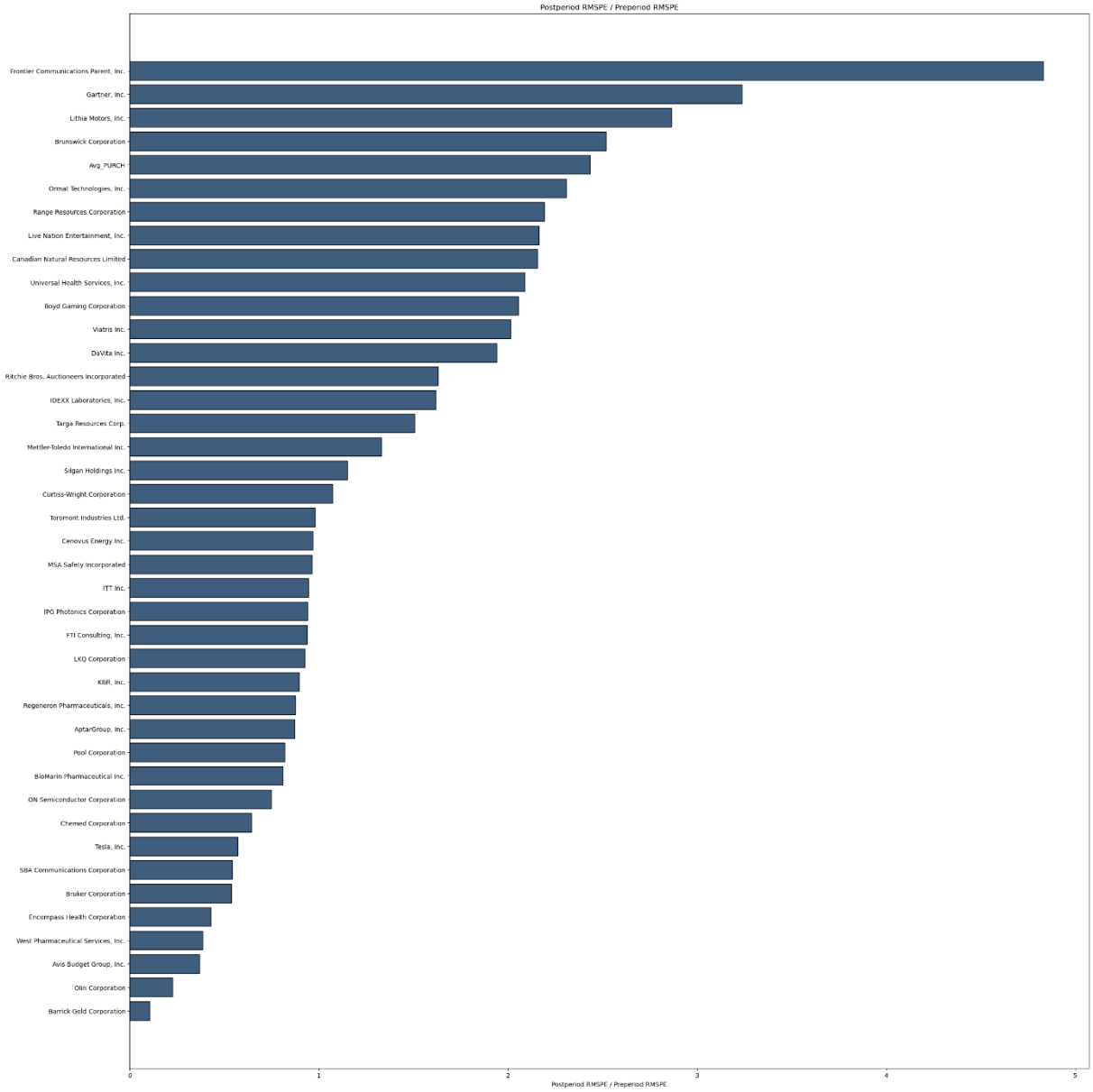


7.4.4 Investment Expenditure/Assets: Plotted trends from differenced synthetic controls

