Uncovering the Undisclosed

Essays in Accounting Using Large-Scale Survey Data of Firm Decision-Makers in Germany

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1 Introduction

In the past, much of the empirical research conducted in the field of accounting has focused on publicly available archival data sources. For example, Bloomfield et al. (2016) show, that from 2003 to 2013, 87 % of articles published in some of the leading accounting journals (namely the *Journal of Accounting Research*, *The Accounting Review*, the *Journal of Accounting and Economics* or *Accounting, Organizations and Society*) relied on archival data, compared to only 10 % of research articles which utilized survey or field case based data. Besides the obvious advantage that archival data is more easily accessible, it has the advantage of showing revealed preferences and is, of course, useful and appropriate for a variety of questions (Stantcheva, 2022). However, the exclusive use of archival data for accounting research also comes with some constraints. First, since firms only need to follow mandatory disclosure regulations for the information put forth in their financial statements, publicly available data sources will be limited in their coverage and scope (Bischof et al., 2021). In the majority of cases, publicly available data will also only be available on an annual or quarterly basis, and for companies with low reporting requirements (such as private companies), its availability can be even more limited. Consequently, much of the research in accounting focuses on large publicly traded companies for which necessary data is publicly available, neglecting a large portion of the corporate population (Angelini and Generale, 2008; Poschke, 2018; Bischof et al., 2021). While this is not a major issue for topics such as financial reporting, corporate governance or executive compensation, it is challenging to contribute to accounting research topics such as managerial accounting, real effects of transparency, or auditing without relying on additional information which is not contained in mandatorily disclosed publications (Bloomfield et al., 2016). Finally, data from publicly disclosed financial statements does not include things such as perceptions, knowledge and beliefs, attitudes and reasoning that are important factors in the managers' decision-making process (Bischof et al., 2021; Stantcheva, 2022).

With this in mind, the purpose of this dissertation is to show how survey data can be used to answer research questions in accounting and how it can overcome some of the drawbacks of archival data. To this end, I proceed as follows: First, chapter 2 describes the survey data used in this dissertation. Chapter 3 demonstrates how survey data can be used to draw inferences about a firms cost structure by exploiting the fact that many firms experienced an unexpected negative revenue shock during the COVID-19 pandemic. The results show that firms with high operating leverage react more dramatically to revenue declines and are less likely to invest or hire in both the short and medium term. Additional liquidity support in the form of government assistance mitigates

this negative effect of operating leverage by reducing investment cancellations and increasing the likelihood of investment in the medium term. By contrast, firms with different levels of operating leverage behave very similarly if they are not facing a sudden drop in sales. The outcomes show that operating leverage is an important determinant of firm flexibility and thus shapes a firm's resilience and risk profile. Past research conducted on the effects of a firms cost structure such as Anderson et al. (2003), Novy-Marx (2011), or Chen et al. (2019) rely on variables from either the income statement such as Selling, General and Administrative Expenses or on variables from the balance sheet such as Total Assets to identify the cost structure of firms. We take another approach and calculate a novel measure for operating leverage by benefiting from the fact that the survey data collected by the German Business Panel asks firms about monthly changes to their revenues and profits. Knowledge about these monthly changes allowed us to identify a firms cost structure by comparing how revenues and profits changed in response to the COVID-19 shock.

Chapter 4 introduces another advantage of surveys, namely the possibility to implement randomized information provision experiments, which are an excellent tool to identify causal relationships (Haaland et al., 2020). To this end, we conduct a large-scale survey experiment to examine whether arguments of fiscal prudence or arguments of luck (or lack thereof) are more successful in changing firm decision makers' attitudes toward the 130 billion stimulus package [1], their future tax expectations, and their willingness to finance the government intervention via increased future tax rates. The results show that statements about fiscal prudence, as opposed to social justice arguments, increase the willingness to pay taxes. We also observe a higher desire to pay taxes the more decision-makers agree with the stimulus. Our results emphasize the importance of fiscal prudence considerations when policy makers motivate tax policy reforms.

In Chapter 5, we exploit the fact that we have more than two years of data at our disposal and simultaneously benefit from the rolling survey structure of the German Business Panel. The key advantage of a rolling survey structure is that it provides us with cross-sectional data at a daily frequency, allowing us to closely track and disaggregate crisis episodes during the COVID-19 pandemic and the Russian-Ukrainian war [2]. The results show that the notion of crises episodes during the COVID-19 pandemic representing a series of recurring events is misleading. There is considerable heterogeneity in the type of shocks, their intensity, and in turn, firm responses to these shocks. We observe that the Early COVID-19 and COVID-19 Lockdown phases exhibit characteristics of a demand shock that remained confined to specific crisis industries directly affected

[1] For further information on the stimulus package, see: `https://www.bundesregierung.de/breg-en/news/konjunkturpaket-1757640`.

[2] An overview of the rolling cross-section design and its application can be found in Faas and Blumenberg (2012).

by lockdown and hygiene restrictions. In contrast to the typical behavior of firms in distress, these firms respond by raising prices above the average and by cutting back investments and hiring compared to "non-crisis" industries. The Late COVID-19 phase represents a crisis episode that shows pronounced marks of supply shocks. At that time, managerial decisions no longer differ between crisis and non-crisis industries and price increases spill over to the entire economy. Firms that experience supply chain disruptions are particularly vulnerable to this and react by raising prices and costs. Finally, the crisis induced by the Russo-Ukraine war resembles a cost shock that amplifies supply chain problems and increased energy costs, forcing firms to reduce investments. Our study shows that a wide range of business decisions required to cope with each crisis episode become transparent once the specific nature of the crisis is taken into account. Careful analysis of demand- and supply-side factors enables policymakers and investors to get a more accurate picture of the environment in which they operate and to find better measures to mitigate the effects of the crisis.

Chapter 6 concludes the dissertation and briefly summarizes the most important findings and implications of the previous chapters. The results are significant for several parties. First, consistent with the objective of this dissertation to highlight how survey data can be used to answer relevant research questions in accounting, each chapter uses a different empirical strategy to draw conclusions from the collected survey data. Second, chapter 3 highlights how differently firms can be affected by a sudden revenue shock depending on their cost structure, which informs policymakers about how government support programs might be designed in the future. In addition, it also helps managers identify the potential advantages and disadvantages of using operating leverage. Chapter 4 helps policymakers strategically frame the motivation for potential future tax policy changes by showing that firms are guided much more by arguments of fiscal prudence than by arguments of social fairness. Finally, Chapter 5 shows how survey data collected by the German Business Panel can help track the current business climate of German firms.

2 The Data

For the empirical analysis in the following chapters we use data gathered by the German Business Panel, a long-term survey project funded by the German Research Foundation as part of the Collaborative Research Center "Accounting for Transparency". Its objective is to systematically collect expectations, perceptions, and opinions of decision makers of all legally independent businesses active in Germany. Except for phone interviews carried out irregularly and at smaller scale, the survey is conducted predominantly online, allowing for quick data processing. Thus, the survey responses yield timely insights into the current situation of German businesses. Beyond this short introduction of the data, Bischof et al. (2022b) provide a detailed description of the survey, its structure, and scope.

Since its beginning in 2020, the German Business Panel has collected responses from more than 15.000 or about half of a microcensus (0.5 %) of all individual firms active in Germany. The German BusinessPanel's list of contacts includes business addresses from various sources including professional or industry associations, web scraping, and publicly available databases. These firms are predominantly contacted via e-mail and invited to voluntarily participate in the survey. Survey invitations are sent out on a workday frequency, which allows to capture macroeconomic trends and events at high frequency. Answers given to the German Business Panel may be linked to external sources under data protection compliance, provided that the respondents have given their consent. Among the survey participants, about 90 % hold positions as CEO, owner, or board member (Bischof et al., 2022b), evincing that the GBP indeed reaches key decision makers of German firms.

So far, the German Business Panel has fielded five survey rounds that are structured as rolling cross sections in half-yearly intervals. Accordingly, each firm is contacted every six months unless it has declared to drop out of the panel. The first survey was conducted from July 6 to October 3, 2020, the second from November 16, 2020 to June 24, 2021 (by telephone until April 16, 2021), the third from July 1, 2021 to December 28, 2021, the fourth from December 29, 2021 to June 29, 2022, and the fifth survey round launched on July 26, 2022. The German Business Panel complements its data with industry classification codes that follow the Klassifikation der Wirtschaftszweige (WZ 2008) of the German Federal Statistical Office. This categorization scheme is compatible with the Statistical Classification of Economic Activities in the European Community (Nomenclature statistique des activités économiques dans la Communauté européenne (NACE) Revision 2). In addition, regional indicators are assigned to all respondents, allowing for an identification of the state in which each firm's headquarter is located.

3 Operating Leverage and Corporate Responses to the COVID-19 Crisis

3.1 Introduction

Many firms experienced an unexpected negative revenue shock during the COVID-19 pandemic, and corporate flexibility is a key determinant of how firms can cope with such an unanticipated shock (e.g., Fahlenbrach et al., 2020; Barry et al., 2021). However, in contrast to companies with low operating leverage, companies with high operating leverage have a large proportion of costs that they cannot reduce immediately, at least not proportionally, if revenues suddenly decline or even stop (e.g., in the case of government-imposed closures). The continuing incurrence of these fixed costs leads to substantial operating cash outflows and can therefore result in a more severe liquidity shortage than for companies with low operating leverage. During a crisis, such a shortage is amplified by the lack of alternative ways of raising liquidity because the sale of assets often entails fire sale discounts (Shleifer and Vishny, 2011) and the raising of additional debt capital becomes prohibitively costly (Fazzari et al., 1988).

We predict that high operating leverage is particularly likely to lead to actions that reduce liquidity outflows (e.g. postponing or cancelling investments or laying off employees) when revenue suddenly drops. This effect could be offset because companies with high operating leverage tend to adopt more conservative financial policies, meaning that highly levered firms have been shown to have greater liquidity reserves for bridging shortages of liquid resources (Almeida et al., 2011; Kahl et al., 2019), muting the need for drastic short-term reactions. At the same time, substantial government aid programs offered during the crisis have compensated for the high liquidity outflows of firms with a large portion of fixed costs. Thus, we secondly analyze whether the additional liquidity relief provided in the form of government support is able to reduce adverse crisis behavior of high operating leverage firms. Such analysis enables us to identify whether any differential response between high and low leverage firms during the crisis is indeed driven by a lack of ample liquidity. Third, we examine whether operating leverage influences crisis and planning behavior by firms that grow despite the emergence of the Covid-19 crisis. We expect firms not to behave differently immediately following the outbreak of the pandemic depending on their level of operating leverage.

Overall, we find evidence supportive of the role of operating leverage for firm decision making given a sudden slump in revenues. When exposed to a negative revenue shock, we observe that

both the likelihood to invest in the short and medium term of low operating leverage firms is higher by 8% and 7% respectively compared to firms with high operating leverage. We further show that low operating leverage firms hire 18% more in the short term and 7% more in the medium term compared to firms with high operating leverage. Additional liquidity in form of governmental support weakens the adverse reaction of high operating leverage firms by reducing the probability of investment cancellations and by increasing the probability that high operating leverage firms hire additional personnel in the medium term. Finally, if firms are not affected by a negative revenue shock during the crisis, their immediate response to the outbreak of the pandemic does largely not depend on their level of operating leverage. Yet, high operating leverage firms are on average more likely to invest in the short and medium term given a growth in revenues and no unexpected liquidity bottleneck.

We contribute to two streams of prior literature. First, we build on prior studies of the determinants and consequences of operating leverage (e.g., Novy-Marx, 2011). While operating leverage plays an important role in many theories of firm behavior and firm value (going back at least to Lev, 1974), there is little empirical evidence on its actual role in shaping managerial decisions. Previous evidence focuses on the relation between operating leverage and financial leverage (Reinartz and Schmid, 2016; Serfling, 2016; Chen et al., 2019; Kahl et al., 2019). To investigate the relation between operating leverage and managerial decision-making in response to a negative revenue shock we introduce a novel measure for operating leverage that is applicable also to small or privately held firms, because we do not rely on publicly available information.

Second, we add to studies of corporate behavior during a crisis, and in particular during the recent COVID-19 pandemic. Several factors have been shown to shape the crisis performance especially of public firms, for instance, the reliance on international trade especially with China (Ramelli and Wagner, 2020) or more generally on global supply chains (Ding et al., 2021), a business model that is immune to social distancing (Pagano et al., 2020), and the attitude towards employees, i.e., workplace flexibility (Lester et al., 2021; Barry et al., 2021). Our paper is closest to previous literature on the role of financial flexibility during a crisis (Fahlenbrach et al., 2020). We expand this literature by focusing on operating leverage as one specific aspect of financial flexibility that often remains unobservable. We also extend the analysis to a private-firm setting and can thus observe corporate behavior absent from capital market pressure.

This study is structured as follows. In Section 3.2, we describe our sample, while in Section 3.3 we present our novel classification method of operating leverage, apply it to the data, and pro-

vide validation checks. In Section 3.4, we present our findings concerning the effect of operating leverage on firm behavior when confronted with negative or positive revenue shocks, respectively. This section also includes robustness checks and additional evidence from a follow-up survey. We conclude in Section 3.5.

3.2 Data

Our analysis rests on two survey datasets, collected by the German Business Panel from July 6, 2020, to the end of October 2020, and from November 16, 2020, to the end of June 2021. The surveys examine various challenges that German firms faced during the Corona crisis, with the respondents ranging from owners of small and medium sized businesses to CEOs of large listed corporations[3].

The survey contains data on firm characteristics including industry, legal form, revenue and the number of employees subject to social security contributions. Moreover, the survey asks firm-decision makers about the extent to which key operating figures like revenue, profit or the number of employees of the respective firms were affected by the COVID-19 crisis. Beyond that, firm decision makers are invited to specify their expectations about the general economic development (e.g., if and how quickly businesses will recover), their scheduled investments, hiring plans in the short and medium term as well as to provide information on the take-up of government relief programs by their firms.

Whereas the overall sample consists of 19,831 participating firms in the first survey wave, we restrict our analysis to 6,786 entities for which all relevant data is available. The sample in the second survey wave consists of 6,411 fully completed interviews. Table A.2 in the Appendix provides a detailed overview of the sample selection procedure for both survey waves. In order to verify the representativeness of our data, we benchmark key accounting figures of the survey sample against all German entities available in the Orbis database for 2019. As outlined in detail within Appendix A.3, there is no statistically significant difference in the mean of the overall size of the workforce, total assets, equity ratio, and yearly revenue between our sample and the remaining German firms listed in the Orbis-database. Thus, our sample does not systematically differ with respect to key characteristics from the overall population of German firms. While our sample is not systematically different from Orbis, we nonetheless need to rely on survey data and cannot use only the data available from Orbis, because many of the variables needed for our analysis are not available for small or private firms. Moreover, while publicly available data show disclosed actions,

[3]Refer to Appendix A.1 for a detailed summary of the characteristics of the survey respondents.

they do not provide information about future plans or beliefs of corporate decision makers.

3.3 Research Design

In this section, we introduce our identification strategy and our measure of operating leverage. In addition to illustrating its design, we validate our research approach with data from the second wave of the GBP survey. Our measure of operating leverage utilizes the relationship between a firm's percentage changes in monthly revenue ($\Delta Revenue$) compared to its changes in monthly profit ($\Delta Profit$).

3.3.1 Identification

We use the COVID-19 crisis in order to study how and why a firm's operating leverage choice impacts its response to an unanticipated revenue shock. We assume that companies have chosen their optimal level of operating leverage prior to the emergence of the COVID-19 crisis and that they are not able to significantly adjust their cost structure within a short time window. Rather, any adjustment of a company's long-term cost structure and any reduction of sticky resources is a time-consuming process. This allows us to compare variation in the behaviour of firms that are hit by a comparable drop in revenues, but differ in their chosen levels of operating leverage while controlling for other observable characteristics like industry membership, the company's size, their expectation on the general economic development, and their levels of financial leverage. Thus, our identification rests on cross-sectional variation in the direction and magnitude of the revenue shock imposed by the COVID-19 pandemic in combination with firms' pre-crisis established levels of operating leverage. Given the exogenous nature of this shock and the fact that there are firms which were negatively impacted by the pandemic as well as a number of firms which continued to grow, it provides a valuable research setting for the analysis of our research question.

Since the cost structure of firms and the impact of the COVID-19 crisis on corporate revenues vary widely by industry, we confine our analysis to a within-industry comparison of firms. In order to ensure that heterogeneity in the response variables is indeed driven by differences in firms' operating leverage and not by variation in the severity of the revenue shock following the COVID-19 pandemic, we additionally control for $\Delta Revenue$ in our analyses. Consequently, we identify differences in the response variables among firms with varying degrees of operating leverage conditional on a similar shock to revenues.

Previous literature establishes a relationship between the level of a firms operating leverage

and its financial policies (Chen et al., 2019; Kahl et al., 2019). Accordingly, firms with a higher proportion of fixed cost are more likely to have lower financial leverage rations than firms with lower fixed costs (Kahl et al., 2019). This is attributable to the fact that companies with high fixed costs accumulate larger levels of cash and have smaller amounts of debt compared to their low fixed costs peers, enabling them to compensate for a greater decline in their cash flows when sales are low. To isolate the effect of a firm's cost structure choice, we additionally control for monthly changes in the liabilities ($\Delta Liabilities$) of a firm.

To strengthen the validity of our findings, we complement our analysis by assessing the impact of operating leverage on firms' crisis responses through two different matching procedures. These matching procedures reduce potential bias induced by systematic differences in the data's covariates. At the same time, the methods alleviate concerns of functional form misspecification. While the OLS specification in our main analyses presumes a linear relationship between the response variables and our classification into the different groups of operating leverage, the matching procedures are not bound to this restrictive assumption[4].

Thus, we firstly implement a 5-nearest neighbor matching (NNM) that estimates an average treatment effect by identifying for each observation from the treatment group a set of 5 observations from the control group that experience a comparable revenue change, while holding industry membership and size constant. Secondly, propensity score matching (PSM) assigns observations from the treatment group to observations from the control group depending on their estimated likelihood of being treated. Together, these tests alleviate potential doubt that our analysis exhibits endogeneity or misspecification (Shipman et al., 2017).

Finally, we repeat these matching procedures using a subsample of firms, for which equity ratio data is available in the Orbis-database at pre-pandemic times. Although we are controlling for a firm's change in liabilities during the crisis within our main specification, we aim to rule out that financial leverage ratios established prior to the emergence of the pandemic might be impairing our results and inferences.

3.3.2 Defining a measure for operating leverage

Following Lev (1974), we define operating leverage as the ratio of fixed costs c_i^f compared to total variable costs, i.e. $c_i^v x_i$, with c_i^v indicating the firm's variable production costs per unit sold and x_i indicating its sales quantity. A high degree of operating leverage refers to a large proportion

[4]Although higher-order terms in the regression might represent one way to mitigate issues of functional form misspecification, Shipman et al. (2017) argue that such an approach does not verify the nonexistence of model misspecification.

of fixed costs relative to variable costs ($\frac{c_i^f}{c_i^v x_i}$). For deriving our regression we start with a simple definition of profit, $\Pi_i(\cdot)$, for any given firm i:

$$\Pi_i(x_i) = \underbrace{[p(x_i) - c_i^v]x_i}_{revenue_i} - c_i^f, \tag{1}$$

where $p(\cdot)$ represents the inverse demand function. Application of the product rule to calculate the first derivative with respect to sales quantities yields:

$$\frac{\delta \Pi_i(x_i)}{\delta x_i} = \underbrace{\frac{\delta p(x_i)}{\delta x_i} x_i + p(x_i)}_{\text{Revenue Effect}} - c_i^v, \tag{2}$$

where fixed costs disappear from the equation as they are not dependent on marginal changes of the sales quantity. Replacing the marginal change in profits, $\frac{\delta \Pi_i(x_i)}{\delta x_i}$, by the relative change in profit for the last year, $\Delta Profit$, and replacing the marginal change in revenue, $\frac{\delta p(x_i)}{\delta x_i} x_i + p(x_i)$, by the relative change in revenue, $\Delta Revenue$, we argue that differences in changes of revenue and profit between two otherwise identical firms are largely explained by disparities in their operating leverage. Consider, for example, two otherwise identical firms which both experience a positive shock to revenue of similar magnitude. A firm with low (high) operating leverage will experience a larger (smaller) average increase in total variable costs and therefore generate a smaller (higher) increase in profits just because its variable costs per unit c_i^v are larger (smaller). In case of a negative revenue shock the effects reverse.

In a perfect world with marginal changes of profits and revenues, (2) would describe the regression equation. However, several modifications are necessary. First, as can be inferred from (2), the overall revenue effect consists of a quantity and a price effect. During the pandemic, business-specific cycles did not only cause changes in sales quantities, but industry-related price changes were observed, too. In order to mitigate this concern, we constrain our analysis to a comparison of firms within one industry. As the potential for fixed cost management varies among firms of different sizes, we additionally control for the $numberofemployees$ and for the firms $revenue$ in the regression. Finally, as our data reflect changes over time that are not taken into account in (2), we add $Month$ to consider timing issues resulting from the time span the survey was in the field.

For the design of our measure, we approximate operating leverage with the variables $\Delta Revenue$ and $\Delta Profit$ which quantify the changes in revenue and profits in percentage terms. In doing so, we split the construction of our measure into two stages. First, we regress $\Delta Profit$ on $\Delta Revenue$

while controlling for size, industry classification and the response date to calculate the expected change in profits, $\Delta\widehat{Profit}$, given the realized shock to revenues, $\Delta Revenue$, for a given firm within its industry and size classification:

$$\begin{aligned}\Delta\widehat{Profit}_i = \hat{\beta}_1 \Delta Revenue_i + \hat{\beta}_2 Industry + \hat{\beta}_3 Revenue_i + \hat{\beta}_4 \Delta Revenue_i * Industry \\ + \hat{\beta}_5 \Delta Revenue_i * Revenue_i + \hat{\beta}_6 + Employees_i + \hat{\beta}_7 Month + \hat{\epsilon}_i,\end{aligned} \tag{3}$$

where *Month* represents the month in which each respondent completed the survey, *Industry* represents the 2-digit industry classification from the German Statistical Office, *Revenue* is the total amount of sales generated in the fiscal year 2019 and *Employees* represents the number of employees at the end of the fiscal year 2019. We use months as our unit of time since respondents were asked about the monthly changes in revenues and profits as compared to January 2020. We additionally include two interaction terms, $\Delta Revenue$*$Industry$ and $\Delta Revenue$*$Revenue$, to account for the fact that different industries and firms of different size have different cost structures and sales development. This allows us to identify the average ability of firms within each individual industry and size combination to convert sales into profits.

In the second stage, we utilize the firm specific error term $\hat{\epsilon}_i$ to identify whether the realized change in profit for any given individual firm is higher or lower compared to the average change in profits within its industry and size classification. Following our argument from above, firms with a negative shock to revenue ($\Delta Revenue < 0$) whose profits decreased less (more) than predicted ($\hat{\epsilon}_i > 0$) have more (less) variable costs as compared to their industry and size class and, as such, are categorized as firms with *below-* (*above-*)average operating leverage. Firms with a positive revenue development ($\Delta Revenue > 0$) whose profits increased less (more) than predicted have more (less) variable costs relative to their competitors that operate in the same industry and that are of comparable size and, as such, are categorized as having *below-* (*above-*)average operating leverage.

To refine our analysis of the effect of operating leverage on our outcome variables, we further differentiate firms with *above-average* operating leverage into the two distinct subcategories *High* and *Very High*, with the degree of operating leverage increasing in the vertical distance to the regression line. This approach allows us to evaluate the predictions by Kahl et al. (2019), who argue that high fixed cost firms, which only experience low sales growth, should not scale down investments more than industry peers with lower fixed costs because they have built up a liquidity buffer for times of weak business development. Accordingly, we expect effect sizes to increase in

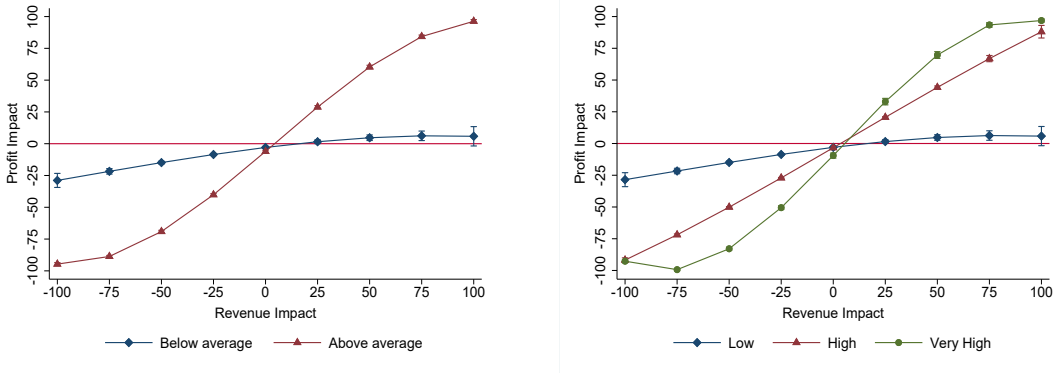
the degree of operating leverage.

Conceptually, firms that experienced a positive revenue shock and exhibit very high operating leverage will realize higher profits such that the difference between $\Delta Profit$ and $\Delta\widehat{Profit}$ will be large and positive. If $\Delta Revenue < 0$, firms with very high operating leverage will experience a much steeper decline in profits compared to the average firm in the industry. Accordingly, we apply the following classification threshold:

$$\text{Operating leverage} = \begin{cases} Very\ High & |\hat{\epsilon}_i| \geq \frac{\sigma}{2} \\ High & \frac{\sigma}{2} > |\hat{\epsilon}_i| \end{cases}$$

The standard deviation of the error term $\hat{\epsilon}$ is denoted by σ. We choose one-half of a standard deviation to approximately cut the sample of above-average operating leverage firms in half. For firms in the category $High$ the vertical distance to the regression line is smaller than one-half of the standard deviation of $\hat{\epsilon}$, whereas the distance to the regression line for firms in the category $Very\ High$ is larger than one-half of a standard deviation of $\hat{\epsilon}$.

Figure 3.1: Degrees of Operating Leverage



(a) Below-average vs. Above-average

(b) Below-average vs. High vs. Very High

Figure 3.2a shows the difference in $\Delta Profit$ between firms with high and low operating leverage for different levels of $\Delta Revenue$. For illustrative purposes, we utilize a cubic trend in $\Delta Revenue$. In line with our argumentation, profits of companies with high operating leverage are more sensible to further declines in revenues than those of firms with low operating leverage. Conversely, firms with high operating leverage benefit more from an increase in sales compared to companies with low operating leverage. Figure 3.2b illustrates this difference after further differentiating the degree of operating leverage, confirming the previous observation on a more granular level.

3.3.3 Descriptive statistics by type of revenue shock

After classifying respondent firms into their respective categories of operating leverage, we provide descriptive statistics for the full sample and the groups of firms with varying degrees of operating leverage. This section only discusses differences in firm characteristics; crisis responses and future planning choices are considered in Section 3.4. The descriptive statistics are split into two separate Panels depending on whether firms experienced a negative revenue shock (Panel A) or continued to grow during the crisis (Panel B). For descriptive statistics of the more granular differentiation, please refer to Table 3.4 and Table 3.7 in Section 3.4.1 and Section 3.4.3, respectively.

Panel A of Table 3.1 provides descriptive statistics for firms that experienced a decrease in revenues resulting from the crisis. For the entire sample of 4,873 companies, we find that firms, on average, lost 0.87 pp. of profit for a 1 pp. decline in revenues. In comparison, companies with above-average operating leverage lost 1.26 pp. of profit for every 1 pp. decline in sales − a difference of 45% compared to the entire sample. By contrast, firms in the below-average operating leverage category fared significantly better, losing only 0.34 pp. of profit for each 1 pp. reduction in revenues. Similar patterns emerge when looking at the changes in liquidity with above-average operating leverage firms experiencing a significantly larger drop in liquidity during the crisis months. Noteworthy, firms with a higher share of fixed cost rely heavier on the uptake of liabilities to endure the crisis. Their increase in debt is 88% higher than the change in liabilities for below-average operating leverage firms.

Panel B of Table 3.1 outlines descriptive statistics for firms which experienced a growth in revenues during the crisis. The full sample of 1,913 firms on average turns a 1 pp. increase in revenues into a 0.68 pp. increase in profits. Above-average operating leverage firms were even more successful in turning the positive revenues into profits by generating a 1.12 pp. increase in profit for each 1 pp. increase in sales − an increase of almost 70% compared to the average firm. In comparison, below-average operating leverage firms significantly struggled to extract profits from their growth in revenues. On average, profits only increased by 2.42% compared to an average increase in sales of about 34%. Further, we find that firms with below-average operating leverage experienced a much smaller increase in liquidity from the positive shock to revenues compared to the above-average group. These findings suggest that below-average operating leverage firms incur a much higher cost to service the increased demand relative to above-average operating leverage firms. Note that for the whole sample of firms the median number of workforce size per firm amounts to 5 employees. Thus, we are not only observing crisis responses by large public companies, but

extend such analysis to privately held firms for which cost information is typically not disclosed.[5]

[5]Previous literature uses information on a firm's SG&A expenses or COGS in order to proxy for its degree of operating leverage (see, e.g. Chen et al. (2019) for a review of these mainstream measures of leverage). In our sample of 6,786 firms, which comprises a significant portion of small and medium sized firms, COGS data for the financial year of 2019 is publicly available only for 9 firms.

Table 3.1: Descriptive Statistics

Panel A: Negative Revenue Shock

	Full sample			Below-average operating leverage			Above-average operating leverage			Mean diff.
	Mean	Median	Std.	Mean	Median	Std.	Mean	Median	Std.	t-statistic
Firm characteristics										
Revenue 2019	12,474,815	650,000	188,954,671	14,912,014	650,000	209,085,234	9,913,269	599,000	165,180,170	0.92
Δ Revenue	−43.64	−40.00	28.75	−36.46	−30.00	25.64	−51.19	−45.00	29.88	18.50***
Δ Profit	−37.83	−28.00	37.50	−12.35	−10.00	21.94	−64.58	−70.00	31.31	67.69***
Δ Liquidity	−24.42	−20.00	34.98	−14.06	−10.00	30.28	−35.29	−31.00	36.27	22.13***
Δ Liabilities	3.96	0.00	28.99	2.8	0.00	23.31	5.18	0.00	33.92	-2.87***
No. of employees	44.53	5.00	424.66	45.72	6.00	360.30	43.26	5.00	483.44	0.20
Δ Employees	−4.66	0.00	29.70	−3.48	0.00	25.12	−5.91	0.00	33.81	2.86***
Crisis responses										
Tax-related gov. aid	0.43	–	–	0.38	–	–	0.49	–	–	-8.02***
Non-tax gov. aid	0.69	–	–	0.65	–	–	0.73	–	–	-6.71***
Investm. postponed	0.28	0.10	0.34	0.24	0.04	0.33	0.32	0.20	0.35	-7.48***
Investm. canceled	0.19	0.00	0.30	0.14	0.00	0.26	0.24	0.02	0.33	-10.92***
Layoffs	0.23	–	–	0.19	–	–	0.26	–	–	-5.87***
Price increases	0.24	–	–	0.23	–	–	0.25	–	–	-1.77*
Future planning										
Investm. short term	0.37	–	–	0.41	–	–	0.33	–	–	5.62***
Investm. medium term	0.53	–	–	0.57	–	–	0.49	–	–	6.04***
Hiring short term	0.25	–	–	0.29	–	–	0.20	–	–	7.40***
Hiring medium term	0.41	–	–	0.44	–	–	0.38	–	–	4.79***
N	4,873			2,496			2,377			

Continued on next page.

Table 3.1 - Continued

Panel B: Revenue growth

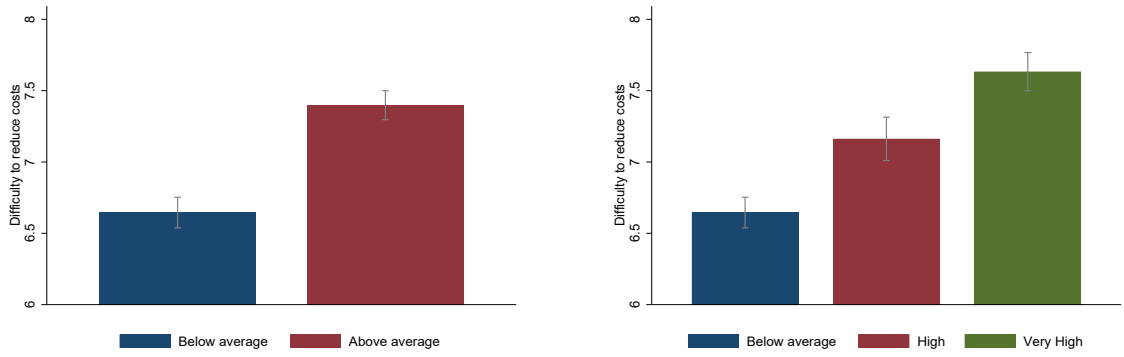
	Full sample			Below-average operating leverage			Above-average operating leverage			Mean diff.
	Mean	Median	Std.	Mean	Median	Std.	Mean	Median	Std.	T-statistic
Firm characteristics										
Revenue 2019	12,049,467	650,000	203,009,111	14,856,812	650,000	265,321,982	9,958,176	650,000	139,670,307	0.52
Δ Revenue	34.55	20.00	31.17	34.01	22.00	28.16	34.95	20.00	33.22	-0.65
Δ Profit	23.46	11.00	36.49	2.42	1.00	25.44	39.05	23.00	35.62	-24.99***
Δ Liquidity	25.41	15.00	37.83	13.41	6.00	33.96	34.15	20.00	38.11	-12.24***
Δ Liabilities	13.64	0.00	36.95	10.85	0.00	31.61	15.71	0.00	40.34	-2.85***
No. of employees	61.90	6.00	875.88	82.84	6.00	1,194.16	46.34	7.00	527.28	0.90
Δ Employees	16.68	0.00	35.54	14.00	0.00	32.44	18.67	0.00	37.57	-2.85***
Crisis responses										
Tax-related gov. aid	0.21	–	–	0.25	–	–	0.18	–	–	3.62***
Non-tax gov. aid	0.34	–	–	0.39	–	–	0.31	–		3.95***
Investm. postponed	0.12	0.00	0.25	0.14	0.00	0.27	0.11	0.00	0.24	2.97***
Investm. canceled	0.06	0.00	0.18	0.07	0.00	0.19	0.06	0.00	0.17	1.35
Layoffs	0.07	–	–	0.08	–	–	0.06	–	–	1.06
Price increases	0.19	–	–	0.21	–	–	0.18	–	–	1.34
Future planning										
Investm. short term	0.58	–	–	0.55	–	–	0.61	–	–	-2.54**
Investm. medium term	0.68	–	–	0.66	–	–	0.70	–	–	-2.06**
Hiring short term	0.49	–	–	0.48	–	–	0.50	–	–	-0.92
Hiring medium term	0.58	–	–	0.56	–	–	0.59	–	–	-1.50
N	1,913			814			1,099			

This table presents descriptive statistics of the variables used in the cross-sectional regressions. Panel A provides this data for firms experiencing a negative revenue shock. The same information is provided for firms with a positive revenue development in Panel B. *Revenue 2019* and *No. of employees* are denoted in absolute terms. Variables expressing relative changes (indicated by Δ) range from -100% to 100%. *Investm. postponed and Investm. canceled* range from 0 to 1. For dummy variables the mean is shown only. The last column provides the t-statistic for testing the mean difference between the groups classified as having below-average or above-average operating leverage. Refer to Section 3.3 for a detailed description of our classification procedure and to Appendix A4 for a comprehensive summary of all variables. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

3.3.4 Validation

To validate, that we indeed correctly capture operating leverage with our novel measure, we draw on additional data from the second Corona survey conducted by the GBP. We benefit from a new question included in the follow-up survey, which asks firms about their perceived difficulty in reducing their costs over a 3-month period. The variable is measured on a 11-point Likert scale ranging from 0 (very easy) to 10 (very hard). Since this question specifically addresses a firm's flexibility with respect to its cost structure, we conclude that companies which perceive the task of scaling down costs to be more difficult have a higher portion of fixed, long-term commitments. We treat the new data as a cross-section and classify firms from the second wave according to our measure of operating leverage outlined in the previous section.

Figure 3.2: Difficulty in Reducing Costs Depending on the Level of Operating Leverage



(a) Below average vs. Above average

(b) Below average vs. High vs. Very High

As shown in Figure 3.2a, we find that for those firms which experienced a revenue decline, companies with above-average operating leverage (below-average operating leverage) have a significantly greater (lower) difficulty in reducing costs. After further differentiating the group of firms with above-average operating leverage, as shown in Figure 3.2b, we find a large difference in the perceived difficulty to reduce costs between firms classified as having below-average operating leverage and those with very high operating leverage. This analysis verifies that our measure is indeed capturing operating leverage and underlines the validity of our research design as well as of our novel measurement approach.

Second, we further analyse whether potential measurement error biases our results, which we address by bound identification (Klepper and Leamer, 1984). Like in any econometric analysis, measurement error might be present in our key variables, $\Delta Revenue$ and $\Delta Profit$. This may, for example, result from incorrect responses to the survey questions or from the use of the indicated

responses as a proxy for another unobserved variable that is actually underlying corporate decisions. The extent to which these variables are measured with error may have consequences for our classification since this could lead to attenuation bias. In addition, a low signal-to-noise ratio may inflate or deflate the error variance. In order to validate that biases arising from measurement error do not impair our analyses, we run reverse regressions (e.g., Klepper and Leamer, 1984; Bollinger, 2003). It can be shown that the estimates of the standard regression $\hat{\beta}_1$ and the reverse regression $\hat{\beta}_1^r$ will bracket the true coefficient as $\operatorname{plim}\hat{\beta}_1 \leq \beta_1 \leq \operatorname{plim}\hat{\beta}_1^r$. This is clear from considering our basic first-stage regression: $\Delta Profit_i = \beta_1 \Delta Revenue_i + \epsilon_i$. In this standard specification, measurement error would bias $\hat{\beta}_1$ towards zero. By contrast, $\hat{\beta}_1^r = 1/(\widehat{1/\beta}_1)$ obtained through the reverse regression, that is $\Delta Revenue_i = 1/\beta_1 \Delta Profit_i - 1/\beta_1 \epsilon_i + u_i$ with mean-zero error u_i, is biased upwards because $\Delta Profit$ and ϵ are negatively correlated by construction. As shown by Klepper and Leamer (1984), the true β_1 coefficient for $\Delta Revenue$ is nested in the interval generated by the lower bound $\hat{\beta}_1$ from the standard specification and the upper-bound $\hat{\beta}_1^r$ of the reverse regression of $\Delta Revenue$ on $\Delta Profit$. As outlined in Table 3.2 we find that the bounds from both the direct and the reverse regression are extremely tight, implying minimal measurement error in our classification.

Table 3.2: Direct and Reverse Regression

	Direction of minimization	
	ΔProfit	ΔRevenue
Constant	-3.813***	-5.735***
	(0.415)	(0.420)
ΔRevenue	0.780***	
	(0.010)	
ΔProfit		0.768***
		(0.009)
N	6,858	6,858
R^2	0.599	0.599

The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. This table provides results for the regression of $\Delta Revenue$ on $\Delta Profit$ and its reverse regression to estimate a lower and upper bound for the true coefficient of $\Delta Revenue$.

3.4 Results

In this section, we begin by analyzing companies that suffered a negative shock to revenues during the COVID-19 crisis. First, we show how these firms differ in their crisis responses and future planning decisions depending on their level of operating leverage. Second, we use liquidity enhancements provided in the form of government support to determine the extent to which additional liquidity might mitigate the differences found in the first analysis. Afterwards, we analyze crisis behavior and planning decisions by companies that continued to grow during the COVID-19 crisis. We conclude by showing descriptive evidence of the hurdles that firms with negative revenue outcomes face when trying to reduce costs and the hurdles that companies with positive revenue development face when trying to increase production capacity.

3.4.1 Operating Leverage and Responses to a Negative Revenue Shock

We investigate the difference in crisis reactions and future planning decisions among firms with different levels of operating leverage that experienced a negative revenue shock of equal proportions. Following the strategy outlined in Section 3.3.1 we run the following equation for our outcome variables denoted Y_i:

$$\begin{aligned} Y_i = \alpha_i + \beta_1 OL\,Degree_i + \beta_2 \Delta Revenue + \beta_3 Industry + \beta_4 Size + \beta_5 GDP\,Expectations \\ + \beta_6 \Delta Liabilities + \beta_7 Government\,Support + \epsilon_i, \end{aligned} \tag{4}$$

where *OLDegree* represents the varying degree of operating leverage as our variable of interest. We include industry fixed effects based on the 2-digit industry classification from the German Statistical Office. Further, we restrict our analysis to a comparison of companies with similar size by controlling for each firm's revenue generated in 2019 and its absolute number of employees. Since a firm's crisis behavior and, in particular, its future planning decisions should depend on its expectations about the economic development, we account for GDP expectations in 2020 and 2021 in each regression. We also account for the fact that operating and financial leverage decisions are taken simultaneously. By controlling for $\Delta Liabilities$ we aim to isolate the effect of a firm's cost structure on its crisis behavior. Additionally, we control for any possible governmental assistance a firm has received to account for the fact that some firms may have benefited from additional liquidity, softening the effect of the negative revenue shock.

Table 3.3: Operating Leverage and a Negative Revenue Shock

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Benchmark	0.245	0.144	0.193	0.232	0.413	0.574	0.289	0.444
Above-average operating leverage	0.044***	0.048***	0.033***	0.017	-0.033**	-0.040***	-0.051***	-0.030**
	(0.010)	(0.009)	(0.012)	(0.013)	(0.014)	(0.014)	(0.012)	(0.014)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gov. aid controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,873	4,873	4,873	4,873	4,873	4,873	4,873	4,873
R^2	0.089	0.152	0.204	0.079	0.102	0.110	0.144	0.140

This table presents results from OLS regressions for analyzing the effect of operating leverage on firms' responses to a crisis. According to the framework presented in Section 3.3.2, this analysis only considers firms that experience a negative revenue shock. Firms classified as having below-average operating leverage represent the benchmark group. The dummy variable *Above-average operating leverage* serves as independent variable with each column representing a separate regression using a different dependent variable. Please refer to Appendix A.4 for a full description of all variables. Firm controls include the following variables: *GDP expectations 2020 and 2021*, *Categorical revenue 2019*, *Categorical no. of employees*, Δ*Revenue*, and Δ*Liabilities*. In addition, gov. aid controls capture whether firms have received any governmental support during the crisis. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Turning to the results of the outlined regression design, we find that the degree of operating leverage significantly affects how firms react to an unanticipated decline in revenue. For three out of four regressions which identify a firm's immediate crisis responses, the coefficient is positive and significant at the 1% level. Specifically, for firms with above-average operating leverage, the share of investments that have been planned before the COVID-19 crisis but have been postponed or canceled in light of the pandemic situation increases, on average, by 4.4 and 4.8 pp. respectively. Beyond that, the fraction of firms which had to reduce the number of employees is, on average, 3.3 pp. higher than that of their industry peers with below-average operating leverage.

The results are consistent with the notion that firms with high operating leverage need to respond more drastically to an unanticipated revenue shock because they have less flexibility to reduce ongoing costs, leaving them more vulnerable to potential liquidity shortages. Noteworthy, firms with an above-average share of fixed costs are also more likely to reduce the size of their workforce although human resources are generally perceived to be "sticky", meaning that they are associated with significant resource adjustment costs (Anderson et al., 2003).

A firm's degree of operating leverage does not only affect its immediate responses to the crisis, but also its strategic planning decisions. We find that a firm with more levered assets is, all else being equal, less likely to invest in the short and medium term by 3.3 and 4.0 pp., respectively, relative to its industry peers of comparable size with lower fixed costs. Given the benchmark level of investment in the control group, this change implies a reduction in the likelihood to invest of 8% in the short and 7% the medium term. At the same time, a firm's intention to increase its workforce is a function of its degree of operating leverage: Having a share of fixed costs that is above the average among industry peers of comparable size makes a firm less likely to hire additional employees within the upcoming 12 months by 5.1 pp. (-18%) and within the following 12-24 months by 3 pp. (-7%).

Our finding of reduced willingness to invest for firms with high operating leverage stands in contrast to the results presented by Kahl et al. (2019). During the financial crisis of 2008-2009, the authors show that high fixed cost firms did not reduce their total investment more than those with lower fixed costs. Rather than cutting down their investments, firms with high operating leverage responded to the crisis by exploiting their (larger) cash reserves to a greater extent than firms with low operating leverage. In comparison, we find a negative effect of operating leverage on firms' willingness to invest. This difference could be either due to the sharp revenue drop of 51% among firms with a high share of fixed costs during the COVID-19 crisis, indicating that liquidity reserves might not have been sufficiently high to sustain a level of investment similar to that of

their competitors with lower degrees of operating leverage. Another possible explanation is that the COVID-19 crisis has reduced companies' future growth expectations more drastically, leading to firms lowering their operating leverage by reducing future investments in fixed assets.

In order to get a more detailed understanding of the impact of operating leverage on crisis behavior by firms, we repeat our regression analysis using a more granular dummy variable approach. As outlined in Section 3.3.2, firms with above-average operating leverage are divided into two separate groups depending on the severity of deviation from their predicted changes in profits, given their changes in revenues. In doing so, we are able to analyze the incremental effect of increasing the degree of operating leverage and investigate whether effect sizes intensify in the degree of operating leverage relative to firms with a below-average share of fixed costs. According to Kahl et al. (2019), firms with moderate levels of fixed costs might compensate for a loss in sales by depleting their reserves of liquid resources. Due to the severity of the revenue shock induced by the COVID-19 crisis, such reserves might not have been sufficiently high for firms with a substantial share of fixed costs. If liquidity concerns are the main determinant of different behavior, we would expect the severity of the crisis reaction to increase in the degree of operating leverage. In turn, if firms significantly downgrade their future growth expectations due to the crisis, we would expect the negative effect on future planning decisions to increase in the degree of operating leverage.

Table 3.4 provides descriptive statistics and regression outcomes resulting from this modified research design. Considering the descriptive statistics provided in Panel A, some data characteristics deserve special consideration: First, firms with very high operating leverage experience a much steeper decline in profits given their change in revenues as compared to the other groups. Second, a disproportionate decrease in liquidity among firms with very high operating leverage becomes apparent. Such pattern is explained by higher costs that need to be covered at times of a revenue drop and gives reason for differences in crisis behavior of firms with varying operating leverage. Finally, the increase in liabilities for companies with a very high fixed cost ratio is more than 80% higher than the corresponding change of their peers with lower degrees of operating leverage, suggesting that liquidity strain is particularly pronounced for this group of companies.

Table 3.4: Variation in the Level of Operating Leverage for a Negative Revenue Shock

Panel A: Descriptive statistics for the three groups of operating leverage

	Below-average operating leverage		High operating leverage		Very high operating leverage	
	Mean	Median	Mean	Median	Mean	Median
Firm characteristics						
Revenue 2019	14,912,013	650,000	8,918,769	600,000	10,705,677	550,000
Δ Revenue	-36.46	-30.00	-43.72	-35.00	-57.07	-57.00
Δ Profit	-12.35	-10.00	-44.60	-37.00	-80.31	-90.00
Δ Liquidity	-14.06	-10.00	-27.68	-20.00	-41.31	-40.00
Δ Liabilities	2.80	0.00	3.55	0.00	6.46	0.00
No. of employees	45.72	6.00	25.07	5.00	57.52	5.00
Δ Employees	-3.48	0.00	-8.64	0.00	-3.75	0.00
Crisis responses						
Tax-related gov. aid	0.38	-	0.43	-	0.54	-
Non-tax gov. aid	0.65	-	0.67	-	0.78	-
Investm. postponed	0.24	0.04	0.28	0.10	0.35	0.25
Investm. canceled	0.14	0.00	0.21	0.00	0.26	0.09
Layoffs	0.19	-	0.22	-	0.29	-
Price increases	0.23	-	0.25	-	0.26	-
Future planning						
Investm. short term	0.41	-	0.32	-	0.35	-
Investm. medium term	0.57	-	0.48	-	0.49	-
Hiring short term	0.29	-	0.21	-	0.19	-
Hiring medium term	0.44	-	0.39	-	0.37	-
N	2,496		1,047		1,330	

Continued on next page.

Table 3.4 - Continued

Panel B: The different levels of operating leverage and responses to the crisis

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Benchmark	0.245	0.144	0.193	0.232	0.413	0.574	0.289	0.444
High operating leverage	0.025**	0.036***	0.016	0.012	-0.056***	-0.055***	-0.053***	-0.031*
	(0.012)	(0.011)	(0.014)	(0.016)	(0.017)	(0.018)	(0.015)	(0.018)
Very high operating leverage	0.061***	0.059***	0.048***	0.020	-0.014	-0.026	-0.049***	-0.029*
	(0.012)	(0.011)	(0.015)	(0.015)	(0.017)	(0.017)	(0.015)	(0.017)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gov. aid controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,873	4,873	4,873	4,873	4,873	4,873	4,873	4,873
R^2	0.091	0.152	0.205	0.079	0.103	0.111	0.144	0.140

This table presents results from OLS regression for analyzing the effect of different degrees of operating leverage on firms' responses to the crisis. According to the framework presented in Section 3.3.2, this analysis only considers firms that experience a negative revenue shock. The dummy variable *Very high operating leverage* has a residual smaller than one half of the standard deviation in the residual. The dummy variable *High operating leverage* has a residual in the interval ($-\frac{\sigma}{2}$,0). Firms classified as having below-average operating leverage serve as the control group. Each column represents a separate regression with different dependent variables. Please refer to Appendix A.4 for a full description of all variables. Firm controls include the following variables: *GDP expectations 2020 and 2021*, *Categorical revenue 2019*, *Categorical no. of employees*, Δ*Revenue*, and Δ*Liabilities*. In addition, gov. aid controls capture whether firms have received any governmental support during the crisis. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 3.4 Panel B highlights the regression results. In each of the regressions, firms with high or very high operating leverage are compared against below-average operating leverage firms. Considering the impact of a firm's cost structure on its immediate crisis responses, we find that the magnitude of this effect is increasing in the degree of operating leverage. Consistently, a firm with very high operating leverage is, on average, more likely to postpone and cancel investments, as well as to lay off workers than its industry peers with below-average operating leverage *and* those with high operating leverage. This finding is consistent with Kahl et al. (2019), who show that firms with highly levered assets behave as if they were financially constrained even if traditional measures indicate the absence of financial constraints. Consequently, firms with high operating leverage build up greater financial reserves to buffer against an adverse economic development. Using these funds, they are able to maintain investment levels comparable to their peers with lower leverage. In contrast, our results are indicative of the fact that the liquidity buffer for firms with a very high level of fixed costs has not been large enough to offset the severe drop in revenues during the pandemic.

Yet, a pattern of increasing size effects in the degree of operating leverage is not observed with respect to firms' future planning decisions. Concerning future investment and hiring plans, we note that effect sizes are declining in the degree of operating leverage. Though investment plans differ, on average, between firms with below- and above-average operating leverage as shown in Table 3.3, this difference seems to be driven mostly by firms with moderately high operating leverage. In sum, our results show that highly levered firms took strong, immediate action to endure the crisis. However, especially very high operating leverage firms are not revising future growth expectations downward too drastically and are more concerned with making adjustments based on liquidity constraints and short-term economic conditions. A finding which indicates firm decision-makers of highly levered firms think that the current crisis is rather short-term than a long lasting shift in economic conditions.

3.4.2 The Moderating Effect of Governmental Aid on Crisis Responses

Shortly after the outbreak of the COVID-19 pandemic, governments all over the globe took immediate fiscal action to weaken the negative consequences of the following economic crisis[6]. By setting up large-scale financial support programs, swiftly lifting tax requirements, and temporarily suspending insolvency rules, policymakers were aiming to preserve the pre-crisis economic struc-

[6]For example, already in March 2020 the British finance minister Rishi Sunak promised to use every possible means to protect the British economy from any potential harm induced by the COVID-19 crisis (Reuters, 2021).

ture, thereby keeping firms in business that have been operating successfully prior to the emergence of the pandemic [7].