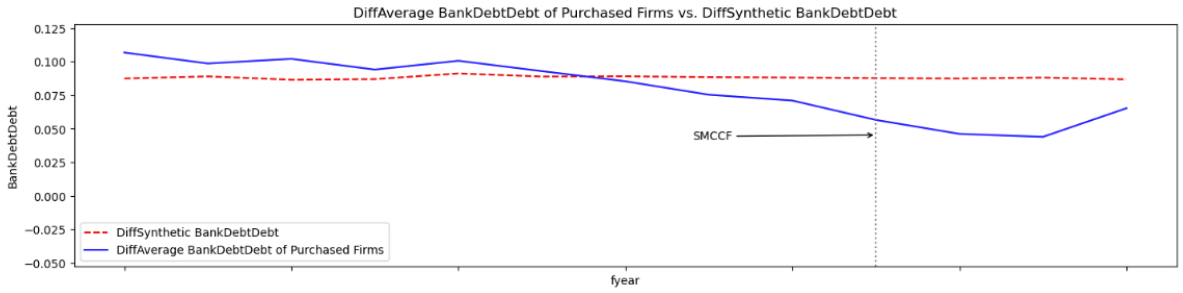


7.5 Synthetic Controls Purchased

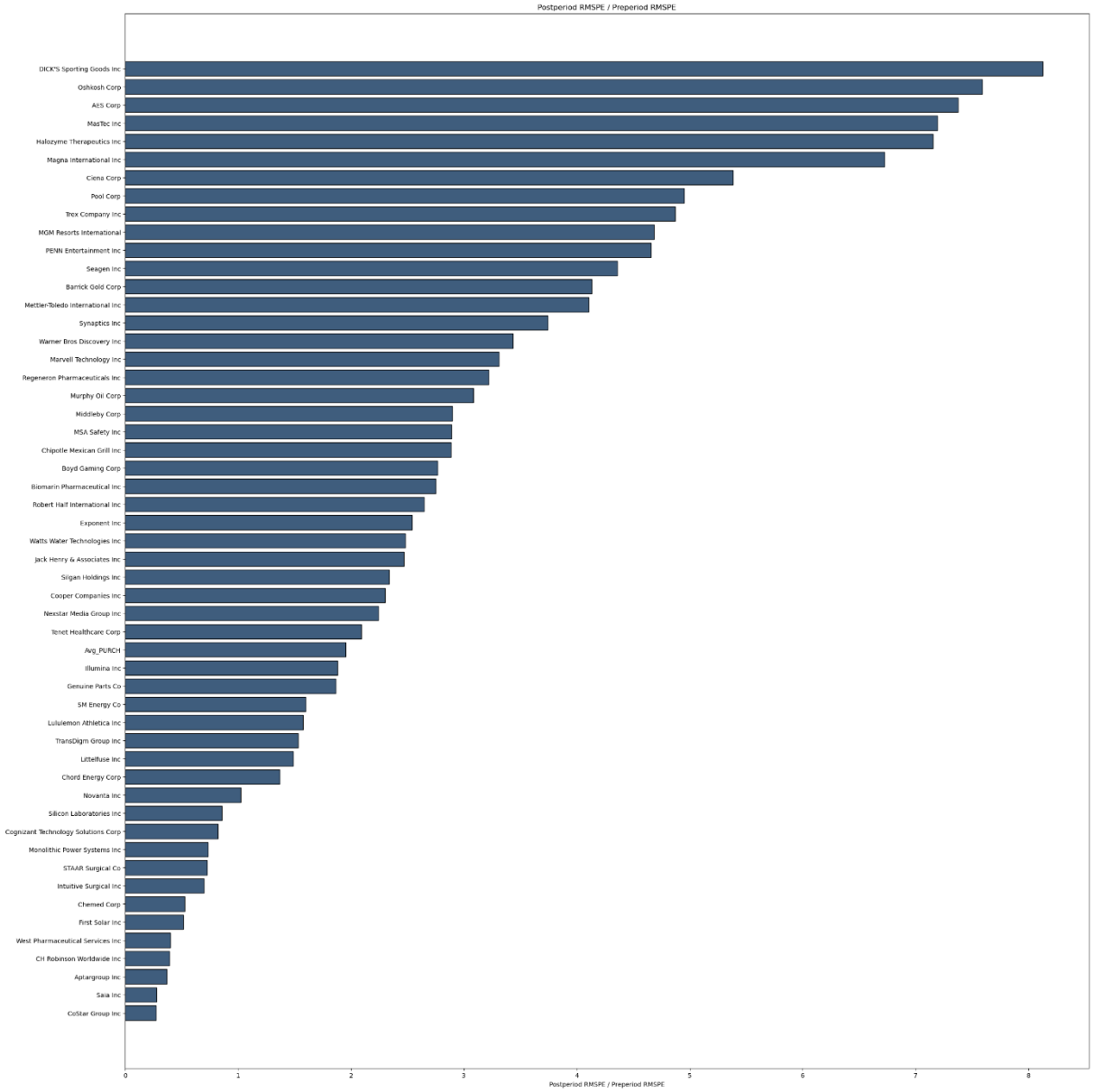
7.5.1 RMSE ratios for Bank Debt/Total Debt