We use these government-provided liquidity measures to determine whether the differences in behavior are actually due to differences in liquidity needs, or whether the differences are more likely due to a downward revision in future growth expectations following the COVID-19 crisis. In this section, we extend the regression outlined in equation (4) by adding an interaction term of a firm's level of operating leverage and the take-up of governmental support during the crisis. For that purpose, we identify and group those governmental aid measures that immediately and significantly boosted corporate liquidity or significantly reduced the liquidity requirements during the crisis[8]. If missing liquidity is a primary reason for why firms with varying degrees of operating leverage respond differently to the crisis, we expect a moderating effect of the interaction term, implying that the interaction term should significantly reduce the negative crisis response of firms with high operating leverage.

The results outlined in Table 3.5 indicate that liquidity relief in the form of government support indeed mitigates at least some of the adverse crisis reaction of high operating leverage firms. While firms with above-average operating leverage still postpone a larger fraction of their investments and reduced their workforce more drastically, high operating leverage firms which received additional liquidity in form of government support are 10% less likely to cancel investments compared to high operating leverage firms that did not receive such additional liquidity injection. Yet, the share of companies with high operating leverage deferring investments did not decline despite the governmental support. This can be explained by the fact that the crisis was still ongoing during the field phase of the survey and government-imposed restrictions could still have had a negative impact on the ability to engage fully in the economy. For the planning outcomes, we find that the additionally provided liquidity is not able to reduce the difference in short-term investing or short-term hiring. However, we do find that high operating leverage firms which received government support are 20% more likely to invest in the medium term compared to their high operating leverage peers which did not receive additional liquidity.

Overall, these results suggest that additional liquidity is not able to fully offset the more drastic near-term adjustments required by firms with high operating leverage. However, the additional

[7] For an overview of the different stimulus programs put forth by the German government see `https://www.bundesfinanzministerium.de/Content/EN/Standardartikel/Topics/Priority-Issues/Corona/comprehensive-pandemic-crisis-support.html`.

[8] Among the set of support measures offered in Germany, these liquidity-enhancing measures are, in particular, the Corona emergency relief program, the interim aid program, the allowance for short time work and the KfW special program. For an overview of further Covid-19 relief options refer to Bischof et al. (2022b).

liquidity seems to enable the companies to avoid cancelling some of their commitments while also returning to their original planning in the medium term.

Table 3.5: The Moderating Effect of Governmental Measures on Crisis Responses

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Benchmark	0.180	0.091	0.103	0.172	0.445	0.606	0.308	0.422
Above-average operating leverage	0.044***	0.072***	0.052***	0.055***	-0.062**	-0.086***	-0.039*	-0.016
	(0.016)	(0.014)	(0.017)	(0.021)	(0.024)	(0.025)	(0.021)	(0.024)
Gov. aid	0.066***	0.021	0.015	0.078***	0.020	0.033	0.034	0.079***
	(0.010)	(0.015)	(0.018)	(0.021)	(0.021)	(0.021)	(0.019)	(0.020)
Above-average operating leverage x Gov. aid	-0.001	-0.037**	-0.028	-0.057**	0.045	0.070**	-0.015	-0.018
	(0.020)	(0.017)	(0.022)	(0.026)	(0.029)	(0.030)	(0.026)	(0.029)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gov. aid controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,873	4,873	4,873	4,873	4,873	4,873	4,873	4,873
R^2	0.087	0.149	0.203	0.077	0.099	0.108	0.141	0.135

This table presents results from OLS regressions for analyzing the moderating impact of governmental aid boosting corporate liquidity on the effect of operating leverage on firms' responses to a crisis. According to the framework presented in Section 3.3.2, this analysis only considers firms that experience a negative revenue shock. Firms classified as having below-average operating leverage represent the benchmark group. The dummy variable *Above-average operating leverage* serves as independent variable with each column representing a separate regression using a different dependent variable. Please refer to Appendix A.4 for a full description of all variables. Firm controls include the following variables: *GDP expectations 2020 and 2021*, *Categorical revenue 2019*, *Categorical no. of employees*, Δ*Revenue*, and Δ*Liabilities*. In addition, gov. aid controls capture whether firms have received any governmental support during the crisis. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

3.4.3 Operating Leverage and Responses to Revenue Growth

We now examine how the operating leverage ratio affects a firm's crisis reactions and its future planning decisions in the event of a positive revenue trend. Despite an overall recession of the German and the global economy, the COVID-19 crisis has not only brought up firms that lose revenue. 1,935 firms in our sample indicate that they experienced an increase in revenues as compared to pre-pandemic times. In contrast to the previous section, a crisis winner exhibits above-average operating leverage if its profits *increase* more than predicted. This classification is consistent with the finding that firms with "high-levered" assets generate average returns that are significantly higher than those of firms with "unlevered" assets (Novy-Marx, 2011).[9] Again, the specification for our regression model is presented in equation (7).

The results in Table 3.6 show that firms which experienced revenue growth during the crisis react quite similar, irrespective of their degree of operating leverage. We do find however, that high operating leverage firms are 24% less likely to postpone investments. Looking at the future planning decisions of these firms, we find that high operating leverage firms are 8% more likely to invest in the short term and 6% more likely to invest in the medium term.

As before, we additionally divide the group of companies with above-average operating leverage into those with high operating leverage and those with very high operating leverage to determine the incremental effect of increasing operating leverage on firm behavior. Panel A of Table 3.7 provides descriptive statistics using this more granular partition of firms. In line with our classification process, companies with very high operating leverage show the highest increase in ΔProfits per percentage point increase in ΔRevenues. Additionally, we find that very high operating leverage firms experience a much greater increase in ΔLiquidity per percentage point increase in ΔRevenue.

Panel B provides regression outcomes illustrating the effect of operating leverage on firm behavior using the more granular dummy variable approach. Similar to our findings in Table 3.6, we find that crisis reactions do not differ much between the different types of operating leverage firms. However, both high and very high operating leverage firms are less likely to postpone investments compared to the benchmark group. Looking at the future planning outcomes, we find that the significant difference in investment plans is mostly driven by the very high operating leverage group. This finding is in line with our argumentation that firms choose a very high degree of operating leverage only when future growth expectations are positive.

[9] Of course, this notion of leverage refers to operating and not to financial leverage.

Table 3.6: Operating Leverage and Responses to Revenue Growth

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Benchmark	0.141	0.069	0.076	0.206	0.549	0.657	0.479	0.555
Above-average operating leverage	-0.034***	-0.005	-0.004	-0.014	0.042*	0.039*	0.013	0.015
	(0.012)	(0.008)	(0.012)	(0.019)	(0.023)	(0.022)	(0.022)	(0.023)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gov. aid controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913
R^2	0.183	0.175	0.171	0.136	0.161	0.143	0.213	0.192

This table presents results from OLS regressions for analyzing the effect of operating leverage on firms' responses to revenue growth. Firms classified as having below-average operating leverage represent the control group. The dummy variable *Above-average operating leverage* serves as independent variable with each column representing a separate regression using a different dependent variable. Please refer to Appendix A.4 for a full description of all variables. Firm controls include the following variables: *GDP expectations 2020 and 2021*, *Categorical revenue 2019*, *Categorical no. of employees*, Δ*Revenue*, and Δ*Liabilities*. In addition, gov. aid controls capture whether firms have received governmental support (both tax-related and non-tax aid) during the crisis. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 3.7: Variation in the Level of Operating Leverage for Revenue Growth

Panel A: Descriptive statistics for the three groups of operating leverage

	Below-average operating leverage		High operating leverage		Very high operating leverage	
	Mean	Median	Mean	Median	Mean	Median
Firm characteristics						
Revenue 2019	14,856,812	650,000	6,192,620	650,000	15,529,133	650,000
Δ Revenue	34.01	22.00	22.53	15.00	53.06	50.00
Δ Profit	2.42	1.00	20.56	13.00	66.01	75.00
Δ Liquidity	13.41	6.00	19.10	10.00	56.23	51.00
Δ Liabilities	10.85	0.00	7.10	0.00	28.26	2.00
No. of employees	82.84	6.00	29.31	7.00	71.50	6.00
Δ Employees	14.00	0.00	9.94	0.00	31.40	3.00
Crisis responses						
Tax-related gov. aid	0.25	-	0.15	-	0.23	-
Non-tax gov. aid	0.39	-	0.27	-	0.36	-
Investm. postponed	0.14	0.00	0.09	0.00	0.13	0.00
Investm. canceled	0.07	0.00	0.05	0.00	0.07	0.00
Layoffs	0.08	-	0.04	-	0.09	-
Price increases	0.21	-	0.17	-	0.19	-
Future planning						
Investm. short term	0.55	-	0.61	-	0.61	-
Investm. medium term	0.66	-	0.71	-	0.70	-
Hiring short term	0.48	-	0.49	-	0.51	-
Hiring medium term	0.56	-	0.58	-	0.61	-
N	814		652		447	

Continued on next page.

Table 3.7 - Continued

Panel B: The different levels of operating leverage and responses to the crisis

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Benchmark	0.141	0.069	0.076	0.206	0.549	0.657	0.479	0.555
High operating leverage	-0.035***	-0.002	-0.012	-0.018	0.024	0.036	0.003	0.006
	(0.013)	(0.009)	(0.013)	(0.022)	(0.027)	(0.026)	(0.026)	(0.026)
Very high operating leverage	-0.033**	-0.009	0.007	-0.007	0.068**	0.044*	0.028	0.028
	(0.016)	(0.011)	(0.018)	(0.025)	(0.030)	(0.028)	(0.029)	(0.030)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gov. aid controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913
R^2	0.183	0.175	0.171	0.136	0.161	0.143	0.213	0.192

This table presents results from OLS regression for analyzing the effect of different degrees of operating leverage on firms' responses to the crisis. This analysis only considers firms that experience revenue growth. The dummy variable *Very high operating leverage* has a residual greater than one half of the standard deviation in the residual. The dummy variable *High operating leverage* has a residual in the interval $(0, \frac{\sigma}{2})$. Firms classified as having below-average operating leverage serve as the control group in the analysis. Each column represents a separate regression with different dependent variables. Please refer to Appendix A.4 for a full description of all variables. Firm controls include the following variables: *GDP expectations 2020 and 2021*, *Categorical revenue 2019*, *Categorical no. of employees*, and Δ*Revenue*. In addition, gov. aid controls capture whether firms have received governmental support (both tax-related and non-tax aid) during the crisis. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Overall, we find that crisis reactions and future planning decisions are similar irrespective of the degree of operating leverage considering firms that grow during the crisis. These results emphasize that the differential crisis response of high and low leverage firms is indeed likely to be driven by a lack of ample liquidity when faced with a sudden, unexpected negative shock to revenues.

3.4.4 Robustness Tests

In order to examine whether our model is well specified, we complement our main tests with an analysis that utilizes matching techniques. The objective of these procedures is to identify pairs of observations from the treatment and from the control group that are identical with respect to their observable characteristics and only differ concerning their degree of operating leverage. At the same time, matching procedures are not bound to assumptions about a linear relation between variables and, thus, reduce the potential risk of bias resulting from functional form misspecification.

First, we carry out a nearest neighbor matching procedure comparing observations that exhibit above-average vs. below-average operating leverage and have the smallest difference with respect to the revenue shock they experience while requiring them to operate in the same industry, to be of comparable size, and to have similar expectations about the general economic development. Second, we conduct a propensity score matching that determines the probability of having high operating leverage for each firm based on the full set of independent variables that are employed in our main analysis. Using this propensity score, firms are then matched to identify the effect of being treated, i.e. having above-average operating leverage, on the set of outcome variables. To ensure an appropriate matching quality, we impose a maximum caliper distance of 0.1, which is commonly used in accounting research (Shipman et al., 2017).

In Table 3.8, we provide matching results that highlight the effect of operating leverage on firm behavior at times of an unexpected negative shock to revenues. When comparing these results to the main specification reported in Table 3.3, we find a high degree of conformity with respect to the coefficients' signs, their magnitude, and their statistical significance. The nearest neighbor matching shown in Panel A confirms that firms with high operating leverage are more likely to postpone and cancel investments, as well as to lay off workers. At the same time, having above-average operating leverage makes a firm less likely to make investments into human resources following a crisis, both in the short and the medium term. Noteworthy, the magnitude of these coefficients is consistently stronger than in the prior analysis, indicating that we are not systematically overestimating the effect sizes in our main specification.

Table 3.8: Matching Results - Operating Leverage and a Negative Revenue Shock

Panel A: 5-Nearest Neighbor Matching

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Above-average operating leverage	0.035***	0.053***	0.033**	0.016	-0.040**	-0.031	-0.050***	-0.039**
	(0.011)	(0.010)	(0.014)	(0.014)	(0.016)	(0.017)	(0.015)	(0.017)
N	4,872	4,872	4,872	4,872	4,872	4,872	4,872	4,872

Panel B: Radius Matching Without Replacement

	Crisis responses				Future planning			
	% Investm. postponed	% Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Above-average operating leverage	0.044***	0.059***	0.038***	0.015	-0.043***	-0.042***	-0.060***	-0.042***
	(0.010)	(0.009)	(0.013)	(0.013)	(0.015)	(0.015)	(0.013)	(0.015)
N	4,872	4,872	4,872	4,872	4,872	4,872	4,872	4,872

This table presents matching results for identifying the effect of operating leverage on firms' responses to the crisis using two different methods. According to the framework presented in Section 3.3.2, this analysis only considers firms that experience a negative revenue shock. Panel A presents regression outcomes resulting from a 5-nearest-neighbor matching procedure with replacement and a caliper width of 0.1. This method identifies for each observation classified as having above-average operating leverage a group of its 5 nearest neighbors with respect to $\Delta Revenue$, Revenue, its No. of Employees and the support measures received during the crisis. Panel B presents regression results from radius matching without replacement using a caliper width of 0.1. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 3.9: Matching Results - Operating Leverage and a Positive Revenue Shock

Panel A: 5-Nearest Neighbor Matching

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Above-average operating leverage	-0.033***	-0.012	-0.014	-0.008	0.047	0.047	0.010	0.013
	(0.014)	(0.010)	(0.014)	(0.021)	(0.027)	(0.025)	(0.027)	(0.027)
N	1,897	1,897	1,897	1,897	1,897	1,897	1,897	1,897

Panel B: Radius Matching Without Replacement

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Above-average operating leverage	-0.035***	-0.010	-0.016	-0.015	0.046	0.044	0.012	0.010
	(0.013)	(0.009)	(0.013)	(0.020)	(0.024)	(0.023)	(0.025)	(0.024)
N	1,897	1,897	1,897	1,897	1,897	1,897	1,897	1,897

This table presents matching results for identifying the effect of operating leverage on firms' responses to the crisis using two different methods. According to the framework presented in Section 3.3.2, this analysis only considers firms that experience a positive revenue shock. Panel A presents regression outcomes resulting from a 5-nearest-neighbor matching procedure with replacement and a caliper width of 0.1. This method identifies for each observation classified as having above-average operating leverage a group of its 5 nearest neighbors with respect to $\Delta Revenue$, Revenue, its No. of Employees and the support measures received during the crisis. Panel B presents regression results from radius matching without replacement using a caliper width of 0.1. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Likewise, the results of the propensity score matching, which are shown in Panel B, generally confirm the robustness of our findings. The signs and, in particular, the magnitude of the coefficients are in line with the results highlighted before.

Table 3.9 provides regression results using matched pairs of firms that even experienced revenue growth during the crisis. Overall, these are in line with the regression outcomes reported in Table 3.6. Again, companies which experienced a positive development of their revenues do not seem to differ greatly in their crisis responses or in their planning behavior despite different degrees of operating leverage. This finding strengthens our argument that the differences we find for negative revenue companies are not driven by other systematic differences than different levels of operating leverage and emerging liquidity shortages for highly levered firms that are faced with a slump in revenues.

Previous literature establishes a relationship between the level of a firms operating leverage and its financial policies (Chen et al., 2019; Kahl et al., 2019). Accordingly, firms with a higher proportion of fixed cost are more likely to have lower financial leverage ratios than firms with lower fixed costs (Kahl et al., 2019). To isolate the effect of a firm's cost structure choice, we control for monthly changes in the liabilities ($\Delta Liabilities$) of a firm in our main analyses. Yet, this approach does not capture a firm's level of financial leverage established prior to the emergence of the COVID-19 crisis. To mitigate this concern, we lastly use equity ratio data from the Bureau van Dijk's Orbis database to account for differences in firms' capital structure prior to the crisis.

We are able to calculate the equity ratio for 2,547 out of 6,786 firms in our sample. Of these, 1,816 firms experienced a negative shock to revenues and 731 firms continued to grow during the pandemic. Table 3.10 Panel A provides regression results for firms which experienced a negative shock to revenues. As before, the matching results are generally in line with the results from Table 3.3. However, we are no longer able to identify a statistically significant difference in short term investment plans. Panel B summarizes the matching results for firms which experienced revenue growth during the crisis and we find that high operating leverage firms are, on average, more likely to invest in the short and medium term.[10]

[10]The (limited) differences in the results as compared to the main analyses might result from the specific sample of firms for which capital structure data is available in the Orbis database: Due to low disclosure requirements for small firms, the respective subsample contains a greater portion of larger firms.

Table 3.10: 5-Nearest Neighbor Matching on Pre-Crisis Equity Ratio

Panel A: Negative Revenue Firms

	Crisis responses				Future planning			
	Investm. postponed	Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Above-average operating leverage	0.061***	0.063***	0.076***	0.031	0.048	-0.078***	-0.111***	-0.085***
	(0.017)	(0.014)	(0.022)	(0.022)	(0.025)	(0.025)	(0.023)	(0.025)
N	1,816	1,816	1,816	1,816	1,816	1,816	1,816	1,816

Panel B: Positive Revenue Firms

	Crisis responses				Future planning			
	% Investm. postponed	% Investm. canceled	Layoffs	Price increases	Investm. short term	Investm. medium term	Hiring short term	Hiring medium term
Above-average operating leverage	-0.026	-0.030*	-0.045*	-0.018	0.080*	0.103**	0.049	0.071
	(0.021)	(0.014)	(0.020)	(0.032)	(0.039)	(0.037)	(0.040)	(0.038)
N	731	731	731	731	731	731	731	731

This table presents matching results which additionally utilizes Mahalanobis-metric matching on pre-crisis Equity Ratio. Panel A provides regression outcomes resulting from a 5-nearest neighbor matching procedure on firms which experienced a negativ shock to revenues. Panel B presents regression results resulting from a 5-nearest neighbor matching procedure on firms which experienced a positive revenue development. Matching is done on a caliper width of 0.1. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

3.4.5 Hurdles for Reducing Costs or Increasing Capacity

In this section, we utilize data from the second wave of the COVID-19 survey conducted by the German Business Panel to provide some descriptive evidence on the main issues that respondent firms face when trying to cut costs or to increase production capacities. Furthermore, we try to identify whether there are significant differences between firms that differ with respect to their levels of operating leverage. The corresponding results are summarized in Table 3.11.

We begin our analysis with an investigation of the main difficulties to reduce costs (Table 3.11 Panel A) when revenue declines. This analysis focuses only on companies which reported a negative sales shock in the second wave of the GBP survey. Our results suggest that employee contracts represent an obstacle for a majority of firms when aiming to reduce costs. While we only identify minor differences between varying levels of operating leverage, we find that approximately 30% of firms consider employee contracts a significant hurdle. At the same time, almost 56% of firms argue that know-how retention constitutes one of the biggest obstacles when reducing costs. The fraction of firms which consider know-how retention to be an issue increases by another 8% when moving from the below-average operating leverage group to firms with very high operating leverage. Long-term commitments such as lease and rental agreements as well as other legal obligations such as cancellation periods represent another significant obstacle to cost reductions: Almost 50% of firms consider such commitments a barrier for swift cost reductions. Interestingly, compared to the below-average operating leverage group, firms with very high operating leverage are 22% more likely to consider long-term commitments an issue in reducing costs. The same holds true for legal obligations, where very high operating leverage firms are 14% more likely to consider them an obstacle. We find a very large difference between the operating leverage categories when looking at the fraction of firms which consider the disposal of assets not economical for cost reduction. One potential reason is that firms face different resource adjustment costs (e.g., Anderson et al., 2003) depending on their share of fixed costs. Very high operating leverage firms are 44% more likely to consider this factor a hurdle when trying to reduce costs. Finally, more than 50% of firms consider planning uncertainty to be an issue for quick cost reductions.

Table 3.11: Second Survey Wave Results

Panel A: Biggest hurdles for reducing costs when revenue drops

	Employee contracts	Know-how retention	Long-term commitments	Legal obligations	Uneconomical asset disposal	Planning uncertainty
Benchmark	0.292	0.558	0.495	0.268	0.150	0.504
High operating leverage	0.009	-0.008	0.080***	-0.002	0.026*	0.049***
	(0.015)	(0.017)	(0.018)	(0.016)	(0.014)	(0.018)
Very high operating leverage	-0.019	0.042***	0.110**	0.037**	0.066***	0.054***
	(0.022)	(0.023)	(0.025)	(0.023)	(0.020)	(0.025)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	4,687	4,687	4,687	4,687	4,687	4,687
R^2	0.126	0.178	0.050	0.091	0.052	0.045

Panel B: Biggest hurdles for increasing capacity when revenue soars

	Qualified employees	Contractual regulation	Legal regulation	Missing liquidity	Supply chain constraints	Planning uncertainty
Benchmark	0.620	0.046	0.083	0.238	0.330	0.400
High operating leverage	0.000	-0.003	-0.012	-0.109***	-0.042	-0.072**
	(0.027)	(0.012)	(0.016)	(0.023)	(0.026)	(0.028)
Very high operating leverage	0.007	-0.003	0.026	-0.066***	-0.027	-0.074**
	(0.028)	(0.013)	(0.018)	(0.024)	(0.027)	(0.029)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1724	1724	1724	1724	1724	1724
R^2	0.153	0.067	0.070	0.092	0.158	0.075

This table presents evidence resulting from a second survey wave conducted by the GDP from November 2020 until June 2021. If firms indicate a drop in revenues following the COVID-19 crisis, they are asked about their biggest hurdles for reducing costs. Conversely, if they report rising revenues, they are inquired about their biggest hurdles for increasing production capacity. Firms classified as having below-average operating leverage serve as the control group in the analysis. Please refer to Section 3.3.2 for a detailed summary of our classification procedure. Each column represents a separate regression with different dependent variables. Appendix A.4 contains a full description of all variables. Firm controls include the following variables: *GDP expectations 2020 and 2021*, *Categorical revenue 2019*, *Categorical no. of employees*, and Δ*Revenue*. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Next, we analyze the biggest obstacles for firms with a positive revenue shock (N = 1,724) when trying to increase production capacity (Table 3.11 Panel B). Similar to the findings in the cost reduction analysis, we find that human resources are an important factor, also for firms trying to increase capacity. More than 60% of firms consider finding qualified employees a major obstacle. At the same time, contractual and legal regulations seem not be a major hindrance when trying to increase capacity. Another important hurdle for expanding capacity under continuing growth is missing liquidity. More than 23% of firms with below average operating leverage respond that missing liquidity is an issue when trying to increase production capacity. Liquidity does not seem to be an issue of similar importance for firms with higher levels of operating leverage. One possible reason for this result is that firms with high operating leverage experience a much smaller increase in variable costs when they scale their production, so lack of liquidity only becomes an issue when they make large changes to production capacity, such as building a new plant or buying a new machine.

Furthermore, we find that approximately one-third of the respondents find supply-chain constraints to be an issue for capacity increases, where the fraction of firms increases slightly in the degree of operating leverage. Lastly, similar to the results in Panel A, we find that a large fraction of firms consider planning uncertainty to be an important issue. Interestingly, the uncertainty effect when increasing capacity is exactly opposite to the uncertainty effect when reducing capacity. (Very) high operating leverage firms face significantly higher uncertainty when trying to reduce costs but face significantly less uncertainty when trying to increase capacity.

3.5 Concluding Remarks

We investigate how and why operating leverage affects short-term reactions and future planning decisions after an unanticipated shock to revenues. For this, we develop a simple, novel method to empirically assess the degree of operating leverage of a firm that does not require a direct observation of costs. With information on the percentage change of profits and revenues, we predict expected profit changes within industries for firms with the same observed characteristics in a first step. In the second step, we classify firms' operating leverage as high (low) if its profits decrease more (less) than predicted given its observed decrease in revenue. For the construction of this measure, we use survey data on almost 6,800 corporate decision makers from the GBP. Detailed questions in a follow-up survey allow us to validate our research design. In comparison to conventional measures of operating leverage, our proposed measure has a number of advantages.

First, it is a comprehensive account of costs, that aggregates different types of costs without the need to think about how, for instance, cost of goods sold plus selling, general, and administrative expenses add to firing costs or often unobserved search, information, or transaction costs like costs of planning, deciding, changing plans, resolving disputes, and after-sales. Second, it does not need to rely on cross-sectional variation but captures the ease with which costs can be adjusted within a firm. Third, we can calculate it for firms for which data on profits, revenues, or costs are not yet available or which do not publicly disclose cost information.

We find that operating leverage has an important impact on corporate decision making. For otherwise equivalent firms, we find significant differences in strategies to cope with sudden and unexpected negative revenues shocks. Compared to firms with low operating leverage, high operating leverage firms are 17% more likely to layoff employees, 18% more likely to postpone investments, and 33% more likely to cancel investments. With regards to longer-term planning, we find that the likelihood to invest in the short and medium term of firms with high operating leverage is 8% and 7% lower respectively compared to firms with low operating leverage. Lastly, we also show that high leverage firms exhibit a smaller propensity to hire additional employees both in the short and medium term. When looking at firms which experienced revenue growth during the crisis, we find that crisis reactions and future planning decisions are similar irrespective of the degree of operating leverage. This suggests that the differences we find in the negative revenue group are indeed due to the unexpected negative shock in revenues combined with the degree of operating leverage chosen ex-ante, rather than some systematic difference between firms with different levels of operating leverage that is also present in a good economic state.

4 Compassionate or Fiscally Prudent: How do Firm Decision-Makers Form Preferences About Fiscal Policy?

4.1 Introduction

Throughout the COVID-19 pandemic governments all over the world pledged trillions of dollars to support their respective economies. Several studies have evaluated the economic consequences of these programs. However, little is known about the opinion and attitudes the main recipients of such transfers have about these stimulus programs. We aim to bridge this gap by studying how firm decision-makers such as business owners or managers reason about the fiscal stimulus program. Do they consider such vast fiscal stimulus programs to be justified? Are they aware that fiscal stimulus programs could entail higher taxes? Do fairness considerations influence their attitudes towards the fiscal stimulus program and how the fiscal stimulus program should be financed? Our paper aims to answer these questions but also to provide a broader understanding of how firm decision-makers reason about tax policy in particular during times of crises. Studying how firm decision-makers think about tax policy is important for many reasons. First, firm owners and managers play an important role in shaping the political agenda, influencing public opinion or the political preferences of their employees (Faccio, 2006; Bertrand et al., 2014; Babenko et al., 2020; Bertrand et al., 2020).[11] Second, firm decision-makers' are a specific subset of the population and differ along many characteristics from the "representative" individual (McClure et al., 2022; Zhao and Seibert, 2006; Cramer et al., 2002). At the same time, firm decision-makers might be subject to the same biases and inconsistencies as the "average" individual which might influence firm-level decisions.[12] Understanding which factors influence firm decision-makers attitudes towards tax policy and their support for financial assistance in times of crisis is crucial to improve the design of such policies in the future.

In this paper, we survey 7,854 German firms to provide empirical evidence on the determinants of firm decision-makers attitudes towards tax policy. Our survey was conducted during the beginning of the Covid pandemic. Before the start of our survey the German government announced a fiscal stimulus program to support the German economy in the amount of €130 billion. We exploit the issuance of this stimulus program to answer the following two research questions: Are firm decision-makers aware of the costs of public goods and are they willing to pay for it? Do fairness

[11] In addition, public relation and philanthropic activities of firms are important and heavily used strategies of firms to shape policy and public opinion.

[12] Survey studies have found misconceptions of firm decision-makers with regard to inflation or unemployment expectations comparable to results found for households (McClure et al., 2022; Candia et al., 2021; Kumar et al., 2015).

considerations play a role for firm decision-makers attitude towards tax policy? To answer our research questions we conduct two information treatments. The fiscal treatment stresses that the increase in government spending could necessitate higher taxes in the future. The social treatment instead focuses on the fact, that many businesses experienced hardship through no fault of their own. We compare the effects of the treatments against the results obtained in our control group.

We obtain three main results. First, when confronted with the potential costs of the fiscal stimulus program firm decision-makers support for the fiscal stimulus program decreases. Nonetheless, they desire a higher level of taxes than the control group to afford the fiscal stimulus program. Second, unlike individuals, arguments of redistribution or misfortune only have limited influence on firm decision-makers attitudes towards financial support programs in times of crises and their willingness to pay for it through higher taxes. Third, firm decision-makers want to increase in particular taxes which their firms do not have to pay.

Our paper relates to the strand of literature investigating how individuals form beliefs about economic policies, in particular taxation. Coibion et al. (2021) investigate how individual's inflation expectations are influenced by information about debt levels and government spending. Roth et al. (2021) investigate the impact of individual's beliefs about the debt-to-gdp ratio on attitudes towards government spending and taxation. The authors find that when individuals revise their beliefs about concurrent debt-to-GDP levels upwards, respondents demand less government spending but attitudes towards taxation are unaltered. Other studies have investigated if fairness considerations influence individuals attitudes towards tax policy. Stantcheva (2021) shows that stressing equity considerations increases support for higher tax rates. Other studies show that individuals beliefs about why some people earn high incomes or have a large amount of wealth are important for their opinions about how income and wealth should be taxed (Fong, 2001; Konow, 2003; Alesina and Angeletos, 2005; Alesina and Giuliano, 2011; Ooghe and Peichl, 2014; Durante et al., 2014; Fisman et al., 2020). If individuals believe that wealth or income is a product of luck individuals they demand more redistribution, however if they believe that higher income or wealth is due to a high level of effort they demand less redistribution. Similar to Coibion et al. (2021) and Roth et al. (2021), we assess how arguments over the development of future government debt levels influence attitudes towards government spending and taxation. We find that support towards government spending decreases when people are made aware that the government is not willing to take on more debt. In contrast to Roth et al. (2021), we find that firm decision-makers also change their attitudes towards taxation and are willing to pay higher taxes.

The paper proceeds as follows. Section 4.2 describes the data and general design of the survey used to collect the data. Section 4.3 outlines the experimental setup and gives an overview of the different treatments. In section 4.4 we begin by describing the attitude towards the fiscal stimulus program and show how the treatments affected the future tax expectations of participating firms. Next, we analyse whether the treatments also shifted the desire of firm-decision makers to pay taxes while controlling for potential differences in the attitude towards the stimulus package. Finally, we investigate whether corporate decision makers exhibit some strategic motive by preferring to change taxes that do not apply to the firm they manage. We conclude with suggestions on how our findings can be helpful to policy makers when disclosing changes in tax policy.

4.2 Data

The survey questions used in the paper were fielded in the first wave of the German Business Panel, which ran from July to October 2020. The focus of the survey was on how German firms coped with the Corona crisis.[13]. For the empirical analysis, we restrict our sample to 7,854 firm decision-makers, which participated in the survey experiment and did not drop out before the experiment section was reached.

The target group of participants for this paper ranges from business owners of small- and medium-sized companies to CEOs of large corporations. 91% of the sample participants are owners or CEOs and 87% are part of the executive board. Furthermore, 60% hold an university degree. The majority of decision-makers in our sample are male (80%). To ensure that there is no selection of firms into our survey we compare the characteristics of participating firms to firms which did not participate in *Orbis*. We find that participating firms and non-participating firms from *Orbis* are comparable with regard to employees, total assets and revenues. We also contrast our sample against the German business register of the German Federal Statistical Office.[14] Comparing the distribution of the universe of German firms for the reporting year 2020 to our experimental sample with regard to legal form, revenues, full-time employees and economic sector, shows that our sample population is quite close to the full firm population in Germany and the population of German firms in Orbis.

[13] A detailed overview of the survey can be found in Bischof et al. (2022b)

[14] See `https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Unternehmen/Unternehmensregister/_inhalt.html#sprg233588`

4.3 Experimental Design

We run two different experiments to elicit if fairness considerations or arguments of fiscal prudence influence firm decision-makers attitudes towards tax policy. We randomly assign the different information treatments to our survey participants. After random assignment, all survey participants are first required to answer questions about firm characteristics such as legal form, number of employees and revenues. Afterwards, survey participants receive different information treatments in the SOCIAL and FISCAL treatment or no text when assigned to the CONTROL group. After the treatment, all firm decision makers are first asked whether or not they think it is justified for the government to intervene with this stimulus package at the taxpayer's expense. Second, they are asked about their beliefs regarding future tax rates and how they would like to adjust taxes. Table B.10 presents summary statistics of all outcome variables used in the analysis of the paper and Figure 4.1 gives a graphical summary of our experimental setup. Note that the number of observations in the treatment groups is different because we focus only on the observations that received the question about attitudes toward the stimulus program, which was only displayed for 50 percent of the control group. Consequently, the number of observations in the control group is about half the number of observations in the other treatment groups. Moreover, descriptive statistics and balancing tests of firm and manager characteristics as well as the original and translated treatment texts can be found in Appendix B.

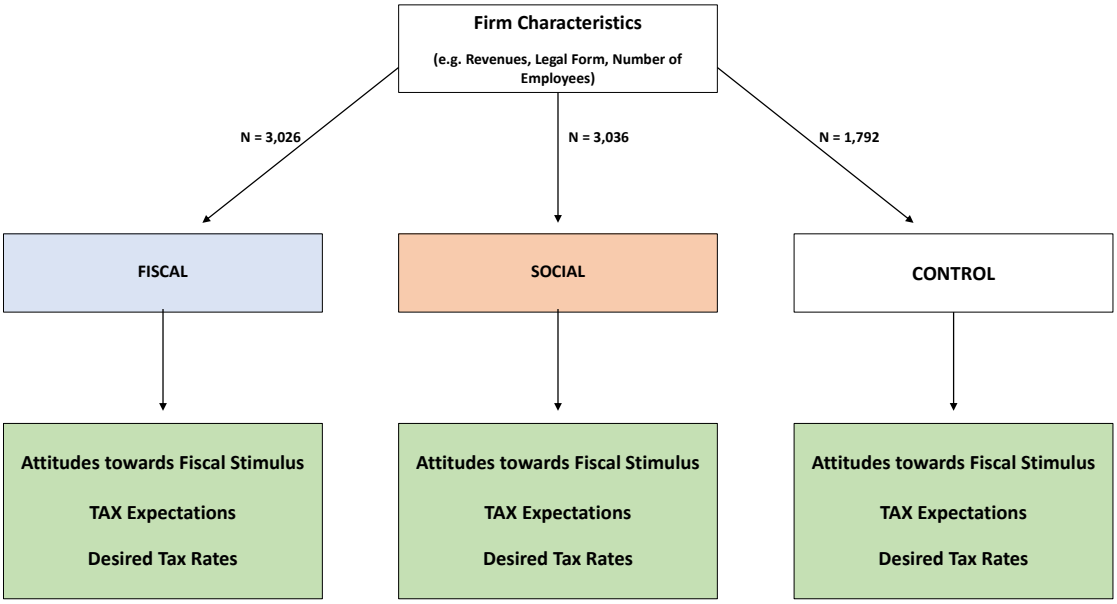
Participants in both the FISCAL and SOCIAL treatment are reminded that the government had pledged a stimulus package of €130 billion to support the German economy during the Corona crisis. In addition, participants in the FISCAL treatment group receive the information that this increase in government spending would necessitate tax increases in the future. To make the treatment more credible, we also inform the participants that many countries increased their tax rates after the financial crisis and that representatives of the governing party already stressed the necessity to increase taxes to restore fiscal balance.

For participants in the SOCIAL treatment group the information treatment stresses that many companies experienced hardship through no fault of their own as a result of the Corona crisis. To highlight this fact, we inform the firm-decision makers that sales in the hospitality industry dropped by 75.8 percent compared to the same month in the prior year[15].

Our survey experiment is designed to answer our two research questions. Comparing the results

[15]Refer to Appendix B.1 for an overview of the different information treatments and their wording.

Figure 4.1: Experimental Design



of the FISCAL treatment to the results of the CONTROL group will allow us to test whether firm decision-makers are aware of the potential cost of the stimulus program in the form of higher government debt. Further, we will be able to assess if arguments of fiscal prudence change firm decision-makers attitudes towards tax policy. The SOCIAL treatment is designed to elicit if firm decision-makers attitudes towards tax policy change, once fairness considerations are being made more salient to them. Both, considerations of fairness and government debt, have been shown to influence attitudes of "representative" individuals towards government spending and taxation[16]. To examine if redistribution and fairness arguments increase willingness to pay taxes, we compare the SOCIAL group with the CONTROL group. To examine whether awareness of the fact that past stimulus programs also had to be refinanced increases willingness to pay taxes, we compare the FISCAL treatment to the CONTROL group. We test for systematic differences between firm decision-makers in the various treatment groups. The test shows that characteristics are well balanced across different treatment groups.[17]

[16]The importance of the fiscal outlook of public debt for households has been shown, e.g., by Roth et al. (2021) and Coibion et al. (2021). At the same time, studies have shown that individuals preference for redistribution is strongly influenced by fairness considerations (Fong, 2001; Konow, 2003; Alesina and Angeletos, 2005; Alesina and Giuliano, 2011; Ooghe and Peichl, 2014; Durante et al., 2014; Fisman et al., 2020).

[17]Descriptive statistics and balancing tests of firm and manager characteristics can be found in Appendix B.4.

4.4 Experimental Results

4.4.1 Future Tax Expectations

We begin by presenting results on the tax expectations of firm decision-makers. First, we want to verify that firm decision-makers do not confuse tax expectations and preferences about tax policy. Second, studying tax expectations also serves as a manipulation check to verify that merely receiving any treatment does not alter tax expectations which could then be reflected in preferences about tax policy. Lastly, we want to verify that similar to findings in Coibion et al. (2021) firm decision-makers underestimate the costs of the fiscal stimulus program and adjust their tax expectations upward if they are confronted with the need to counter-finance the fiscal stimulus program. Table 4.1 presents OLS regression results of the expected medium-term tax rate changes for *corporate tax*, *local business tax*, *income tax* and *capital gains tax* on a treatment dummy of the following form:

$$y_i = \beta_0 + \sum_{k=1}^{2} \beta_k \times TREATMENT_{ik} + X_i'\gamma + \varepsilon_i. \tag{5}$$

The dependent variable y_i is the expected medium-term tax change of the respective tax rate and $Treatment_{ik}$ is a categorical variable which indicates the experimental treatment firm i is in (SOCIAL, FISCAL). The coefficient β_0 represents the baseline effect for the CONTROL group and is captured in the row CONTROL (Baseline). β_k denotes the effect of the other experimental groups compared to the CONTROL group. We additionally include results for a specification with controls (X_i) such as firm size, industry, legal form, gender, education, position in the company and, most importantly, we control for whether the stimulus program was perceived as just. The results

in Table 4.1 show that firms on average expect only very minor increases to future tax rates. The largest increase is expected for the *capital gains tax* for which firms expect a 2.3 percentage point increase, followed by the *business tax* and the *income tax* where firms expect a 0.8 percentage point increase. For the *corporate tax*, no significant change is expected. Comparing the tax expectations of firms in the SOCIAL treatment group to tax expectations of firms in the CONTROL group, we find no significant difference. Consequently, our results confirm that receiving a treatment or being reminded of the fiscal stimulus program does not have any effect on expectations about future tax rate changes. Moving to the results of the FISCAL group, we find that explicitly mentioning that the benefit of the fiscal stimulus program may come at a future cost significantly raises expected

Table 4.1: Expected Medium-term Changes in Taxes

Dependent Var.:	**Medium-Term Tax Expectations**							
	Corporate Tax		**Business Tax**		**Income Tax**		**Capital Gains Tax**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CONTROL (Baseline)	0.004	0.004	0.008***	0.010**	0.008***	0.011***	0.023***	0.024***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
SOCIAL	-0.004	-0.004	-0.004	-0.003	-0.003	-0.005	-0.000	-0.000
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)
FISCAL	0.022***	0.021***	0.025***	0.019***	0.024***	0.017***	0.029***	0.026***
	(0.003)	(0.004)	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)	(0.005)
Controls	None	All	None	All	None	All	None	All
N	3397	2209	3681	2392	3746	2420	3464	2245
Adj. R^2	0.029	0.038	0.027	0.031	0.028	0.035	0.034	0.033

Note: OLS estimates from the regression of equation 5. Dependent variable: expected medium-term change in percentage points of respective tax. Independent variables: experimental group, constant, and control variables (sizegroup (EC's definition for small and medium-sized enterprises (SMEs)), industry (WZ08 1-digit), legal form, gender of manager, manager education, position in company, dummy equal to 1 if decision-maker finds stimulus justified and 0 otherwise). Robust standard errors in parenthesis. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

future tax rates. The effect ranges from 2.2 percentage points to 2.9 percentage points in the specification without controls and is statistically and economically significant. Participants in the FISCAL group expect a 2.5 percentage points higher tax rate for the medium-term *business tax* compared to the CONTROL group. Based on an average *local business tax* of 14% in 2021, this implies a difference of 11.5%. We show that merely mentioning the fiscal stimulus program in a treatment does not have any effect. Further, firm decision-makers do not appear to internalize the costs of the fiscal stimulus program.

4.4.2 Attitude towards Fiscal Stimulus Program

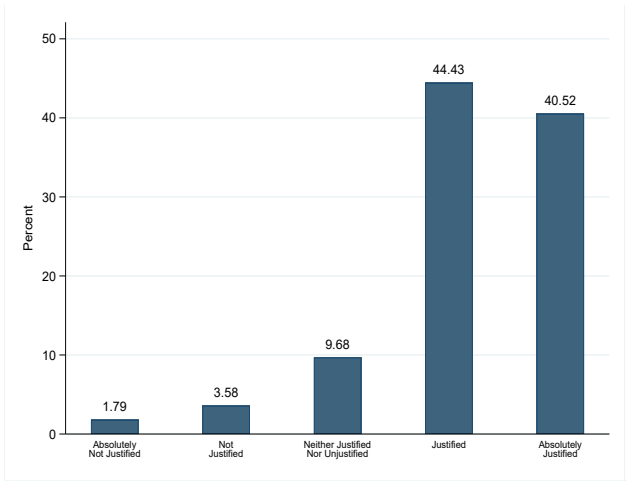
We now proceed to assess if the different treatments affect firm decision-makers' opinions on the fiscal stimulus program. The willingness to pay might be strongly affected by the support for that policy. Several studies have shown that fairness considerations strongly influence how individuals judge different policies (Fisman et al., 2020; Stantcheva, 2021). At the same time, support for government spending can decline if decision-makers are more aware of the cost associated with the government intervention (Roth et al., 2021). As previously mentioned, firm decision-makers in the SOCIAL treatment receive two different pieces of information. First, we mention the €130 billion necessary for the stimulus program which we expect to dampen the approval compared to the CONTROL group. Second, we stress that many firms were in distress due to unforeseen circumstances, namely the Corona crisis. Stressing such fairness considerations, we expect that respondents in

the SOCIAL treatment are more in favor of the fiscal stimulus package than respondents in the FISCAL treatment group. In the FISCAL treatment, we again provide two pieces of information. We mention the €130 billion necessary for the stimulus program, which again might lead to less approval compared to the CONTROL group. Second, we make firm-decision makers aware of the fact that the fiscal stimulus might lead to higher future government revenues or spending cuts. Hence, we expect that firm decision-makers are less in favor of the fiscal stimulus program than firm decision-makers in the CONTROL group or the SOCIAL group.

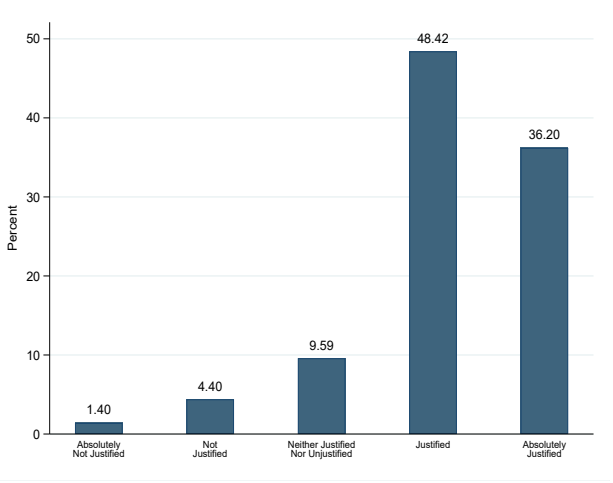
Figure 4.2 provides an overview of the response distribution by treatment group. There are three main takeaways: First, the majority of decision-makers in our sample think that the fiscal stimulus package is justified. Second, mentioning the possible future cost of the government intervention in the form of a possible future tax increase or spending cuts has a significant negative effect on the support of the fiscal stimulus program. Highlighting that the increase in government spending might ultimately be paid by the taxpayer strongly changes attitudes towards the fiscal stimulus program. Nonetheless, a large share of firm decision-makers (approx. 60%) still view the government intervention as justified. Third, there are no economically meaningful differences between participants of the SOCIAL treatment and participants of the CONTROL treatment. On average participants in the SOCIAL treatment are less likely to absolutely support the fiscal stimulus program than the CONTROL group. This suggests that arguments about misfortune or bad luck do not change the level of support for the fiscal stimulus program. The effect of the treatments is not sensitive to the modelling choice. We find similar effects in an ordered probit model (e.g. Table B.2) as well as in a linear probability model[18] and when we define the outcome variable as a binary variable (e.g. Table B.1).

[18]In the linear probability model we treat the dependent variable as a continuous variable

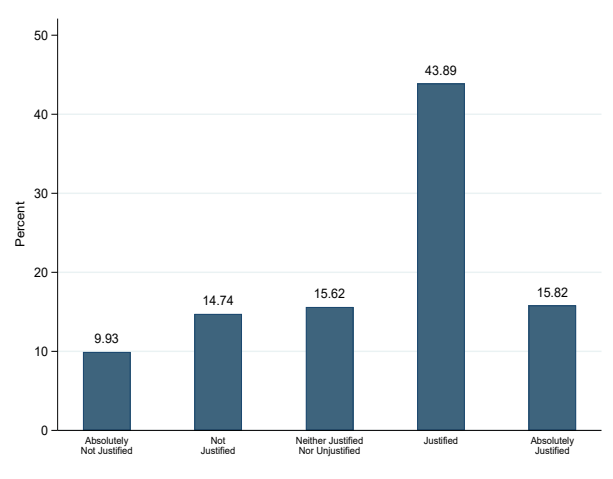
Figure 4.2: Attitude towards the Fiscal Stimulus



(a) CONTROL



(b) SOCIAL



(c) FISCAL

Note: Figure 4.2 illustrates the distributions over a 5-point Likert scale on the question *Do you think it is justified for the government to intervene with a/this stimulus package (at the taxpayer's expense)?* for CONTROL group ($N = 1,229$), SOCIAL group ($N = 3,003$) and FISCAL group ($N = 2,971$). Firm decision-makers could choose between the following five options: *Absolutely Not Justified*, *Not Justified*, *Neither Justified Nor Unjustified*, *Justified* and *Absolutely Justified*.

4.4.3 Experimental Findings: Adjustment Desired Taxes

In this section, we present results on the tax preferences of firm decision-makers by asking about their preferred future tax rate. We further illustrate how these preferences change in response to either emphasizing fiscal prudence or the role of bad luck. Similar to Table 4.1, results are based on a regression in the form of Equation 5 where we regress our treatment dummies on the desired tax rates for the *corporate tax, local business tax, income tax* and the *capital gains tax*. Additionally, our specification with controls now also includes the tax expectations of firm decision-makers as summarized in Table 4.1. Table 4.2 shows results for the CONTROL group as baseline in the first row and differences between the treatment groups and the baseline in rows two and three. We expect that both the SOCIAL treatment and the FISCAL treatment group prefer higher taxes compared to the CONTROL group. In the SOCIAL treatment, we expect that stressing the role of circumstantial differences will increase firm decision-makers willingness to support businesses who incurred financial distress through higher taxes. If firm decision-makers reason similar to households this should increase the willingness to redistribute by paying higher taxes. In the FISCAL treatment, we emphasize the need to counter-finance the state intervention via taxes. If firm decision-makers value governmental spending programs, we expect to observe higher preferred taxes compared to the CONTROL group.

Table 4.2: Desired Adjustment Tax Rates

Dependent Var.:	**Adjustment Corporate Tax**		**Adjustment Business Tax**		**Adjustment Income Tax**		**Adjustment Capital Gains Tax**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CONTROL (Baseline)	-0.031***	-0.026***	-0.041***	-0.032***	-0.034***	-0.024***	-0.004	0.005
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)
SOCIAL	-0.001	0.002	-0.001	0.001	-0.001	-0.001	0.011**	0.012**
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.006)
FISCAL	0.025***	0.017***	0.028***	0.018***	0.028***	0.019***	0.041***	0.031***
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.006)
Controls	None	All	None	All	None	All	None	All
N	3798	1806	4024	1952	4040	1963	3834	1852
Adj. R^2	0.023	0.210	0.026	0.199	0.029	0.198	0.031	0.176

Note: OLS estimates from the regression of equation 5 and additionally controlling for medium-term tax expectations. Dependent variable: desired adjustment in percentage points of respective tax. Independent variables: experimental group, constant, and control variables (sizegroup (EC's definition for small and medium-sized enterprises (SMEs)), industry (WZ08 1-digit), legal form, gender of manager, manager education, position in company, dummy equal to 1 if decision-maker finds stimulus justified and 0 otherwise, medium-term tax expectations). Robust standard errors in parenthesis. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

The results highlighted in Table 4.2 show that firm decision-makers in the CONTROL group

want to reduce their respective tax rates relative to the current tax rate. The tax they want to reduce the most is the *business tax* which they want to lower by 4.1 percentage points. Further, they wish to reduce the *income tax* by 3.4 percentage points and *corporate tax* by 3.1 percentage points. It is plausible that we observe the largest desired reduction for the *business tax*, since this tax is levied on all businesses and does not depend on the legal form of a business. Interestingly, participants in the CONTROL group do not want a substantial or statistically significant reduction of the *capital gains tax*. For the SOCIAL treatment group, we find that there are no statistically significant differences in the desired tax rates in the corporate tax, business tax or income tax compared to the CONTROL group. However, we find that participants in the SOCIAL treatment want to increase the capital gains tax by 1.1 percentage points more than the CONTROL group. It is notable that, with the exception of the capital gains tax, respondents in the FISCAL treatment also do not want to increase taxes but favor a significantly lower reduction in the corporate tax (-0.6 percentage points), business tax (-1.3 percentage points) and income tax (-0.6 percentage points). In comparison to respondents in the CONTROL group, firm decision-makers in the FISCAL treatment strongly prefer higher taxes to pay for future government bailouts. This finding is independent of the type of tax and statistically significant at the one percent level. The largest response is observable for the capital gains tax, where respondents in the FISCAL group want a 4.1 percentage points higher tax rate than respondents in the CONTROL group. Differences between CONTROL and FISCAL group for the other types of taxes range between 2.5 percentage points to 2.8 percentage points. Given the current tax rates, the treatment effects are substantial. The corporate tax rate in Germany amounts to 15%, hence a difference of 2.5 percentage points implies that respondents in the FISCAL group want to lower the tax rate 17 % less than respondents in the CONTROL group. The desired raise of the capital gains tax by 3.65 percentage points implies a 15% increase of the statutory capital gains tax of 25%. Even when controlling for the support of the fiscal stimulus program, results for participants of the FISCAL treatment remain statistically and economically unchanged. Also, controlling for the future tax expectations of firm decision makers does not completely absorb the treatment effect for the desired tax rates. Thus, the desire to pay taxes is not explained only by a successful shift in future tax expectations. Rather, expectations and willingness to pay should be viewed as two separate things.