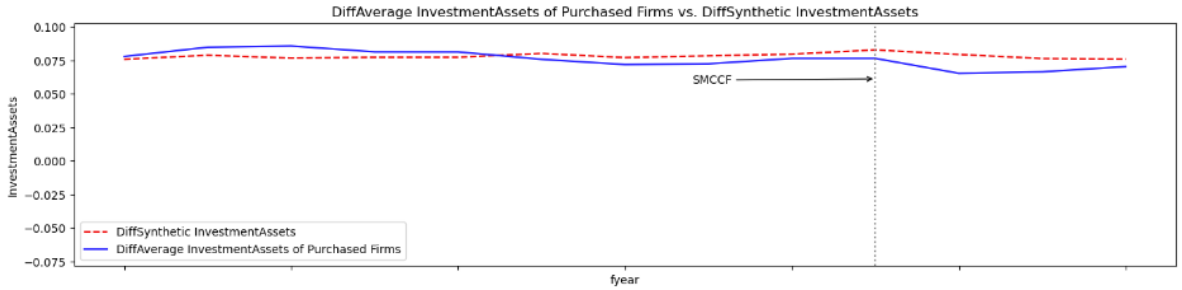
7.5.2 Bank Debt/Total Debt: Plotted trends from differenced synthetic controls



7.5.3 RMSE-ratios for Invested Capital



7.5.4 Investment Expenditure/Assets: Plotted trends from differenced synthetic controls



8. List of Variables

Variable	Source	Definition
Total Debt/Assets	Capital IQ, Compustat North America	Total Debt (Outstanding Credit Lines, Term Loans, Senior Bonds, Subordinated Bonds, Commercial Paper, Capital Leases and Other Debt) divided by Assets
Bond Debt/Total Debt	Capital IQ	Sum of outstanding Commercial Paper, Senior and Subordinated Bonds divided by Total Debt
Bank Debt/ Total Debt	Capital IQ	Sum of outstanding Drawn Credit Lines and Term Loans divided by Total Debt
Asset Growth	Compustat North America	Percentage change of Total Assets
ΔEBIT/Assets	Compustat North America	Change in EBIT divided by Lagged Assets
ΔCash/Assets	Compustat North America	Change in Cash divided by Lagged Assets
Investment Expenditure/Assets	Compustat North America	Sum of CapEx and R&D Expenses in a given period, divided by the Lagged Assets
Dividend Payout Ratio	Compustat North America	Dividends divided by Adjusted Net Income
Repurchase Yield	Compustat North America (Quarterly)	Value of Repurchased Shares divided by Market Value of company
LnAssets	Compustat North America	Natural Logarithm of Total Assets
Price-Book Ratio	Compustat North America	Market Value of the firm divided by its Book Value
PE Ratio	Compustat North America	Market Value of the firm divided by its Earnings
Profitability	Compustat North America	EBITDA divided by Total Assets
Tangibility	Compustat North America	Property, Plant & Equipment divided by Total Assets
Intangibility	Compustat North America	Intangible Assets divided by Total Assets
Investment Grade	EIKON Datastream	Binary variable (1 if the firm has an investment grade rating in the period in question)

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