Our experimental evidence provides three main findings. First, participants in the FISCAL treatment want to increase taxes more than participants in the CONTROL group even when controlling for support of the fiscal stimulus program. Second, there are no differences between participants

of the SOCIAL treatment and the CONTROL group. The only exception is that participants in the SOCIAL treatment appear to support a higher capital gains tax than participants in the CONTROL group. Third, on average firm decision-makers want to decrease all tax rates, except for the capital gains tax rate

How can our results be rationalized? First, firm decision-makers appear to adjust their attitudes towards tax policy when confronted with arguments of fiscal prudence. This suggests that firm decision-makers do not account for potential costs of the fiscal stimulus program and are not aware of the need to counter-finance such programs. Second, the limited effect on attitudes towards tax policy in the SOCIAL treatment suggest that firm decision-makers do not become more supportive of higher taxes after being exposed to arguments of fairness or misfortune. This contrasts the findings of studies conducted among representative individuals (Fong, 2001; Konow, 2003; Alesina and Angeletos, 2005; Alesina and Giuliano, 2011; Ooghe and Peichl, 2014; Durante et al., 2014; Fisman et al., 2020).[19] Another important difference between the FISCAL and the SOCIAL treatment concerns the revenue resources of the government. Whereas the statements in the FISCAL treatment make it clear that the revenues of the government are not sufficient to pay back the stimulus package expenditures, participants in the SOCIAL treatment are less aware of the need to counter-finance the extraordinary expenses caused by the Corona crisis. Thus, participants in the SOCIAL treatment might assume that the government budget and revenues will be large enough to support firms in the future without the need to raise additional revenues via higher taxes. Third, firm decision-makers consider their overall tax burden to be too high, however this finding does not hold for the capital gains tax. Interestingly, this finding is very much in line with public statements by prominent business owners or CEOs who strongly advocate for introducing a wealth tax.[20] There might be several explanations as to why firm decision-makers want to increase the capital gains tax. First, the wish to increase the capital gains tax rate might be driven by a willingness to redistribute, since the tax base for the capital gains tax are increments in wealth. Second, firm decision-makers might perceive the capital gains tax as less distortive to the firm production process than the corporate or the personal income tax. To better understand the rationale underlying the wish to increase the capital gains tax rate we conducted a smaller follow-up survey. In the follow-up survey, different sample of firms received the same treatment and where asked an open

[19]Participants might not have responded in a stronger manner to the SOCIAL treatment since the information provided did not update their beliefs. Many participants might have been aware that the degree to which firms were affected by the Corona crisis was not influenced by past firm performance or managerial effort. Therefore, we cannot observe a difference between the SOCIAL and the CONTROL group.

[20]The effects of capital gains tax and wealth tax can be considered to be similar since the capital gains tax constitutes a tax on the returns to wealth, while the wealth tax constitutes a tax on the stock of wealth.

text question as to why they wanted to increase the capital gains tax rate after being asked about their desired tax rates. The participants mostly mentioned redistributive arguments, for example making the wealthy pay their fair share. Given the small number of participants who filled out the open-ended text question and the fact that the follow-up survey was conducted one month after the original survey these results need to be interpreted with caution. Thus, we can only presume that fairness considerations do matter for firm decision-makers' attitudes towards tax policy to some extent. This presumption is buttressed by the fact that in particular firm decision-makers in the SOCIAL treatment, for whom fairness considerations were emphasized, wanted to increase the capital gains tax rate.

All in all, the results presented in this section show that firm decision-makers adjust their tax preferences more strongly when they are confronted with statements of fiscal prudence than with fairness concerns. Extending previous results by Roth et al. (2021), who find that beliefs over government debt level have an effect on the attitude towards government spending, we find that these beliefs also influence attitudes towards taxation. However, it appears that firm decision-makers are only to a limited extent susceptible to fairness considerations. There is some tentative evidence that fairness prompt firm decision-makers to increase taxes for the affluent, since participants of the SOCIAL treatment want to increase the capital gains tax.

4.4.4 Heterogenities

In this section, we examine if our experimental treatments have differential effects on the willingness to pay taxes for different types of firms and decision-makers. First, we are interested if firm decision-makers support for the fiscal stimulus program determine their attitudes towards tax policy. We expect that the effect of support for the stimulus program on tax policy is particularly strong in the FISCAL treatment. Firm decision-makers in this treatment group recognize the need to counter-finance the government stimulus, hence if they are in support of the policy they should adjust their attitudes towards taxes accordingly. Second, we are interested if attitudes towards tax policy depend on the taxes the firm has to pay. To investigate this channel we test for heterogenous effects between firms of different legal forms. In contrast to incorporated firms, non-incorporated firms such as sole proprietorships or business partnerships are not subject to the corporate income tax.[21] Hence, we examine if the desired level of the corporate income tax rate depends on incorporation status. We expect a lower willingness to pay the *corporate tax* for

[21] A firm is classified into an incorporated firms when it is a GmbH, UG, AG, SE, Genossenschaft or limited corporation as these legal forms are subject to the *corporate tax* in Germany. Non-incorporated firms consist of Einzelunternehmen, oHG, GbR, PartG, KG and Personengesellschaft, which are not subject to the *corporate tax*.

corporations than for non-incorporated firms. Nevertheless, this effect could be mitigated by the statements made in the SOCIAL and FISCAL treatment, as fairness and fiscal prudence motives could become more important and dampen other strategic motives.

To test these channels, we run separate OLS regressions of the following form:

$$y_i = \alpha + \beta \times Covariate_i + \sum_{k=1}^{2} \delta_k \times TREATMENT_{ik} + \sum_{k=1}^{2} \theta_k \times Covariate_i \times TREATMENT_{ik} + X_i'\gamma + \varepsilon_i. \quad (6)$$

The dependent variable y_i represents the tax rate adjustment of the *corporate tax*, *business tax*, *income tax*, and the *capital gains tax*. The categorical variable $Covariate_i$ is used to test for potential heterogeneous treatment effects we are interested in. To test the two channels described above, $Covariate_i$ is defined in the following two ways. First, when looking at differences in tax preferences depending on the attitude towards the fiscal stimulus, $Covariate_i$ is a dummy variable equal to one if a firm decision-makers finds the fiscal stimulus *Justified* or *Absolutely Justified* and zero otherwise. Second, in the case of tax preferences for different legal forms, $Covariate_i$ is a categorical variable equal to one for corporations and zero for non-incorporated businesses such as sole-proprietorships or business partnerships. $Treatment_i \times Covariate_i$ represents the full interaction between the respective treatment received and the category of the respective covariate. Finally, similar to equation 5 we control for firm characteristics ($FirmChar_i$; e.g. number of employees, revenues, economic sector, profit change due to Corona crisis) and manager characteristics ($ManagerChar_i$; e.g. gender, education and risk attitude of firm decision-maker). Including these controls ensures that our experimental results found in Sections 4.4.1 and Sections 4.4.3 are not driven by imbalances due to observables.

Table 4.3 presents the group average treatment effects (GATEs) for firm decision-makers with different attitudes towards the fiscal stimulus. We observe a clear pattern for all experimental groups, where firm decision-makers who find the government stimulus justified have a higher willingness to pay taxes compared to decision-makers who find the stimulus unjust. Further, we observe heterogeneity within the treatments. While the difference between the two groups of firm-decision makers is positive for all treatments, the effect is particularly strong (significant at the 1% level) for the FISCAL treatment (2 percentage points). At the same time, the economic magnitude of the effect is rather large. With a flat corporate tax of 15%, this implies a 13% higher desired tax rate

for firm decision-makers in the FISCAL treatment, who find the stimulus justified as compared to decision-makers in the same experimental group, who have a neutral perspective or perceive the fiscal stimulus as unjust. Moreover, this pattern is not specific to the *corporate tax*, but also present for the *business tax*, *income tax* and *capital gains*. We conclude that firm decision-makers, who support the fiscal stimulus program, have a higher willingness to pay taxes. This effect is particularly strong when decision-makers realize the need of the government to counter-finance the expenditures such that the state can support firms in future crises (FISCAL treatment).

In Table 4.4 we investigate if treatment effects differ with respect to the type of tax a firm is liable to. As mentioned above, only corporations but not non-incorporated firms are subject to the *corporate tax*. Therefore, we expect a lower willingness to pay the *corporate tax* for corporations compared to non-incorporated firms. The GATEs of Table 4.4 show that this is indeed the case. Incorporated firms want a significantly lower *corporate tax* as compared to non-incorporated firms. Over all experimental groups, this effect is significant at least at the 5% level and the difference between incorporated and non-incorporated firms ranges from 1.6 percentage points to 3.0 percentage points. However, we also observe that the absolute difference between incorporated and non-incorporated firms becomes weaker in the SOCIAL (1.6 % percentage points) and FISCAL (1.8 % percentage points) group as compared to the CONTROL group (3.0 % percentage points). This finding, suggests that fairness and fiscal prudence arguments, with which decision-makers are confronted with in the SOCIAL and FISCAL treatment, can be a successful tool to dampen a firm's self-centered interest to lower the kind of taxes it is subject to.

Table 4.3: Heterogeneous Effects by Attitude towards Fiscal Stimulus

	Estimated GATE (SE in parenthesis)		
	CONTROL	SOCIAL	FISCAL
Corporate Tax			
Not Justifed or Neutral	-0.037***	-0.040***	-0.019***
	(0.009)	(0.006)	(0.003)
Justifed	-0.031***	-0.030***	0.002
	(0.004)	(0.002)	(0.002)
Difference	0.006	0.010	0.020***
	(0.010)	(0.006)	(0.004)
Business Tax			
Not Justifed or Neutral	-0.041***	-0.050***	-0.026***
	(0.009)	(0.006)	(0.003)
Justifed	-0.039***	-0.041***	-0.006**
	(0.004)	(0.002)	(0.002)
Difference	0.002	0.009	0.020***
	(0.010)	(0.006)	(0.004)
Income Tax			
Not Justifed or Neutral	-0.032***	-0.050***	-0.022***
	(0.009)	(0.006)	(0.003)
Justifed	-0.032***	-0.032***	0.005**
	(0.004)	(0.002)	(0.002)
Difference	0.001	0.019***	0.027***
	(0.010)	(0.006)	(0.004)
Capital Gains Tax			
Not Justifed or Neutral	-0.019*	-0.012*	0.019***
	(0.011)	(0.006)	(0.004)
Justifed	0.001	0.010***	0.048***
	(0.004)	(0.003)	(0.003)
Difference	0.020*	0.022***	0.030***
	(0.012)	(0.007)	(0.005)

Note: Table 4.3 presents estimated group average treatment effects (GATE) for the *corporate tax*, *business tax*, *income tax* and *capital gains tax* for firms varying by their attitude towards the fiscal stimulus. Estimated GATEs are based on the regression in column (1) (*corporate tax*), column (3) (*business tax*), column (5) (*income tax*) and column (7) (*capital gains tax*) shown in Table B.4 in the Appendix. The regressions are based on equation 6: $y_i = \alpha + \beta \times Justified_i + \sum_{k=1}^{2} \delta_k \times TREATMENT_{ik} + \sum_{k=1}^{2} \theta_k Justified_i \times TREATMENT_{ik} + \varepsilon_i$. Dependent variable: desired adjustment in percentage points of *corporate tax*, *business tax*, *income tax* and *capital gains tax*. Independent variables: experimental group, dummy variable $Justified_i$ equal to one for firm decision-makers finding the fiscal stimulus absolutely justified or justified and zero otherwise and a constant. Robust Standard Errors are in parentheses. Significance Levels are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4.4: Heterogeneous Effects by Legal Form

Corporate Tax:	Estimated GATE (SE in parenthesis)		
	CONTROL	SOCIAL	FISCAL
Non-incorporated	-0.008	-0.020***	0.009
	(0.008)	(0.007)	(0.006)
Incorporated	-0.038***	-0.035***	-0.010***
	(0.004)	(0.003)	(0.002)
|Difference|	-0.030***	-0.016**	-0.018***
	(0.009)	(0.007)	(0.006)

Note: Table 4.4 presents estimated group average treatment effects (GATE) for the *corporate tax* for firms varying by legal form. Estimated GATEs are based on the regression in column (1) shown in Table B.3 in the Appendix. The regressions are based on equation 6: $y_i = \alpha + \beta \times Corporation_i + \sum_{k=1}^{2} \delta_k \times TREATMENT_{ik} + \sum_{k=1}^{2} \theta_k Corporation_i \times TREATMENT_{ik} + \varepsilon_i$. Dependent variable: desired adjustment in percentage points of corporate tax. Independent variables: experimental group, dummy variable $Corportation_i$ equal to one for corporations and zero for sole-proprietorships/business partnerships and a constant. Robust Standard Errors are in parentheses. Significance Levels are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.5 Concluding Remarks

In this paper we investigate firm decision-makers attitudes towards the fiscal stimulus program adopted by the German government during the Covid pandemic. Further, we provide evidence on how firm decision-makers reason and think about tax policy.

Our descriptive statistics provide some evidence on firm decision-makers attitude towards tax policy. We show that firm decision-makers desire a reduction to most tax rates, except for the *capital gains tax*. Furthermore, we document that firm decision-makers largely agree that the fiscal stimulus program was justified.

We investigate whether awareness about the costs of the fiscal stimulus program or fairness considerations influence firm decision-makers attitudes towards tax policy. First, we show that the support for the fiscal stimulus program is reduced once we highlight the costs associated with it. However, firm decision-makers want to reduce tax rates less than the respective CONTROL group. Hence, it appears that making firm decision-makers aware about the cost of the fiscal stimulus program makes them want to reduce government spending. However, they still demand some level of government support. Second, we find limited evidence that fairness considerations influence firm decision-makers attitudes towards tax policy. In contrast to findings for households, firm decision-makers do not want to adjust taxes more than the CONTROL group if they are made aware that the beneficiaries of the fiscal stimulus program were in distress due to external circumstances which are not under the firms' control. However, firms in the SOCIAL Treatment prefer a slight increase of the capital gains tax rate relative to the control group which could potentially be driven by a higher demand for redistribution.

Further, we observe that firm decision-makers exhibit a certain degree of *free-riding* behaviour as they prefer to lower in particular the type of taxes to which they are subject to.

Our findings highlight that firm decision-makers were unaware of the potential costs of the fiscal stimulus program. Further, we find that in contrast to households firm decision-makers attitudes towards tax policy are only influenced by fairness considerations to a limited extent. Our results open up many interesting avenues for future research. To start with, more evidence, both experimental and non-experimental, is needed to better understand how views of firm decision-makers affect a range of economic policies in both good and bad economic times. As perceptions and expectations can have an important influence on firm representatives' decisions but are, at the same time, not observable in traditional archival firm data, survey research offers a great avenue for future research on these otherwise unobservable factors.

5 Next Time is Different: Evidence from Firm Decisions in the COVID-19 Crisis and the Russo-Ukrainian War

5.1 Introduction

Companies around the world have been exposed to a series of crises since the beginning of 2020. Most notably, the COVID-19 pandemic led to tight restrictions on many business models through government mandated lockdowns and other political measures. Right during the phase-out of most restrictions, the Russian attack on the Ukraine led to a war that once more affected many businesses due to the economic sanctions against Russia, a severe disruption of global supply chains[22], and rising energy prices[23]. While the different stages of the COVID-19 pandemic and the war in Ukraine all represent economic shocks, the nature of these shocks is very different.

We show that the intensity of a shock interacts with the type of shock and results in heterogeneous firm behavior. Particularly, we find that firms cannot increase prices if a shock had a substantial impact on sales. This result holds within industry and firm size classes. Canonical models of firms price setting behavior (Calvo, 1983) instead assume homogeneous pricing behavior. Our results suggest that taking into account the relationship between price setting and revenue shocks as well as their likelihood to spill over helps to improve our understanding of firm behavior.

The objective of our analysis is twofold. First, we document how the crisis exposure of companies varied over time. In particular, we distinguish between demand shocks for specific industries, spillover effects resulting from shocks to supply chains, and a shock to companies' cost functions because of high inflation. Second, we show how managerial responses such as pricing, hiring, or investment decisions also vary depending on the type of crisis exposure. Therefore, we examine how a demand shock for a very specific industry affects managerial decision-making differently from a global supply shock and a shock to the cost of production inputs. Our analysis exploits unique, large-scale survey data from the German Business Panel, which systematically surveys a representative sample of all legally independent businesses active in Germany at recurring intervals.

Using this data, we identify four key results. First, we observe a typical pattern for distressed firms during all periods of the crises: Firms with significant revenue declines cut down on costs, investments, and hiring but cannot durably increase prices. Thus, whether or not a firm experienced a material drop in revenues represents a consistent predictor of the firm's managerial decisions during all crisis episodes. Second, we classify the episodes by type of shocks and show that the

[22] https://www.nytimes.com/2022/03/01/business/economy/ukraine-russia-supply-chains.html

[23] For an overview of energy price developments refer to https://www.destatis.de/DE/Themen/Wirtschaft/Preise/Erdgas-Strom-DurchschnittsPreise/_inhalt.html

intensity of the shock determines the managerial responses. We show that the early COVID-19 period and the COVID-19 lockdown phases were characterized by demand shocks in specific industries that were particularly affected by federally imposed lockdown restrictions and tight hygiene requirements. This industry-specific demand shock brought about distinct responses: Early in the pandemic, the effects of lockdown-induced demand reductions remained confined to directly affected firms that dramatically revised their survival probability, increased prices, and initiated cuts in financial as well as non-financial investments. In the further course of the pandemic, these firms were able to recover despite ongoing COVID-19-related business restrictions, and their survival prospects increased fairly quickly.

Third, we demonstrate that the late COVID-19 period and the crisis induced by the Russo-Ukrainian war exhibit pronounced signs of supply shocks. Input prices began to rise on an economy-wide level during the late COVID-19 phase and put particular cost pressure on firms that experienced supply chain disruptions, spreading the crisis impact on firms that were previously immune to the demand shock. These firms had to increase prices to avoid cutting investments as well as hiring and had a more negative sentiment, measured as the expected survival rate among businesses operating in their industries.

Finally, we show that the crisis induced by the Russo-Ukrainian war is again different in its nature, because it largely came as a shock to firms' cost functions, primarily through higher energy prices. Due to the specific nature of this shock, it once more led firm decision makers to respond in distinct ways. Specifically, firms that already suffered from supply chain disruptions reacted disproportionately stronger in adjusting costs and did not just increase prices, but also decided to cut investments. As such, the cost-related disruption following the outbreak of the war in Ukraine amplified pre-existing trends and conditions from the COVID-19 crisis.

Our analysis adds to several streams of literature. In the context of the COVID-19 pandemic, several studies provide early evidence on the economic consequences of the crisis. While Altig et al. (2020), Bartik et al. (2020), Hassan et al. (2020), and Meyer et al. (2022) describe the impact of the pandemic on firm expectations and uncertainty, Alstadsæter et al. (2020), Balleer et al. (2020), and Alekseev et al. (2022) focus on specific managerial decisions, such as changes related to pricing, personnel, or investment plans, taken by firms that were hit by the pandemic. Considering the timing of such crisis responses, Buchheim et al. (2022b) show that rather than anticipating the negative impact of the crisis through tracking the pandemic's impact in earlier affected countries, German firms were rather late in realizing the crisis' substantial economic consequences. While

these studies are mostly concerned with the crisis impact on businesses during the first relevant infection wave of the pandemic, we extend the literature by opening up the analysis to a significantly longer time horizon and demonstrate that heterogeneity in the type and intensity of shocks matters. In particular, we do not only observe corporate decision-making during the early phases of the pandemic in 2020, but we widen the scope of the economic evaluation until after the recent escalation of the Russo-Ukrainian war. Primal studies on the economic impact of the Russo-Ukrainian war foremost focus on stock market effects for affected firms, depending on their proximity to the war zone (Boungou and Yatié (2022); Federle et al. (2022)) and their decision to suspend business operations in Russia (Balyuk and Fedyk (2022); Berninger et al. (2022); Sonnenfeld et al. (2022); Tosun and Eshraghi (2022)). By contrast, we show how the distinct nature of the cost shock induced by the outbreak of the Russo-Ukrainian war triggered heterogeneous business actions. In doing so, we examine a variety of relevant crisis outcomes, thereby providing a comprehensive view on the development of firm responses after the outbreak of the COVID-19 pandemic. Our empirical evidence on how these different types of shock affect firms and how they respond is important for modeling firm behavior.

Furthermore, we add to the literature examining the factors that impact business performance and managerial decisions during crises. With respect to the COVID-19 pandemic, the reliance on global supply chains (Ding et al., 2021), a business model that is immune to social distancing (Pagano et al., 2020; Lester et al., 2021; Barry et al., 2021), and expectations about the duration of the crisis (Buchheim et al., 2022a) have been shown to affect corporate behavior. In a recent study, Alekseev et al. (2022) show that the type of the experienced shock, i.e., demand- or supply-related, and financial constraints were important determinants for the behavior of American firms during early phases of the pandemic. Our study contributes empirical evidence to the dynamics of firm decision making in changing business environments. Tracking a relatively long time horizon at high-frequency allows us to observe how different types of shocks interact with managerial behavior.

5.2 Data

For the empirical analysis in this paper, survey questions from all five waves of the German Business Panel have been utilized. Tables C.1 and C.2 show that the sample composition with respect to employee and revenue classes, legal forms, and industries is extremely stable across the GBP's first four survey waves. Although individual sample firms might change over time, the balanced characteristics of the aggregated, large-scale cross-sections, thus, allow for an analysis of firm behavior over time. In addition, the Tables C.1 and C.2 report on the corresponding figures taken from the Company Register of the German Federal Statistical Office. When comparing this population to the sample of the German Business Panel, it becomes evident that the survey responses, in general, cover firms across all industries and size classes, but overrepresent larger businesses. This is due to the sample's greater share of corporations and its smaller share of sole proprietorships than in the German population of firms. To correct for such sampling bias, the German Business Panel provides survey weights.

5.3 Empirical Strategy and Summary Statistics

We examine the extent to which firms' economic environment and, consequently, managerial decisions deviate between recent crisis periods. To this end, we divide our data into four distinct crisis intervals that cover the Early COVID-19 period, the COVID-19 Lockdown phase, a Late COVID-19 time interval, and the Ukrainian War. We specify the Early COVID-19 period as our baseline time range: Relative to that benchmark, we identify changes in the business climate and firm responses over time. The cutoffs of the individual time periods are summarized in Table 5.1 and defined as below. A detailed timeline of relevant crisis events and implemented restrictions during the COVID-19 pandemic as well as the Russo-Ukrainian war is outlined in Table C.3 in the Appendix.

Table 5.1: Crisis Periods

	Startdate	Enddate	Observations
Early COVID-19	06. July 2020	03. October 2020	7,971
COVID-19 Lockdown	16. November 2020	24. June 2021	6,653
Late COVID-19	01. July 2021	30. October 2021	3,349
Ukraine War	24. February 2022	23. August 2022	2,191

Following the first strict COVID-19 lockdown in Germany, which lasted from March 22, 2020

to May 4, 2020, the German government started to relax hygiene requirements for stores, restaurants, outdoor recreational sports, visits to clinics, nursing homes and facilities for the disabled. While minimum distance restrictions remained in place, states were largely given responsibility for restrictions if they recorded below 50 new infections per 100,000 residents per week. Thus, business activity during the *Early COVID-19* phase, which we specify from July 6, 2020 to October 3, 2020, was permitted but subject to state-specific restrictions. Given our data structure, this time interval exactly covers the first survey wave of the German Business Panel and is compared against later crisis phases.

In contrast to this baseline period, the winter of 2020 and the spring of 2021 were characterized by nationwide, tight lockdown restrictions and strict hygiene requirements. During that time, all but essential stores and businesses were required to close for customers in Germany. To identify the economic effect of these restrictions, we define a *COVID-19 Lockdown* period, lasting from November 16, 2020 to June 24, 2021. This time interval matches the term of the German Business Panel's second survey wave. Following this phase of extremely stringent business restrictions, Germany introduced 3-G rules in the summer of 2021, allowing restaurants, shops and venues to serve customers which were either tested, vaccinated or recovered from a COVID-19 infection. We subsume this period of time, characterized by an easing of business restrictions, in a *Late COVID-19* phase, lasting from July 1, 2021 to October 30, 2021. Eventually, the interval of the *Ukraine War* ranges from February 24, 2022 - the starting date of Russia's invasion - up until August 23, 2022, the date for which the most recent data is available.

To identify changes in the business environment and the associated managerial decisions, we implement the following regression, which considers firm i in period t in county c as basic unit of observation:

$$\begin{aligned} Outcome_{i,t} = \; & \beta_0 + \beta_1 \times COVID\text{-}19 \;\; Lockdown_t + \beta_2 \times Late \;\; COVID\text{-}19_t \\ & + \beta_3 \times Ukraine \;\; War_t + Employees_i + COVID\text{-}19 \;\; Cases_{c,t} \\ & + Federal \;\; State_i + Industry_i + \epsilon_{i,t} \end{aligned} \tag{7}$$

We regress our outcome variables, characterizing the business environment and relevant managerial decisions, on three of the four different crisis phases as identified above, leaving the Early COVID-19 period as our baseline category. $COVID\text{-}19 \;\; Lockdown$, $Late \;\; COVID\text{-}19$, and $Ukraine \;\; War$ represent dummy variables, that are equal to one if the recorded response date of an observation falls into the respective time interval and zero otherwise. Thus, β_0 represents the baseline level

of each outcome variable during the Early COVID-19 phase, while β_1, β_2, and β_3 indicate the incremental change of the dependent variable in the respective time period relative to the baseline period. As control variables, we add to the regression each firm's number of employees and the amount of COVID-19 cases in the firm-specific county (both in logs). Furthermore, we include industry fixed effects based on the 2-digit industry classification from the German Statistical Office as well as federal state fixed effects.

Table 5.2 presents descriptive statistics of all relevant variables for the different periods.[24] During the Early COVID-19 period, companies in Germany experienced drastic declines in both revenues and profits, registering an average drop of 17.31 % and 17.51 %, respectively. At that time, 79 % of companies expected to survive the upcoming twelve months, 10 % of firms experienced supply-chain constraints and 22 % of firms planned to increase prices. Despite a sharp drop in the economic indicators, 61 % of firms intended to invest, and more than 50 % of businesses planned to hire in the following year. During the subsequent COVID-19 Lockdown period infection rates surged, triggering the introduction of tighter business restrictions. Consequently, German firms continued to experience drastic declines in revenues and profits, yet indicating a slightly worse expectation of survival as compared to the Early COVID-19 period. Still, a majority of companies expressed its intention to invest or hire additional employees in the medium term (66 % and 52 %, respectively).

[24] Appendix C.2 specifies the phrasing of all relevant questions in each survey round.

Table 5.2: Descriptive statistics

	Early COVID-19		COVID-19 Lockdown		Late COVID-19		Ukraine War	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Firm characteristics								
Revenue	1.64 Mio.	750,000	27.814 Mio.	650,000	5.162 Mio.	640,000	17.987 Mio.	683,000
ΔRevenue	-17.31	-16.00	-17.16	-14.00	6.88	2.00	5.78	0.00
ΔProfit	-17.51	-9.00	-17.21	-10.00	-0.12	0.00	-4.60	0.00
No. of Employees	122.84	5.00	119.18	5.00	25.06	5.00	387.48	5.00
ΔEmployees	1.83	0.00	0.66	0.00	6.56	0.00	5.17	0.00
Variables of interest								
Survival Probability	0.79	0.83	0.75	0.80	0.88	0.91	0.88	0.91
Supply Chain Constraints	0.10	-	0.31	-	0.35	-	0.40	-
Costs	0.00	0.00	0.00	0.00	0.07	0.01	0.10	0.05
Price Increases	0.22	-	0.19	-	0.63	-	0.73	-
Investment Plans	0.61	-	0.66	-	0.53	-	0.43	-
Hiring Plans	0.51	-	0.52	-	0.35	-	0.32	-
COVID-19 Cases	550	354	12,293	9,992	5,550	3,219	79,272	55,490
N	7,971		6,653		3,349		2,191	

This table presents descriptive statistics of the variables used in the regressions. *Revenue* indicates a firm's absolute amount of revenues in the previous calendar year (in €). *No. of employees* and *COVID-19 Cases* are also denoted in absolute terms (and logarithmized in the later regressions). Variables expressing relative changes (indicated by Δ) are expressed as percentages. These variables constitute the expected changes in revenues, profits, and staffing numbers as compared to the previous calendar year. *Costs* is calculated as Δ*Revenue* - Δ*Profit* and indicates whether a firm's costs rise/sink proportionally to its revenue increase/decrease. The remaining variables of interest range continuously from 0 to 1 or represent dummy variables. For dummy variables the mean is shown only. These means indicate the share of firms that is willing to increase prices, invest, or hire within the next twelve months and the share of businesses burdened by supply chain constraints. *Survival Probability* specifies the share of firms that is expected to survive the next twelve months.

During the summer of 2021, after the COVID-19 Lockdown, the general business outlook started to brighten up: In particular, revenue and profit expectations began to recover at rates of 6.88 % and -0.12 %, respectively. Consistent with this trend, the mean probability of survival climbed to 88 %. While revenues and profits began to rise, prices and costs increased as well. At the same time, a greater portion of firms suffered from supply chain constraints.

Since the start of the Russo-Ukrainian war, revenues are still expected to grow while profit expectations have dropped again significantly. This divergence between revenues and profits reflects the drastic increase in input prices. Lately, the sentiment of firms, as measured by their probability of survival, is more positive as compared to the beginning of the COVID-19 pandemic. However, the share of firms willing to invest or hire new employees has declined notably since the outbreak of the war in Ukraine.

5.4 Types of Shocks and Firm Decisions

While these descriptive statistics already provide first insights into the economic development along the different crisis periods, we turn to a formal empirical analysis in this section. To begin with, we

run the regression specified in equation (7) separately with various outcome variables that describe the general economic environment and the associated managerial responses during the distinct crisis phases. With respect to the business environment, we investigate changes in firms' survival probability and the share of businesses strained by obstacles along their supply chains. Concerning the responses by firms to shifts in the business climate, we consider pricing and cost decisions as well as investment and hiring plans. The results of the regressions are denoted in Table 5.3 and illustrated in Figure 5.1, 5.2, and 5.3. Recall that the level of each outcome variable in the Early COVID-19 phase serves as baseline. The coefficients of the subsequent crisis periods, thus, represent incremental changes in the outcome variables as compared to the reference level.[25]

Turning to the development of the business environment in Germany during the different crisis periods, first we find that 79 % of firms expected to survive until the end of the year during the Early COVID-19 period. A similar sentiment prevailed in the COVID-19 Lockdown phase. Yet, during the summer following that period of extremely tight business restrictions, companies' sentiment surged, leading to a 7 pp. increase in survival expectations. This outlook has not changed significantly since the beginning of the war in Ukraine. With respect to supply-side influences affecting the economy, we find that supply chain constraints were not seen as a major concern during the Early COVID-19 and COVID-19 Lockdown periods, but became very prevalent thereafter: We observe a 22.4 pp. increase in the share of firms strained by obstacles along their supply chains, pointing towards the emergence of a severe supply shock during the Late COVID-19 phase.

In addition to the significant increase in the share of firms experiencing supply chain issues following the phase of strict lockdowns, we find that companies recorded a considerable increase in costs at that time. After the outbreak of the war in the Ukraine, this increase has drastically intensified, evincing the recent occurrence of a massive cost shock. Interestingly, the severe surge in costs experienced by German firms following the start of the Russo-Ukrainian war does not seem to be solely driven by supply chain issues, as we find a large gap between the increase in these constraints and costs. A reasonable explanation for this result is that although access to supplies has remained stable (or equally bad) as during the Late COVID-19 period, the cost of energy and oil has risen dramatically since the beginning of the war and the introduction of economic sanctions against Russia (Statistisches Bundesamt, 2022).

[25]Note that the GBP has directly asked for supply chain constraints only following the first survey wave and, thus, after the Early COVID-19 period. Yet, supply chain issues are plausibly related to a significant decrease in a firm's access to production inputs. Thus, for the first survey wave we assume that a firm experiences problems along its supply chain if that firm indicates a decrease in access to production inputs greater than 20 % as compared to pre-crisis levels. Furthermore, during the COVID-19 lockdown period, the GBP' inquired firms about potential supply chain constraints only if they expected growing revenues. To mitigate concerns of distorted results given our analysis across multiple survey waves, we add a robustness test checking for a potential selection bias in section C.3.

Table 5.3: Crisis Effect on Firm Decisions & Outcomes

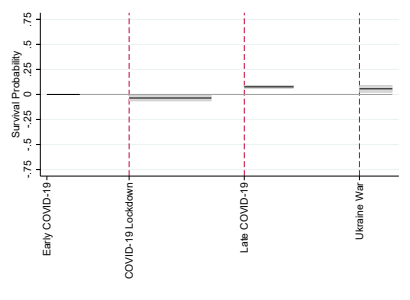
	Business Environment		Management Decisions			
	Survival Probability	Supply Chain Constraints	Costs	Price Increases	Investment Plans	Hiring Plans
Early COVID-19 (Baseline)	0.794	0.097	0.000	0.219	0.609	0.512
COVID-19 Lockdown	-0.031	0.006	0.011	-0.097	0.022	0.158**
	(0.032)	(0.138)	(0.047)	(0.066)	(0.077)	(0.079)
Late COVID-19	0.071***	0.236***	0.086**	0.358***	-0.180***	-0.165***
	(0.018)	(0.055)	(0.037)	(0.059)	(0.064)	(0.061)
Ukraine War	0.057	0.242**	0.227***	0.316***	-0.328***	-0.241**
	(0.038)	(0.106)	(0.067)	(0.101)	(0.122)	(0.117)
Observations	16,672	11,541	16,773	17,796	17,820	17,816
R^2	0.163	0.200	0.029	0.237	0.066	0.104
Controls	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

This table presents results from OLS regressions for analyzing the effect of different crisis periods on the business environment and managerial decisions. The level of the outcome variables during the Early COVID-19 period serves as baseline. While *Costs* is calculated as Δ*Revenue* - Δ*Profit*, all remaining variables lie in the interval from 0 to 1. Firm controls include the following variables: the number of employees (in logs) and the number of COVID-19 cases in the firm-specific county (in logs). Additionally, we include county and industry fixed effects. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1, 5, and 10 % levels (two-tailed), respectively.

Considering the direct managerial responses to the identified changes in the business environment, we find that managers started to increase prices drastically in the Late COVID-19 period. This tendency for price increases is observed in similar magnitude following the outbreak of the Russo-Ukrainian war. As supply chain constraints and costs rose following the COVID-19 Lockdown phase, firm decision-makers reacted quite strongly by reducing investment and hiring plans, with the share of companies willing to invest and hire decreasing by 18 pp. and 16.5 pp. respectively (see Figure 5.3). With respect to investment plans, this pattern intensifies following the war in Ukraine: Relative to the baseline level, we find that the share of firms willing to invest declines by 32.8 pp. Due to the regressions' control variables and fixed effects structure, these estimates are independent of the infection rates in a given county, comparing firms that are of similar size and that operate in the same federal state as well as industry.

Figure 5.1: Business Environment

(a) Survival Probability



(b) Supply Chain Constraints

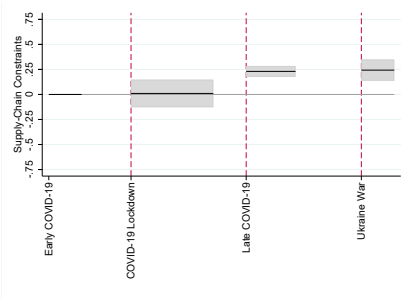
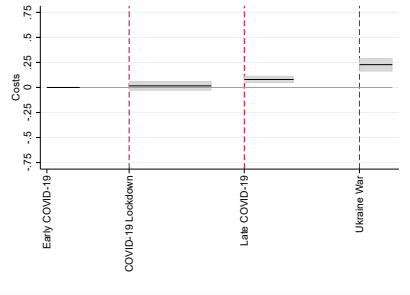


Figure 5.2: Costs and Prices

(a) Costs



(b) Price Increases

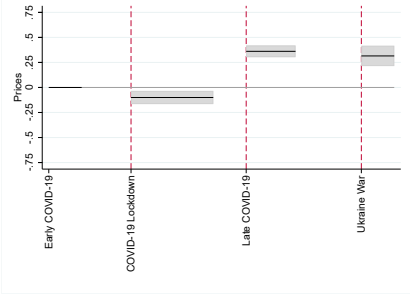
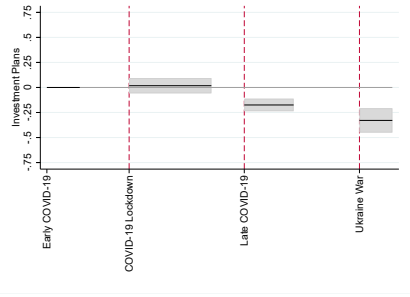
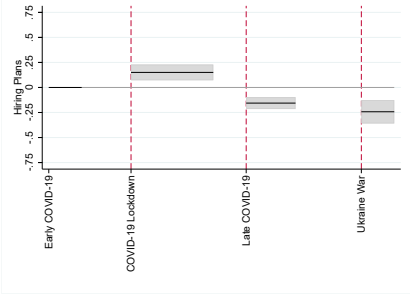


Figure 5.3: Investment and Hiring Plans

(a) Investment Plans



(b) Hiring Plans



Notes: These figures depict the coefficient estimates of the different crisis periods for the six outcome variables analyzed in Table 5.3. The effects are estimated relative to the baseline period, i.e., the phase before the strict lockdown restrictions in Germany during the winter of 2020. Any data gaps correspond to time intervals not covered by the survey and/or the analysis. The shaded areas represent 90 % confidence intervals.

5.5 Heterogeneity in Shock Intensity and Managerial Responses

The purpose of this section is to investigate the driving forces of management behavior during distinct phases of the crises. In particular, we aim to determine whether and to which extent different types of shocks induced specific management responses and affected firms' business practices in distinct ways depending on the nature of risk exposure.

To proxy for shock intensity, we generate a dummy variable *Neg. Revenue* which we set equal to one if a firm experienced a decline in revenues larger than or equal to 10 % during a specific time period. We run regressions as outlined in equation (7), but additionally interact the crisis period indicators with the dummy variable representing the negative revenue shock which yields the following regression equation:

$$\begin{aligned} Outcome_{i,t} = \; & \beta_0 + \beta_1 \times Neg.\,Revenue_{i,t} + \beta_2 \times COVID\text{-}19\;Lockdown_t \\ & + \beta_3 \times COVID\text{-}19\;Lockdown_t \times Neg.\,Revenue_{i,t} + \beta_4 \times Late\;COVID\text{-}19_t \\ & + \beta_5 \times Late\;COVID\text{-}19_t \times Neg.\,Revenue_{i,t} + \beta_6 \times Ukraine\;War_t \\ & + \beta_7 \times Ukraine\;War_t \times Neg.\,Revenue_{i,t} + Employees_i + COVID\text{-}19\;Cases_{c,t} \\ & + Federal\;State_i + Industry_i + \epsilon_{i,t} \end{aligned} \tag{8}$$

The managerial responses as identified in Section 5.4 represent the relevant outcome variables. Panel A of Table 5.4 reports the results of these individual regressions. Taking into consideration the baseline effect of a negative revenue shock during the Early COVID-19 phase, Panel B separately documents the net behavioral differences between firms with and without a drop in revenues during later crisis periods. The corresponding p-values are denoted in parentheses.

The regression outcomes yield several notable insights. First, management decisions during the Early COVID-19 phase strongly depend on the direction of a firm's revenue development. We find that while costs among firms with increasing revenues, on average, rise by 15.4 % during summer and fall 2020, the average firm with shrinking revenues actually cuts down on costs at such times. Turning to the pricing decisions that managers take during the early crisis phase we find significant differences depending on the direction of sales performance. While 21.1 % of companies with growing sales increase prices in the base period, as many as 23.4 % of companies with shrinking sales say they will do the same. Although such behavior already translates into a pricing differential of 10.9 % (and is statistically significant at the 10 % level), the differences concerning investment

Table 5.4: Crisis Effect on Firm Decisions & Outcomes
Negative Revenue Shock

Panel A: Regression Results				
	Costs	Price Increases	Investment Plans	Hiring Plans
Early COVID-19 (Baseline)	0.154	0.211	0.691	0.638
Neg. Revenue	-0.187***	0.023*	-0.104***	-0.159***
	(0.011)	(0.013)	(0.014)	(0.014)
COVID-19 Lockdown	-0.040	-0.114	0.025	0.162**
	(0.048)	(0.070)	(0.080)	(0.082)
COVID-19 Lockdown × Neg. Revenue	0.061***	0.010	-0.001	-0.041*
	(0.015)	(0.019)	(0.021)	(0.021)
Late COVID-19	0.017	0.371***	-0.030	-0.052
	(0.038)	(0.063)	(0.065)	(0.061)
Late COVID-19 × Neg. Revenue	0.078***	-0.033	-0.199***	-0.171***
	(0.016)	(0.022)	(0.023)	(0.023)
Ukraine War	0.176***	0.333***	-0.185	-0.158
	(0.067)	(0.105)	(0.119)	(0.113)
Ukraine War × Neg. Revenue	0.030	-0.034	-0.247***	-0.233***
	(0.020)	(0.025)	(0.029)	(0.028)
Observations	16773	17139	17282	17273
R^2	0.076	0.238	0.097	0.147
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Panel B: Test for Differences – Negative Revenue Shock vs. No Negative Revenue Shock (p-values in parentheses)				
COVID-19 Lockdown	-0.126***	0.033**	-0.104***	-0.200***
	(0.000)	(0.017)	(0.000)	(0.000)
Late COVID-19	-0.109***	-0.009	-0.302***	-0.330***
	(0.000)	(0.615)	(0.000)	(0.000)
Ukraine War	-0.156***	-0.011	-0.351***	-0.391***
	(0.000)	(0.625)	(0.000)	(0.000)

This table presents results from OLS regressions that highlight the contrasting effects of different crisis periods on managerial decision outcome variables depending on whether firms experienced a negative revenue shock. *Neg. Revenue* is set to one if a firm records a drop in revenues larger than or equal to 10 % during a specific time period. Firm controls include the following variables: The number of employees (in logs) and the number of COVID-19 cases in the firm-specific county (in logs). Furthermore, we include county and industry fixed effects. Panel A specifies the regression outcomes. In Panel A, robust standard errors are denoted in parentheses. Panel B takes into account the baseline effect of a negative revenue shock and lists separate t-tests for differences in the outcome variables between firms with and without a negative revenue shock for all considered periods. In Panel B, p-values of these t-tests are denoted in parentheses. ***, **, * indicate statistical significance at the 1, 5, and 10 % levels (two-tailed), respectively.

and hiring decisions are more extensive. The results show that firms experiencing a negative revenue shock are 15.1 % (10.4 pp.) and 24.9 % (15.9 pp.) less likely to increase investments and staffing numbers in the given financial year as compared to firms with growing business.

Second, the identified behavioral gap concerning prices does not transfer to later periods of the crisis. Such result might be due to the fact that we restrict our analysis to a comparison of firms that are of similar size and operate in the same industry. In light of customer stickiness,

unilaterally increasing prices beyond the level of competitors might compensate liquidity needs resulting from shrinking revenues during early phases of the crisis, but might not be a suitable competitive strategy in the medium term when customers have adapted to the crisis situation as well. Third, differences in crises responses with respect to costing, investment and hiring decisions carry over to, and partially intensify during later phases of the COVID-19 pandemic and the Russo-Ukrainian war. After the outbreak of the war in Ukraine, the differential in investment and hiring plans amounts to 35.1 pp. and 39.1 pp., respectively, implying a reduced willingness to increase investments of -69.4 % and to increase staffing levels of -81.5 % relative to the baseline probabilities (50.6 % and 48 %, respectively). Consequently, while pricing differences seem to remain temporary, investment decisions are consistently dependent on the severity of the imposed revenue shock.

Whether or not a firm experiences a negative revenue shock is, thus, a persistent influencing factor of its behavior during all phases of the crises: Firms with drastically shrinking revenues cut down on costs, investments, and hiring but cannot durably increase prices relative to their industry peers. Yet, experiencing declining revenues is not a specific feature of a certain crisis period per se. Rather, shrinking revenues are a sign of distinct types of shocks, whose nature and time-specific effects will be investigated in the following.

5.5.1 Managerial Decisions around an Industry-specific Demand and a Global Supply Shock

We start this more detailed analysis by decomposing the COVID-19 crisis into its individual phases that brought about specific economic shocks. During the early COVID-19 phase, beginning in July 2020, and the period of tight business restrictions in the winter 2020-21, firms in the retail industry were specifically burdened by imposed requirements on the implementation of safety and health measures. Regulatory constraints on business practices peaked from November 2020 to January 2021, when almost all retail firms and businesses offering close contact services were federally mandated to suspend their business activities.[26] These restrictions can be understood as a specific type of demand shock, with customer demand for constrained firms in the extreme case dropping to zero. In line with such interpretation, Alekseev et al. (2022) show that, in the U.S., concerns about demand shocks were outweighing issues resulting from supply-side factors throughout the first year of the pandemic. By contrast, the Late COVID-19 phase exhibits pronounced signs of a severe

[26] On the basis of the resolution of Germany's federal and state ministers as of October 28, 2020, the following businesses were required to suspend their activities starting on November 2, 2020: bars, clubs, discotheques, pubs, restaurants (except for delivery and cafeterias), theatres, operas, concert halls, fairs and exhibitions, cinemas and museums, amusement parks, gambling halls, betting offices, brothels, swimming pools, saunas, thermal baths, and service companies in the field of body care excluding medically necessary procedures (Bundesregierung, 2020).

supply shock. From Table 5.3 and Figure 5.1 we know that during the later stage of the COVID-19 crisis, supply chain constraints gained significant relevance among firms in the German economy. At that time, 33.3 % of firms report on frictions along their partially global supply chains relative to just 9.7 % at earlier phases of the pandemic. We exploit these observations by investigating whether firms hit by a demand shock, brought about by industry-specific lockdown restrictions, or supply shocks, induced by the disruption of global supply chains, differ in their responses to these shocks compared to unaffected firms.

Table 5.5: Crisis Effect on Firm Decisions & Outcomes – *Demand and Supply Shocks*

Panel A: Regression Results	Demand Shock				Supply Shock			
	Costs	Price Increases	Investment Plans	Hiring Plans	Costs	Price Increases	Investment Plans	Hiring Plans
Early COVID-19 (Baseline)	-0.002	0.202	0.628	0.529	-0.004	0.208	0.632	0.526
Shock Dummy	0.061***	0.089***	-0.033**	-0.005	0.069***	0.040*	0.000	0.059***
	(0.010)	(0.014)	(0.015)	(0.015)	(0.013)	(0.020)	(0.022)	(0.022)
COVID-19 Lockdown	0.021	-0.113	0.002	0.132	-0.116	0.038	-0.150	0.200
	(0.045)	(0.069)	(0.078)	(0.080)	(0.088)	(0.127)	(0.136)	(0.144)
COVID-19 Lockdown × Shock Dummy	-0.009	0.027	0.075***	0.002	-0.046**	-0.010	-0.048	-0.119***
	(0.015)	(0.022)	(0.023)	(0.024)	(0.023)	(0.033)	(0.035)	(0.037)
Late COVID-19	0.056	0.372***	-0.214***	-0.227***	0.045	0.295***	-0.232***	-0.240***
	(0.035)	(0.062)	(0.062)	(0.058)	(0.036)	(0.062)	(0.064)	(0.061)
Late COVID-19 × Shock Dummy	-0.014	-0.047	0.015	0.031	-0.037**	0.077***	-0.009	-0.052*
	(0.023)	(0.032)	(0.033)	(0.031)	(0.017)	(0.027)	(0.029)	(0.029)
Ukraine War	0.205***	0.327***	-0.350***	-0.284**	0.179***	0.232**	-0.360***	-0.309***
	(0.063)	(0.106)	(0.119)	(0.112)	(0.063)	(0.105)	(0.121)	(0.113)
Ukraine War × Shock Dummy	-0.033	-0.065*	0.014	-0.004	-0.015	0.104***	-0.053*	-0.066**
	(0.025)	(0.036)	(0.041)	(0.038)	(0.017)	(0.028)	(0.032)	(0.030)
Observations	16,773	17,139	17,282	17,273	10,959	10,950	11,085	11,079
R^2	0.096	0.210	0.087	0.123	0.130	0.284	0.109	0.170
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	Yes	Yes	Yes	Yes
Panel B: Test for Differences – Shock Dummy vs. No Shock (p-values in parentheses)								
COVID-19 Lockdown	0.052***	0.115***	-0.046*	-0.057**	0.023	0.030	-0.048**	-0.060**
	(0.000)	(0.000)	(0.085)	(0.050)	(0.239)	(0.248)	(0.080)	(0.043)
Late COVID-19	0.047**	0.042	-0.015	-0.006	0.032***	0.116***	-0.009	0.007
	(0.027)	(0.111)	(0.438)	(0.742)	(0.004)	(0.000)	(0.651)	(0.697)
Ukraine War	0.028	0.023	-0.063***	-0.020	0.055***	0.143***	-0.053**	-0.007
	(0.214)	(0.481)	(0.010)	(0.371)	(0.000)	(0.000)	(0.025)	(0.755)

This table presents results from OLS regressions that highlight the contrasting effects of different crisis periods on managerial decision outcome variables depending on whether firms experienced a demand or a supply shock. For demand shocks, the *Shock Dummy* is set to one if a firm is affected by the federal lockdown restrictions during the winter of 2020-21. For supply shocks, the *Shock Dummy* is set to one if a firm experiences problems along the supply chain. Firm controls include the following variables: The number of employees (in logs), the number of COVID-19 cases in the firm-specific county (in logs), and a firm's expected change in revenues. Furthermore, we include county and industry fixed effects. Panel A specifies the regression outcomes. In Panel A, robust standard errors are denoted in parentheses. Panel B takes into account the baseline effect of the shock dummy and lists separate t-tests for differences in the outcome variables between firms with and without a demand or supply shock for all considered periods. In Panel B, p-values of these t-tests are denoted in parentheses. ***, **, * indicate statistical significance at the 1, 5, and 10 % levels (two-tailed), respectively.

Operationally, we construct two indicator variables that capture whether firms have been hit by either of the economic shocks. With respect to demand-side influences, we construct an indicator variable *Demand Shock* that is set to one if a firm was affected by the nation-wide hard lockdown during the winter of 2020-21. Concerning supply-side effects, we establish an indicator variable *Supply Shock* that is set to one if a firm indicates significant supply chain obstacles (zero otherwise).[27] As in Section 5.5, we interact these dummy variables with the different phases of the crises. Thus, we run the following regression

$$\begin{aligned} Outcome_{i,t} = \; & \beta_0 + \beta_1 \times Shock\ Dummy_{i,t} + \beta_2 \times COVID\text{-}19\ Lockdown_t \\ & + \beta_3 \times COVID\text{-}19\ Lockdown_t \times Shock\ Dummy_{i,t} + \beta_4 \times Late\ COVID\text{-}19_t \\ & + \beta_5 \times Late\ COVID\text{-}19_t \times Shock\ Dummy_{i,t} + \beta_6 \times Ukraine\ War_t \\ & + \beta_7 \times Ukraine\ War_t \times Shock\ Dummy_{i,t} + Employees_i + \Delta Revenue_i \\ & + COVID\text{-}19\ Cases_{c,t} + Federal\ State_i + Industry_i + \epsilon_{i,t}, \end{aligned} \tag{9}$$

where *Shock Dummy* is a placeholder for *Demand Shock* or *Supply Shock*. In doing so, we are able to test whether firms hit by the significant, lockdown-induced demand shock and those experiencing supply chain constraints took different business decisions as compared to their industry peers unaffected by either the demand or supply shock. In contrast to Section 5.5, we additionally control for a firm's change in revenues to isolate the effect of the different types of shocks on managerial decision-making. Table 5.5 contains the corresponding regression outcomes (Panel A) as well as separate t-tests, examining the significance of behavioral differences between shocked and unaffected firms beyond the baseline period (Panel B).

First considering the impact of a demand shock, we show that the early period of the COVID-19 pandemic, including the phase of business closures during the 2020-21 winter, significantly affected key management decisions of companies hit by the imposed lockdown restrictions. Our findings indicate that at earlier phases of the pandemic, firms from crisis industries are significantly more likely to increase prices (+51 %) and to cut down on investment and hiring plans (-12.4 % and -11.9 %, respectively). Differences in pricing and hiring decisions carry over to the period of the COVID-19 lockdown, whereas firms not affected by tight regulatory measures did not change their behavior significantly from the earlier phase of the pandemic relative to the period with lockdown restrictions. Thus, we conclude that the beginning periods of the COVID-19 pandemic and the

[27] Please refer to Appendix C.2 for a detailed description of our survey questions on supply chain frictions in each survey wave and to section C.3 for a complementary robustness test.

associated governmental restrictions imposed an industry-specific demand shock on particular firms with little spillover to other industries such that managers from these other industries did not adjust their pricing, hiring, or investment decisions at this point in time.

Noteworthy, our results stand in contrast to the findings of Alekseev et al. (2022) who document a tendency for price decreases among firms worrying about demand shocks during the pandemic. Yet, this discrepancy might be explained by the peculiarities of the demand shock experienced by German firms under lockdown restrictions: While consumer demand would have been plausibly constant during that time (without lockdown restrictions), firms were not allowed to fully serve demand due to the business closing restrictions. Thus, for the remaining customers they rationally adapted by increasing prices since customers were not able to switch to alternative, equally restricted suppliers.[28] By contrast, during the winter of 2020-21, in the U.S. no strict lockdown restrictions were in place, forcing firms that faced demand reductions to fight for (fewer) consumers through reduced prices.

While the early phase and the period of strict lockdowns in the winter of 2020-21 affected businesses in those economic sectors that were hit by an industry-specific demand shock in the form of business closures and tight hygiene measures, Table 5.5 indicates that, during the later phase of the pandemic, crisis and non-crisis industries started to behave more similar. In fact, they started to behave *similarly differently* as compared to the lockdown phase given the vast increase in prices as well as costs, and the significant reduction in investment and hiring decisions. Yet, what are the drivers of such changes in behavior?

Our analysis suggests that supply chain frictions are a relevant determinant for crisis behavior at later stages of the pandemic. When assessing the effect of such operational frictions on management decisions, we find that at the later phase of the pandemic, firms suffering from operational problems along their supply chain exhibit an elevated propensity of 11.1 pp. and 2.6 pp. to increase prices and costs as compared to their industry peers without such supply chain constraints. Thus, while governmental restrictions and regulation on hygiene measures did not seem to drive firm behavior at later stages of the COVID-19 crisis, significant spillover effects arose when the disruption of global supply chains hit industries that were previously immune to the demand shock.

[28] Note that we include industry fixed effects based on the German 2-digit industry classification scheme.

5.5.2 Managerial Decisions around a Shock to Companies' Cost Functions

In early 2022, businesses in Germany were faced with yet another crisis situation: the outburst of the Russo-Ukrainian war on February 24, 2022. Bischof et al. (2022a) provide first evidence on the specific challenges imposed by the war on German firms: Among the 78.7 % of businesses that generally expect financial strains associated with the war, the most widely mentioned burdens are increased energy costs (85.7 %), disrupted international supply chains (40.7 %), and higher procurement as well as material costs (23.7 %). Data from the Federal Statistical Office confirms the broad upward shift in the cost functions of almost all companies slowly starting already in fall 2020 and sharply rising after the outbreak of the war. As compared to the previous year, the German consumer price index in April 2022 recorded a 40-year-high increase of 7.4 %, significantly driven by a rise in energy costs (Statistisches Bundesamt, 2022).

Yet, how does this distinct combination of challenges relate to firm decisions taken shortly after the beginning of the war in Ukraine? Table 5.3 shows that the early phase following the start of the war – and the related sharp increase in costs – is associated with an abrupt drop in firms' propensity to invest. We find that firms are 53.9 % less likely to increase investments in the current financial year as compared to the early phase of the COVID-19 pandemic. After the outbreak of the Russo-Ukrainian war, managerial decision-making seems to be partially driven by issues along a firm's supply chains. Table 5.5 indicates an increased propensity to increase prices and to decrease investments among those firms that experience supply chain constraints.

Beyond supply chain frictions, rising input prices represent a significant contemporaneous economic force. To show that differences in firm behavior after the beginning of the Russo-Ukrainian war are particularly driven by gaps in exposure to a cost shock, we provide an additional analysis that segregates firms as to whether they use natural gas as input in their own production processes and along their supply chain or not. The hypothesis is that firms with production-related dependence on natural gas exhibit a greater exposure to increases in energy prices and, thus, should react more strongly to the cost shock following the outbreak of the war in Ukraine. Operationally, we construct an indicator variable *Natural Gas Dependence* that is set to one if a firm indicates a reliance on natural gas as direct production input or along its supply chain. The results of that cross-sectional split are reported in Table 5.6.

Indeed, we find that relative to firms that do not depend on natural gas or use it purely for heating purposes, firms with direct dependence on natural gas in the production or along the supply chain are significantly more likely to increase prices following the outbreak of the war in Ukraine.

Table 5.6: Crisis Effect on Firm Decisions & Outcomes
Natural Gas Dependence

	Cost Shock			
	Costs	Price Increases	Investment Plans	Hiring Plans
Baseline	0.072	0.643	0.440	0.318
Natural Gas Dependence	0.064***	0.099***	-0.077**	-0.061**
	(0.015)	(0.025)	(0.031)	(0.029)
Observations	1,320	1,352	1,319	1,302
R^2	0.110	0.160	0.073	0.113
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

This table presents results from OLS regressions for analyzing the effect of natural gas dependence in the production process or along the supply chain on managerial decisions since the outbreak of the Ukraine war. Firm controls include the following variables: The number of employees (in logs) and the number of COVID-19 cases in the firm-specific county (in logs). Additionally, we include county and industry fixed effects. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1, 5, and 10 % levels (two-tailed), respectively.

Since this behavioral difference amounts to 15.4 % (9.9 pp.), it is statistically and economically meaningful. In addition, we find a difference in investment or hiring behavior between the two types of firms. Thus, businesses with a huge dependence on natural gas do seem to take countermeasures in the form of increased investments in anticipation of potential sanctions on natural gas deliveries from Russia and a potentially necessary rationing of gas supplies. In sum, we conclude that the cost shock imposed by the Russo-Ukrainian war is a plausible determinant of crisis behavior among a large number of firms, amplifying pre-crisis trends from the COVID-19 pandemic.

5.6 Concluding Remarks

In this study we show that the notion of crises episodes during the COVID-19 pandemic representing a series of recurring events is misleading. There is considerable heterogeneity in the type of shocks, their intensity, and in turn, firm responses to these shocks. We observe that the Early COVID-19 and COVID-19 Lockdown phases exhibit characteristics of a demand shock that remained confined to specific crisis industries directly affected by lockdown and hygiene restrictions. In contrast to the typical behavior of firms in distress, these firms respond by raising prices above the average and by cutting back investments and hiring compared to "non-crisis" industries. The Late COVID-19 phase represents a crisis episode that shows pronounced marks of supply shocks. At that time, managerial decisions no longer differ between crisis and non-crisis industries and price increases spill over to the entire economy. Firms that experience supply chain disruptions are particularly

vulnerable to this and react by raising prices and costs. Finally, the crisis induced by the Russo-Ukraine war resembles a cost shock that amplifies supply chain problems and increased energy costs, forcing firms to reduce investments.

In sum, our study shows that once the specific nature of the crisis is accounted for, a variety of firm decisions, required to weather each of the crisis episodes, becomes transparent. Careful analysis of demand and supply-side factors allow policy makers and investors to form a more accurate view of the environment they operate in and to find better measures to mitigate crisis effects.

6 Conclusion

This dissertation shows how survey data can be used as a primary data source for academic research in accounting. Compared to archival data, survey data evidently has other advantages and disadvantages, but these differences should be addressed openly when deciding which type of data to use to answer a relevant research question.

In Chapter 3, the collected survey data has a couple of valuable properties. Compared to archival data, it provides timely insights into the development of revenues and profits of German firms after the sudden COVID-19 shock. These data points would not be available at all for many German companies, as the income statement variables in particular are only available for companies that meet certain size criteria. Compared to past research on operating leverage, the results in chapter 3 therefore include previously unobserved observations. To further emphasize this point, we want to highlight that past literature on operating leverage mostly uses information on a firm's selling, general and administrative expenses or cost of goods sold in order to proxy for its degree of operating leverage (see, e.g. Chen et al. (2019) for a review of these mainstream measures of leverage). In the sample data of 6,786 firms for the empirical analysis of chapter 3, which includes a significant portion of small and medium sized firms, cost of goods sold data for the financial year of 2019 is publicly available only for nine of those firms. Next, since data is available on a daily frequency, the constructed measure of operating leverage captures very closely the effect of the COVID-19 shock on revenues and profits, which allows valuable insights into a firms cost structure. Measures which rely on balance sheet or income statement variables have the advantage of being realized figures, yet they are an aggregate of many transactions that occurred throughout the financial year. Consequently, it is without a doubt challenging to measure operating leverage and the effect of time specific shocks without some degree of measurement error.

Turning to the outcome variables, the results presented in Chapter 3 and Chapter 5 show intentions of the surveyed firm decision-makers but not necessarily realized outcomes. However, this yields insights into how firm decision-makers strategically adjust to a shock and how new elements in their information set influence their planned actions. The fact that archival data measure realized outcomes and surveys measure intentions should be seen as an opportunity for future research to analyze how and why intentions may differ from realized outcomes. Chapter 4 highlights how surveys can be utilized to run information provision experiments to draw conclusions. By providing firm decision-makers with different pieces of information, we are able to find that firm decision-makers react much more severely to arguments of fiscal prudence compared to arguments of

social fairness concerns when forming their future tax expectations or their willingness to pay taxes. This provides valuable insights to policy makers when deciding on how to strategically disclose their tax policy reforms. Archival data is, of course, also used to determine causal relationships, but this usually requires much more elaborate methods than conducting a randomized survey experiment. Lastly, the results in Chapter 5 highlight how a rolling survey design can be utilized to closely track the economic trend of firms within an economy. Compared to archival data, this availability of cross-sectional data for almost any working day of a year allows us to very closely dissect the effects of economic shocks which occur at different points in time. Of course, it is important to recognize that self-reporting by corporate decision makers is subject to measurement error, yet it is also important to recognize that the use of archival data at quarterly or annual frequencies blurs the impact of any temporary shock.

Clearly, survey data can be used to conduct meaningful accounting research but like all other data, it is not the solution to all potential challenges researchers can face. However, the combination of a variety of data sources should help to generate high quality research especially if researchers are aware of the advantages and disadvantages of the different data sources.

Appendices

A Appendix Chapter 3

A.1 Characteristics of Firm Decision-Makers

Table A.1 provides the two-way distribution (in %) of the positions which decision-makers hold in companies and the departments in which they are employed. The distribution is based on 5,402 observations from the study's sample taken from the first wave of the survey, for which data are available on both the respective function and the department.

Table A.1: Firm Decision-Maker Characteristics

	Executive Board	Finance Department	Tax Department	Other	Total
Owner/CEO	86.47	1.63	0.13	3.96	92.19
Department Head	0.61	0.96	0.02	1.80	3.39
Other	1.33	1.20	0.00	1.89	4.42
Total	88.41	3.79	0.15	7.65	100.00

A.2 Sample Selection

Table A.2 provides an overview of the sample selection utilized to obtain the final sample used in the main body of the third chapter. The largest loss in observations is due to a non-response for the variable $\Delta Revenue$.

Table A.2: Sample Selection

	First survey wave	**Second survey wave**
Total respondents	19,831	15,622
Firms with Δ *Revenue* data	9,997	8,373
Drop if missing control variables	-468	–
Drop if crisis responses data missing	-2,722	–
Drop if future planning data missing	-9	–
Drop implausible observations	-12	–
Drop if cost data missing	–	-1,962
Final constant sample	**6,786**	**6,411**

A.3 Sample Firms vs. Orbis Reference Group

This appendix benchmarks the sample firms of our main analysis (following the sample selection procedure outlined in table A.2) against all other German firms retrieved from Orbis in 2019. The last column of Panel B provides the t-statistic for testing the mean difference between the two groups.

Table A.3: Sample Firms vs. Orbis Reference Group

Panel A: Overview sample firms vs. Orbis reference group

	N	% with Orbis 2019 financials
Sample firms	6,786	28%
Orbis reference group	942,274	20%

Panel B: Characteristics of sample firms & Orbis reference group

	Sample firms			Orbis reference group			
	N	Mean	Median	N	Mean	Median	t-statistic
No. of employees	1,098	29.99	8	173,349	42.97	10	0.48
Total assets	637	8,943,149	852,220	120,429	16,396,718	1,023,991	0.32
Equity ratio	590	0.12	0.04	114,222	0.36	0.04	0.24
Revenue	723	7,466,958	630,000	101,325	18,569,081	840,000	0.66

A.4 Variable Definitions

Table A.4: Variable Definitions

This appendix contains the definitions of all variables used in the analyses.

Firm characteristics	
Revenue 2019	A variable indicating the absolute amount of revenues generated by a firm in 2019 (in EUR).
Δ Revenue	A variable ranging from -100% to 100% indicating a firm's relative change in monthly revenues as compared to January 2020.
Δ Profit	A variable ranging from -100% to 100% indicating a firm's relative change in monthly profits as compared to January 2020.
Δ Liquidity	A variable ranging from -100% to 100% indicating a firm's relative change in monthly liquidity as compared to January 2020.
Δ Liabilities	A variable ranging from -100% to 100% indicating a firm's relative change in monthly liabilities as compared to January 2020.
No. of employees	A variable indicating a firm's absolute number of full-time employees that are subject to social contributions.
Δ Employees	A variable ranging from -100% to 100% indicating a firm's relative change in the size of its workforce as compared to January 2020.
Crisis responses	
Tax-related gov. aid	An indicator variable set to one if a firm claims tax-related governmental aid during the COVID-19 crisis. Among others, these aid measures include the refund of tax prepayments for 2020, an immediate loss carryback, the deferral of tax payments, suspension enforcement measures, the reintroduction of degressive depreciation for tax purposes, and the deferral of import turnover tax.
Non-tax gov. aid	An indicator variable set to one if a firm claims non-tax related governmental aid during the COVID-19 crisis. Among others, these aid measures include the Corona emergency relief and interim aid provided by the German federal government, short-time working allowance, as well as a special aid program set up by the German development bank KfW.
Investm. postponed	A variable ranging from 0 to 1 indicating the share of investments that have been planned before the COVID-19 crisis but have been postponed in view of the pandemic.
Investm. canceled	A variable ranging from 0 to 1 indicating the share of investments that have been planned before the COVID-19 crisis but have been canceled in view of the pandemic.
Layoffs	An indicator variable set to one if a firm reduces its number of employees in the short term to cope with the burden of the COVID-19 crisis.
Price increases	An indicator variable set to one if a firm increases prices in the short term to cope with the burden of the COVID-19 crisis.

Continued on next page.

Table A.4 - Continued

Future planning	
Investm. short term	An indicator variable set to one if a firm intends to make investments in the short term (0-12 months).
Investm. medium term	An indicator variable set to one if a firm intends to make investments in the medium term (12-24 months).
Hiring short term	An indicator variable set to one if a firm intends to hire additional employees in the short term (0-12 months).
Hiring medium term	An indicator variable set to one if a firm intends to hire additional employees in the medium term (12-24 months).
Control variables	
GDP expectations 2020	A variable ranging from -10 to 10 indicating a firm's expectation of the GDP's percentage change in the year 2020 as compared to 2019.
GDP expectations 2021	A variable ranging from -10 to 10 indicating a firm's expectation of the GDP's percentage change in the year 2021 as compared to 2020.

A.5 Survey Questions

Table A.5: Survey Questions

This appendix quotes key survey questions.

Firm characteristics

• Δ Revenue, Δ Profit, Δ Liquidity, Δ Liabilities, Δ Employees:

"To which extent have the following operating figures been affected by the corona crisis? Please indicate by how much percent the operating figures have changed with respect to 31.01.20."

• Revenue 2019:

"Please indicate the annual revenue (in EUR) of your company in 2019."

• No. of employees:

"How many full-time employees subject to social contributions does your firm employ? Please indicate the exact number of employees."

Crisis responses

• Tax-related gov. aid, Non-tax gov. aid, Layoffs, Price increases:

"What measures are you taking in the short term (0-12 months) to cover the additional burden of the corona crisis? Multiple answers are possible."

• Investm. postponed, Investm. canceled:

"Before the corona crisis, had you planned investments that you are now postponing or cancelling altogether in view of the situation?"

Future planning

• Investm. short term, Investm. medium term:

"Are you currently planning to make short-term (0-12 months) / medium term (12-24 months) investments?"

• Hiring short term, Hiring medium term:

"Are you currently planning to hire additional employees in the short term (0-12 months) / medium term (12-24 months)?"

Follow-up survey question on impediments to cost reduction

"What are the biggest hurdles for your company when reducing costs (if firm indicates a negative revenue change) / when increasing capacity (if firm indicates a positive revenue change)? Multiple answers are possible."

A.6 Survey Data Coverage

Table A.6: Survey coverage

This appendix outlines the survey coverage according to different categorizations.

	No. of firms in 2018 company register	Survey respondents	Share
Economic sector			
G (Wholesale and retail trade)	612,805	1,681	0.27%
M (Professional, scientific and technical activities)	526,437	1,216	0.23%
F (Construction)	388,991	748	0.19%
I (Accommodation and food service activities)	248,053	448	0.18%
Q (Human health and social work activities)	243,509	534	0.22%
S (Other service activities)	235,775	509	0.22%
N (Administrative and support service activities)	222,359	802	0.36%
L (Real estate activities)	174,200	351	0.20%
J (Information and communication)	134,666	1,443	1.07%
R (Arts, entertainment and recreation)	115,245	419	0.36%
H (Transportation and storage)	114,524	254	0.22%
P (Education)	77,637	158	0.20%
D (Electricity, gas, steam, and air conditioning supply)	75,099	139	0.19%
K (Financial and insurance activities)	69,887	340	0.49%
E (Water supply; sewerage and waste mgmt.)	11,473	55	0.48%
B (Mining and Quarrying)	2,058	22	1.07%

Continued on next page.

Table A.6 - Continued

	No. of firms in 2018 company register	Survey respondents	Share
Employees contributing to social security			
$0 - 9$	3,103,896	6,951	0.22%
$10 - 49$	298,874	2,692	0.90%
$50 - 249$	65,469	682	1.04%
> 249	15,452	260	1.68%
Revenues (in €)			
$<$ 2,000,000	3,247,186	11,638	0.36%
2,000,000 $-$ 10,000,000	175,793	2,478	1.41%
10,000,001 $-$ 50,000,000	46,337	850	1.83%
$>$ 50,000,000	14,375	46	0.32%
Legal form			
Individual entrepreneur	2,146,043	2,073	0.10%
Corporation	736,279	12,981	1.76%
Unincorporated firms	395,415	2,613	0.66%
Others	205,954	2,166	1.05%
Total	3,483,691	19,833	0.57%

B Appendix Chapter 4

B.1 Treatments

B.1.1 Fiscal Treatment

German Version:

Hintergrundinformation:

Der Bund hat im Rahmen des im Juni beschlossenen Konjunkturprogramms Unterstützung in Höhe von **130 Milliarden Euro** zugesagt.

Die erhöhten Staatsausgaben und zusätzlichen Schulden, die im Zuge der Corona-Krise entstanden, könnten künftig höhere Staatseinnahmen oder Ausgabenkürzungen notwendig machen.

Nach der Finanzkrise 2008/2009 wurden beispielsweise in vielen europäischen Ländern die Steuersätze angehoben. Vertreter der CDU haben bereits angekündigt, dass die Schulden, die durch die Corona-Krise angefallen sind, bis 2030 wieder abgebaut werden sollen.

Halten Sie es für gerechtfertigt, dass die Regierung mit diesem Konjunkturpaket auf Kosten der Steuerzahler eingreift?

English Translation:

Background information:

The federal government has pledged support of **130 billion euro** as part of the economic stimulus package adopted in June.

The increased government spending and additional debt incurred in the wake of the Corona crisis could necessitate higher government revenues or spending cuts in the future.

After the 2008/2009 financial crisis, for example, tax rates were raised in many European countries. Representatives of the CDU have already announced that the debt incurred as a result of the Corona crisis will be reduced again by 2030.

Do you think it is justified for the government to intervene with this stimulus package at the taxpayer's expense?

B.1.2 Social Treatment

German Version:

Hintergrundinformation:
Viele Unternehmen sind durch die Corona-Krise unverschuldet in Not geraten, so ist zum Beispiel im Gastgewerbe der Umsatz im Vergleich zum Vorjahresmonat um 75.8 Prozent eingebrochen. Der Bund hat im Rahmen des im Juni beschlossenen Konjunkturprogramms Unterstützung in Höhe von **130 Milliarden Euro** zugesagt.

Halten Sie es für gerechtfertigt, dass die Regierung mit diesem Konjunkturpaket eingreift?

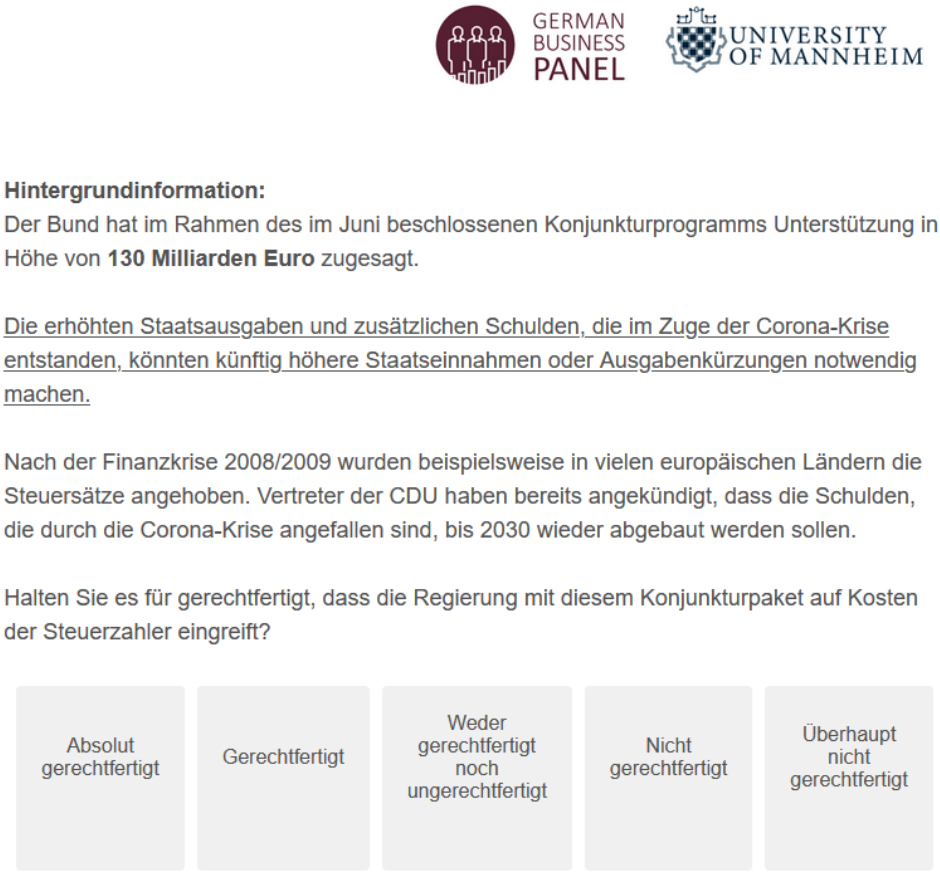
English Translation:

Background information:
Many companies have experienced hardship through no fault of their own as a result of the Corona crisis, with sales in the hospitality industry, for example, plummeting 75.8 percent compared to the same month last year. The federal government has pledged support of **130 billion euros** as part of the economic stimulus package adopted in June.

Do you think it is justified for the government to intervene with this stimulus package?

B.1.3 Screenshots Treatments and Outcomes

Figure B.1: FISCAL Treatment



Note: Figure B.1 illustrates the treatment and the survey question concerning the attitude towards the fiscal stimulus package for the FISCAL group.

Figure B.2: SOCIAL Treatment

Note: Figure B.2 illustrates the treatment and the survey question concerning the attitude towards the fiscal stimulus package for the SOCIAL group.

Figure B.3: CONTROL Group

Note: Figure B.3 illustrates the survey question concerning the attitude towards the fiscal stimulus package for the CONTROL group.

Figure B.4: Desired Taxes

Note: Figure B.4 illustrates the survey question concerning the desired tax adjustment.

Figure B.5: Expected Medium-Term Tax Changes

Note: This figure illustrates the survey question concerning the expected medium-term tax rate change.

B.2 Supplementary Analysis: Attitude towards Fiscal Stimulus

The effect of the treatments on the attitude towards the fiscal stimulus program is not sensitive to the modelling choice. We find similar effects in an ordered probit model (e.g., Table B.2) as well as in a linear probability model[29] and when we define the outcome variable as a binary variable (e.g., Table B.1).

Table B.1: Attitude towards Fiscal Stimulus: Likert Scale and Linear Probability Model

Dependent Var.:	**Attitude towards Fiscal Stimulus**			
	Likert Scale	Likert Scale	LPM (0/1)	LPM (0/1)
	(1)	(2)	(3)	(4)
CONTROL (Baseline)	4.183***	4.239***	0.849***	0.864***
	(0.025)	(0.031)	(0.010)	(0.013)
SOCIAL	-0.047	-0.058	-0.003	-0.003
	(0.030)	(0.037)	(0.012)	(0.015)
FISCAL	-0.774***	-0.766***	-0.252***	-0.240***
	(0.033)	(0.042)	(0.014)	(0.017)
Controls	None	All	None	All
N	7203	4340	7203	4340
Adj. R^2	0.113	0.126	0.079	0.079

Note: OLS estimates from the regression of equation 5. Dependent variable in **Columns (1) and (2)**: Attitude towards fiscal stimulus measured on a 5-point Likert scale (1 = Absolutely Not Justified, 2 = Not Justified, 3 = Neither Justified Nor Unjustified, 4 = Justified, 5 = Absolutely Justified). Dependent variable in **Columns (3) and (4)**: Dummy variable equal to 1 for firm decision-makers finding the fiscal stimulus absolutely justified or justified and zero otherwise. Independent variables: experimental group, constant, and control variables (sizegroup (EC's definition for small and medium-sized enterprises (SMEs)), industry (WZ08 1-digit), legal form, gender of manager, manager education, position in company. Robust standard errors in parenthesis. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

[29] In the linear probability model, we treat the dependent variable as a continuous variable

Table B.2: Attitude towards Fiscal Stimulus: Order Probit Regressions

Dependent Var.:	**Attitude towards Fiscal Stimulus**	
	(1)	(2)
Baseline CONTROL		
SOCIAL	-0.072*	-0.081*
	(0.037)	(0.049)
FISCAL	-0.810***	-0.828***
	(0.038)	(0.050)
cut1	-2.136***	-2.362***
	(0.041)	(0.230)
cut2	-1.545***	-1.706***
	(0.036)	(0.228)
cut3	-1.061***	-1.245***
	(0.034)	(0.228)
cut4	0.246***	0.086
	(0.033)	(0.227)
Controls	None	All
N	7203	4340

	Average Adjusted Predictions		**Average Marginal Effects**	
Absolutely Not Justified			**Baseline CONTROL**	
CONTROL	0.016***	0.013***		
	(0.002)	(0.002)		
SOCIAL	0.020***	0.015***	0.003**	0.003*
	(0.001)	(0.002)	(0.002)	(0.002)
FISCAL	0.092***	0.078***	0.076***	0.065***
	(0.005)	(0.006)	(0.004)	(0.005)
Not Justified				
CONTROL	0.045***	0.043***		
	(0.003)	(0.004)		
SOCIAL	0.051***	0.050***	0.006**	0.007*
	(0.003)	(0.003)	(0.003)	(0.004)
FISCAL	0.139***	0.142***	0.094***	0.099***
	(0.005)	(0.007)	(0.005)	(0.007)
Neither Justified Nor Unjustified				
CONTROL	0.083***	0.072***		
	(0.004)	(0.005)		
SOCIAL	0.091***	0.080***	0.008*	0.008*
	(0.003)	(0.004)	(0.004)	(0.005)
FISCAL	0.170***	0.156***	0.087***	0.083***
	(0.005)	(0.007)	(0.005)	(0.006)
Justified				
CONTROL	0.453***	0.443***		
	(0.007)	(0.010)		
SOCIAL	0.463***	0.457***	0.011*	0.014
	(0.006)	(0.008)	(0.006)	(0.008)
FISCAL	0.453***	0.465***	0.001	0.022***
	(0.006)	(0.008)	(0.006)	(0.008)
Absolutely Justified				
CONTROL	0.403***	0.429***		
	(0.013)	(0.016)		
SOCIAL	0.375***	0.397***	-0.028*	-0.031*
	(0.008)	(0.010)	(0.014)	(0.019)
FISCAL	0.146***	0.159***	-0.257***	-0.269***
	(0.006)	(0.007)	(0.013)	(0.017)

Note: Table B.2 presents results from an Ordered Probit Regression. Dependent variable: Attitude towards fiscal stimulus measured on a 5-point Likert scale (1 = Absolutely Not Justified, 2 = Not Justified, 3 = Neither Justified Nor Unjustified, 4 = Justified, 5 = Absolutely Justified). Independent variables: experimental group, constant, and control variables (sizegroup (EC's definition for small and medium-sized enterprises (SMEs)), industry (WZ08 1-digit), legal form, gender of manager, manager education, position in company. Moreover, average predictions and marginal effects are presented. Robust standard errors in parenthesis. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

B.3 Heterogenities

B.3.1 Legal Forms

Table B.3: Heterogeneous Effects by Legal Form - Full Interaction

Dependent Var.:	**Adjustment Corporate Tax**	
Constant	-0.008	-0.009
	(0.008)	(0.011)
SOCIAL	-0.012	-0.010
	(0.010)	(0.014)
FISCAL	0.016	0.012
	(0.010)	(0.013)
Corporation	-0.030***	-0.023*
	(0.009)	(0.012)
SOCIAL × Corporation	0.015	0.016
	(0.011)	(0.015)
FISCAL × Corporation	0.012	0.008
	(0.011)	(0.014)
Controls	None	All
N	3332	1582
Adj. R^2	0.030	0.214

Note: OLS estimates from the regression of equation 6: $y_i = \alpha + \beta \times Corporation_i + \sum_{k=1}^{2} \delta_k \times TREATMENT_{ik} + \sum_{k=1}^{2} \theta_k Corportation_i \times TREATMENT_{ik} + X_i'\gamma + \varepsilon_i$. Dependent variable: desired adjustment in percentage points of corporate tax. Independent variables: experimental group, dummy variable $Corportation_i$ equal to one for corporations and zero for sole-proprietorships/business partnerships, constant, and control variables (sizegroup (EC's definition for small and medium-sized enterprises (SMEs)), industry (WZ08 1-digit), gender of manager, manager education, position in company, dummy equal to 1 if decision-maker finds stimulus justified and 0 otherwise, medium-term tax expectations). Robust standard errors in parenthesis. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

B.3.2 Attitude towards Fiscal Stimulus

Table B.4: Heterogeneous Effects by Attitude towards Fiscal Stimulus - Full Interaction

Dependent Var.:	**Adjustment Corporate Tax**		**Adjustment Business Tax**		**Adjustment Income Tax**		**Adjustment Capital Gains Tax**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.037***	-0.036***	-0.041***	-0.038***	-0.032***	-0.019**	-0.019*	-0.006
	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)	(0.008)	(0.011)	(0.012)
SOCIAL	-0.003	0.000	-0.009	-0.007	-0.018*	-0.021*	0.007	0.001
	(0.011)	(0.012)	(0.011)	(0.012)	(0.011)	(0.011)	(0.013)	(0.015)
FISCAL	0.019**	0.006	0.015	0.008	0.010	-0.005	0.037***	0.021*
	(0.009)	(0.010)	(0.010)	(0.011)	(0.010)	(0.009)	(0.012)	(0.013)
Justified	0.006	0.015	0.002	0.009	0.001	-0.003	0.020*	0.015
	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)	(0.009)	(0.012)	(0.013)
SOCIAL × Justified	0.004	0.002	0.007	0.010	0.018	0.024*	0.002	0.014
	(0.011)	(0.013)	(0.012)	(0.013)	(0.012)	(0.012)	(0.014)	(0.016)
FISCAL × Justified	0.014	0.015	0.018*	0.013	0.027**	0.029***	0.010	0.012
	(0.010)	(0.012)	(0.011)	(0.012)	(0.011)	(0.010)	(0.013)	(0.014)
Controls	None	All	None	All	None	All	None	All
N	3624	1806	3834	1952	3838	1963	3658	1852
Adj. R^2	0.030	0.210	0.031	0.198	0.042	0.200	0.041	0.176

Note: OLS estimates from the regression of equation 6: $y_i = \alpha + \beta \times Justified_i + \sum_{k=1}^{2} \delta_k \times TREATMENT_{ik} + \sum_{k=1}^{2} \theta_k Justified_i \times TREATMENT_{ik} + X_i'\gamma + \varepsilon_i$. Dependent variable: desired adjustment in percentage points of *corporate tax*, *business tax*, *income tax* and *capital gains tax*. Independent variables: experimental group, dummy variable $Justified_i$ equal to one for firm decision-makers finding the fiscal stimulus absolutely justified or justified and zero otherwise, constant, and control variables (sizegroup (EC's definition for small and medium-sized enterprises (SMEs)), legal form, industry (WZ08 1-digit), gender of manager, manager education, position in company, medium-term tax expectations). Robust standard errors in parenthesis. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

B.3.3 Firm Size by Employees

Table B.5: Heterogeneous Effects: Firm Size by Employees

	Corp. Tax (1)	Bus. Tax (2)	Inc. Tax (3)	Cap. Gains Tax (4)
Reference Category: CONTROL & 0-9 Employees				
SOCIAL	0.003	0.001	0.001	0.011*
	(0.005)	(0.005)	(0.005)	(0.006)
FISCAL	0.026***	0.029***	0.028***	0.042***
	(0.005)	(0.005)	(0.005)	(0.006)
10 - 49 Employees	0.014**	0.011	0.010	0.008
	(0.007)	(0.008)	(0.007)	(0.009)
50 and more Employees	0.019*	0.018*	0.024**	0.010
	(0.011)	(0.011)	(0.010)	(0.013)
SOCIAL × 10 - 49 Employees	-0.004	-0.003	0.001	0.004
	(0.008)	(0.009)	(0.008)	(0.010)
SOCIAL × 50 and more Employees	-0.001	-0.009	-0.011	-0.001
	(0.012)	(0.012)	(0.011)	(0.014)
FISCAL × 10 - 49 Employees	-0.003	-0.006	-0.003	-0.004
	(0.008)	(0.009)	(0.008)	(0.010)
FISCAL × 50 and more Employees	0.002	-0.003	-0.012	-0.009
	(0.011)	(0.011)	(0.011)	(0.013)
Firm Characteristics	Yes	Yes	Yes	Yes
Manager Characteristics	Yes	Yes	Yes	Yes
Question Fiscal Stimulus	Yes	Yes	Yes	Yes
N	3645	3859	3872	3677
Adjusted R^2	0.065	0.059	0.064	0.047
CONTROL Mean	-0.031	-0.040	-0.033	-0.004
Estimated group average treatment effect (Std. errors in parenthesis)				
CONTROL - 0-9 Employees	-0.037***	-0.045***	-0.038***	-0.007
	(0.004)	(0.004)	(0.004)	(0.005)
CONTROL - 10-49 Employees	-0.023***	-0.034***	-0.028***	0.001
	(0.006)	(0.006)	(0.006)	(0.007)
CONTROL - 50 and more Employees	-0.018*	-0.027***	-0.014	0.003
	(0.009)	(0.009)	(0.009)	(0.011)
SOCIAL - 0-9 Employees	-0.036***	-0.045***	-0.038***	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
SOCIAL - 10-49 Employees	-0.026***	-0.037***	-0.027***	0.016***
	(0.004)	(0.004)	(0.004)	(0.005)
SOCIAL - 50 and more Employees	-0.018**	-0.036***	-0.025***	0.012
	(0.008)	(0.008)	(0.007)	(0.009)
FISCAL - 0-9 Employees	-0.012***	-0.016***	-0.009***	0.035***
	(0.003)	(0.003)	(0.002)	(0.003)
FISCAL - 10-49 Employees	0.000	-0.011***	-0.002	0.040***
	(0.004)	(0.004)	(0.004)	(0.005)
FISCAL - 50 and more Employees	0.009	-0.001	0.003	0.036***
	(0.007)	(0.007)	(0.006)	(0.008)

Note: Table B.5 presents OLS regressions of the respective desired tax rate change (*Corporate Tax*, *Local Business Tax*, *Income Tax*, *Capital Gains Tax*) on a categorical variable $Treatment_i$ which specifies which treatment (SOCIAL, FISCAL) was given to firm i, a categorical variable $Employees_i$ (3 categories: 0-9 employees, 10-49 employees, 50 and more employees) and the interaction of the treatment and the respective covariate ($Treatment_i \times Employees_i$). Additionally, manager and firm characteristics are controlled for. OLS Regressions have the following form: $y_i = \beta_0 + \beta_1 \times Treatment_i + \beta_2 \times Employees_i + \beta_3 \times (Treatment_i \times Employees_i) + \beta_4 \times FirmChar_i + \beta_5 \times ManagerChar_i + \epsilon_i$. $FirmChar_i$ capture legal form, revenue change and economic sector (1-digit, WZ2008). $ManagerChar_i$ include gender, education and risk attitude of firm decision-maker. Missings in the respective controls are included in the OLS regressions as a separate category but not shown in the table. Robust Standard Errors are in parentheses. Significance Levels are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.3.4 Firm Size by Revenue

Table B.6: Heterogeneous Effects: Firm Size by Revenues

	Corp. Tax (1)	Bus. Tax (2)	Inc. Tax (3)	Cap. Gains Tax (4)
Reference Category: CONTROL & 0-2 Mio. Revenue				
SOCIAL	0.001	-0.001	-0.001	0.011**
	(0.004)	(0.005)	(0.004)	(0.005)
FISCAL	0.025***	0.027***	0.029***	0.041***
	(0.004)	(0.004)	(0.004)	(0.005)
2 - 10 Mio.	-0.017**	-0.016*	-0.013	-0.015
	(0.008)	(0.009)	(0.008)	(0.010)
10 Mio. and more	-0.002	0.010	0.006	-0.007
	(0.009)	(0.010)	(0.009)	(0.011)
SOCIAL × 2 - 10 Mio.	0.013	0.015	0.010	0.007
	(0.010)	(0.010)	(0.009)	(0.011)
SOCIAL × 10 Mio. and more	-0.021*	-0.020*	-0.012	-0.001
	(0.011)	(0.011)	(0.011)	(0.013)
FISCAL × 2 - 10 Mio.	0.010	0.010	0.006	0.004
	(0.009)	(0.010)	(0.009)	(0.011)
FISCAL × 10 Mio. and more	-0.018*	-0.017	-0.022**	-0.019
	(0.011)	(0.011)	(0.010)	(0.013)
Firm Characteristics	Yes	Yes	Yes	Yes
Manager Characteristics	Yes	Yes	Yes	Yes
Question Fiscal Stimulus	Yes	Yes	Yes	Yes
N	3748	3973	3987	3785
Adjusted R^2	0.064	0.062	0.066	0.048
CONTROL Mean	-0.032	-0.042	-0.034	-0.004
Estimated group average treatment effect (Std. errors in parenthesis)				
CONTROL - 0-2 Mio.	-0.029***	-0.040***	-0.032***	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
CONTROL - 2-10 Mio.	-0.045***	-0.056***	-0.045***	-0.016*
	(0.007)	(0.007)	(0.007)	(0.008)
CONTROL - 10 Mio. and more	-0.031***	-0.030***	-0.026***	-0.008
	(0.008)	(0.009)	(0.008)	(0.010)
SOCIAL - 0-2 Mio.	-0.029***	-0.042***	-0.034***	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)
SOCIAL - 2-10 Mio.	-0.033***	-0.043***	-0.036***	0.001
	(0.005)	(0.005)	(0.005)	(0.006)
SOCIAL - 10 Mio. and more	-0.053***	-0.051***	-0.040***	0.001
	(0.008)	(0.008)	(0.008)	(0.009)
FISCAL - 0-2 Mio.	-0.004*	-0.012***	-0.003	0.040***
	(0.002)	(0.002)	(0.002)	(0.003)
FISCAL - 2-10 Mio.	-0.011**	-0.019***	-0.010**	0.029***
	(0.005)	(0.005)	(0.004)	(0.006)
FISCAL - 10 Mio. and more	-0.024***	-0.020**	-0.019***	0.014*
	(0.008)	(0.008)	(0.007)	(0.008)

Note: Table B.6 presents OLS regressions of the respective desired tax rate change (*Corporate Tax*, *Local Business Tax*, *Income Tax*, *Capital Gains Tax*) on a categorical variable $Treatment_i$ which specifies which treatment (SOCIAL, FISCAL) was given to firm i, a categorical variable $Revenues_i$ (3 categories: 0 - (less than) 2 Mio., 2 - (less than) 10 Mio., 10 Mio. and more) and the interaction of the treatment and the respective covariate ($Treatment_i \times Revenues_i$). Additionally, manager and firm characteristics are controlled for. OLS Regressions have the following form: $y_i = \beta_0 + \beta_1 \times Treatment_i + \beta_2 \times Revenues_i + \beta_3 \times (Treatment_i \times Revenues_i) + \beta_4 \times FirmChar_i + \beta_5 \times ManagerChar_i + \epsilon_i$. $FirmChar_i$ capture legal form, employees and economic sector (1-digit, WZ2008). $ManagerChar_i$ include gender, education and risk attitude of firm decision-maker. Missings in the respective controls are included in the OLS regressions as a separate category but not shown in the table. Robust Standard Errors are in parentheses. Significance Levels are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.3.5 Take-up of Governmental Aid

Table B.7 investigates whether firms which benefited directly from the governmental stimulus program are more or less inclined to pay higher taxes in the future. Yet, take up of any governmental aid program does not seem to significantly shift desired tax rates compared to firms in the control group which did not directly benefit from the governmental stimulus program.

Table B.7: Heterogeneous Effects: Take-up (Corona Überbrückungshilfe, Sofortkredit, Kfw-Kredit)

	Corp. Tax (1)	Bus. Tax (2)	Inc. Tax (3)	Cap. Gains Tax (4)
Reference Category: CONTROL & No Take-up				
SOCIAL	0.003	0.000	0.002	0.010**
	(0.004)	(0.004)	(0.004)	(0.005)
FISCAL	0.024***	0.023***	0.026***	0.036***
	(0.004)	(0.004)	(0.004)	(0.005)
Take-up	-0.007	-0.009	-0.002	-0.006
	(0.007)	(0.007)	(0.007)	(0.008)
SOCIAL × Take-up	-0.006	-0.003	-0.007	0.003
	(0.008)	(0.008)	(0.008)	(0.009)
FISCAL × Take-up	0.005	0.012	0.003	0.014
	(0.008)	(0.008)	(0.008)	(0.009)
Firm Characteristics	Yes	Yes	Yes	Yes
Manager Characteristics	Yes	Yes	Yes	Yes
Question Fiscal Stimulus	Yes	Yes	Yes	Yes
N	3789	4015	4031	3826
Adjusted R^2	0.064	0.062	0.066	0.050
CONTROL Mean	-0.032	-0.042	-0.034	-0.004
Estimated group average treatment effect (Std. errors in parenthesis)				
CONTROL - No take-up	-0.029***	-0.038***	-0.033***	-0.002
	(0.003)	(0.004)	(0.003)	(0.004)
CONTROL - Take-up	-0.036***	-0.047***	-0.035***	-0.008
	(0.006)	(0.006)	(0.006)	(0.006)
SOCIAL - No take-up	-0.028***	-0.039***	-0.032***	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)
SOCIAL - Take-up	-0.040***	-0.050***	-0.040***	0.005
	(0.004)	(0.004)	(0.004)	(0.005)
FISCAL - No take-up	-0.006**	-0.015***	-0.006***	0.034***
	(0.002)	(0.002)	(0.002)	(0.003)
FISCAL - Take-up	-0.008**	-0.012***	-0.004	0.042***
	(0.003)	(0.004)	(0.003)	(0.004)

Note: Table B.7 presents OLS regressions of the respective desired tax rate change (*Corporate Tax*, *Local Business Tax*, *Income Tax*, *Capital Gains Tax*) on a categorical variable $Treatment_i$ which specifies which treatment (SOCIAL, FISCAL) was given to firm i, a dummy variable $Take\_up_i$, which is *1* if firm i claimed at least one of the following three government relief measures **Corona emergency relief/Corona Überbrückungshilfe**, **interim aid/Sofortkredit** or **KfW special program/Kwf-Kredit**, and the interaction of the treatment and the respective covariate ($Treatment_i \times Take\_up_i$). Additionally, manager and firm characteristics are controlled for. OLS Regressions have the following form: $y_i = \beta_0 + \beta_1 \times Treatment_i + \beta_2 \times Take\_up_i + \beta_3 \times (Treatment_i \times Take\_up_i) + \beta_4 \times FirmChar_i + \beta_5 \times ManagerChar_i + \epsilon_i$. $FirmChar_i$ capture employees, revenue change and economic sector (1-digit, WZ2008). $ManagerChar_i$ include gender, education and risk attitude of firm decision-maker. Missings in the respective controls are included in the OLS regressions as a separate category but not shown in the table. Robust Standard Errors are in parentheses. Significance Levels are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.3.6 GDP Expectations

Table B.8: Heterogeneous Effects: GDP Expectations 2020/2021

	Corp. Tax (1)	Bus. Tax (2)	Inc. Tax (3)	Cap. Gains Tax (4)
Reference Category: CONTROL & Negative GDP Growth 20/21				
SOCIAL	-0.003	-0.008	-0.003	0.008
	(0.006)	(0.006)	(0.006)	(0.007)
FISCAL	0.028***	0.027***	0.032***	0.046***
	(0.006)	(0.006)	(0.006)	(0.007)
Positive/Stable GDP Growth 20/21	0.013**	0.011	0.022***	0.025***
	(0.006)	(0.007)	(0.006)	(0.007)
SOCIAL × Positive/Stable GDP Growth 20/21	0.004	0.014*	0.003	0.006
	(0.008)	(0.008)	(0.008)	(0.009)
FISCAL × Positive/Stable GDP Growth 20/21	-0.009	-0.003	-0.013*	-0.016*
	(0.007)	(0.008)	(0.007)	(0.009)
Firm Characteristics	Yes	Yes	Yes	Yes
Manager Characteristics	Yes	Yes	Yes	Yes
Question Fiscal Stimulus	Yes	Yes	Yes	Yes
N	3449	3644	3657	3479
Adjusted R^2	0.068	0.066	0.077	0.064
CONTROL Mean	-0.031	-0.040	-0.033	-0.003
Estimated group average treatment effect (Std. errors in parenthesis)				
CONTROL - No Positive/Stable GDP Growth 20/21	-0.038***	-0.046***	-0.044***	-0.016***
	(0.004)	(0.005)	(0.005)	(0.005)
CONTROL - Positive/Stable GDP Growth 20/21	-0.025***	-0.035***	-0.022***	0.010**
	(0.004)	(0.004)	(0.004)	(0.005)
SOCIAL - No Positive/Stable GDP Growth 20/21	-0.042***	-0.055***	-0.048***	-0.009**
	(0.003)	(0.003)	(0.003)	(0.004)
SOCIAL - Positive/Stable GDP Growth 20/21	-0.025***	-0.031***	-0.022***	0.022***
	(0.003)	(0.003)	(0.003)	(0.003)
FISCAL - No Positive/Stable GDP Growth 20/21	-0.010***	-0.019***	-0.011***	0.031***
	(0.003)	(0.003)	(0.003)	(0.004)
FISCAL - Positive/Stable GDP Growth 20/21	-0.006**	-0.012***	-0.002	0.040***
	(0.003)	(0.003)	(0.002)	(0.003)

Note: Table B.8 presents OLS regressions of the respective desired tax rate change (*Corporate Tax*, *Local Business Tax*, *Income Tax*, *Capital Gains Tax*) on a categorical variable $Treatment_i$ which specifies which treatment (SOCIAL, FISCAL) was given to firm i, a dummy variable $Positive\_GDP\_Growth_i$, which is *1* if the decision-maker of firm i expects a positive or stable GDP growth from 2020 to 2021 and *0* otherwise, and the interaction of the treatment and the respective covariate ($Treatment_i \times Positive\_GDP\_Growth_i$). Additionally, manager and firm characteristics are controlled for. OLS Regressions have the following form: $y_i = \beta_0 + \beta_1 \times Treatment_i + \beta_2 \times Positive\_GDP\_Growth_i + \beta_3 \times (Treatment_i \times Positive\_GDP\_Growth_i) + \beta_4 \times FirmChar_i + \beta_5 \times ManagerChar_i + \epsilon_i$. $FirmChar_i$ capture employees, revenue change and economic sector (1-digit, WZ2008). $ManagerChar_i$ include gender, education and risk attitude of firm decision-maker. Missings in the respective controls are included in the OLS regressions as a separate category but not shown in the table. Robust Standard Errors are in parentheses. Significance Levels are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.3.7 Profit Change

Table B.9 investigates whether attitudes toward desired tax rates change when the respondent is a net recipient or a net payer of the current stimulus program. To this end, we conduct a sample split to identify whether there is a significant difference in desired tax rates between firms which experienced an increase in profits during the crisis and firms which suffered a decrease in profits during the crisis. Interestingly, firms which experienced an increase in profits during the crisis opted, on average, for a significantly smaller reduction in desired tax rates than their counterparts that experienced a decrease in corporate profits. Moreover, the information that current government spending may have to be refinanced by future tax increases did not lead to a significantly negative group-average treatment effect for participants who received the fiscal treatment.

Table B.9: Heterogeneous Effects: Profit Change

	Corp. Tax (1)	Bus. Tax (2)	Inc. Tax (3)	Cap. Gains Tax (4)
Reference Category: CONTROL & Profit Decrease				
SOCIAL	0.001	-0.000	0.001	0.012**
	(0.005)	(0.005)	(0.005)	(0.006)
FISCAL	0.028***	0.030***	0.032***	0.048***
	(0.005)	(0.005)	(0.005)	(0.006)
Profit Increase (or stable)	0.026***	0.026***	0.025***	0.024***
	(0.006)	(0.006)	(0.006)	(0.007)
SOCIAL × Profit Increase (or stable)	-0.002	-0.003	-0.004	-0.004
	(0.007)	(0.008)	(0.007)	(0.009)
FISCAL × Profit Increase (or stable)	-0.004	-0.004	-0.009	-0.017**
	(0.007)	(0.008)	(0.007)	(0.009)
Firm Characteristics	Yes	Yes	Yes	Yes
Manager Characteristics	Yes	Yes	Yes	Yes
Question Fiscal Stimulus	Yes	Yes	Yes	Yes
N	3606	3808	3819	3636
Adjusted R^2	0.066	0.062	0.067	0.051
CONTROL_mean	-0.031	-0.041	-0.034	-0.004
Estimated group average treatment effect (Std. errors in parenthesis)				
CONTROL - Profit Decrease	-0.044***	-0.054***	-0.046***	-0.015***
	(0.004)	(0.004)	(0.004)	(0.005)
CONTROL - Profit Increase (or stable)	-0.018***	-0.027***	-0.021***	0.008
	(0.004)	(0.005)	(0.005)	(0.005)
SOCIAL - Profit Decrease	-0.043***	-0.054***	-0.044***	-0.003
	(0.003)	(0.003)	(0.003)	(0.004)
SOCIAL - Profit Increase (or stable)	-0.020***	-0.030***	-0.023***	0.018***
	(0.003)	(0.003)	(0.003)	(0.004)
FISCAL - Profit Decrease	-0.016***	-0.023***	-0.012***	0.034***
	(0.003)	(0.003)	(0.003)	(0.003)
FISCAL - Profit Increase (or stable)	0.006**	-0.001	0.003	0.040***
	(0.003)	(0.003)	(0.003)	(0.003)

Note: Table B.9 presents OLS regressions of the respective desired tax rate change (*Corporate Tax*, *Local Business Tax*, *Income Tax*, *Capital Gains Tax*) on a categorical variable $Treatment_i$ which specifies which treatment (SOCIAL, FISCAL) was given to firm i, a dummy variable $Profit\_Increase_i$, which is *1* if firm i has experienced a profit increase since January 2020 or has had no change in profits and *0* otherwise, and the interaction of the treatment and the respective covariate ($Treatment_i \times Profit\_Increase_i$). Additionally, manager and firm characteristics are controlled for. OLS Regressions have the following form: $y_i = \beta_0 + \beta_1 \times Treatment_i + \beta_2 \times Profit\_Increase_i + \beta_3 \times (Treatment_i \times Profit\_Increase_i) + \beta_4 \times FirmChar_i + \beta_5 \times ManagerChar_i + \epsilon_i$. $FirmChar_i$ capture employees, revenue change and economic sector (1-digit, WZ2008). $ManagerChar_i$ include gender, education and risk attitude of firm decision-maker. Missings in the respective controls are included in the OLS regressions as a separate category but not shown in the table. Robust Standard Errors are in parentheses. Significance Levels are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.4 Summary Statistics and Balancing Tests

B.4.1 Outcome Variables

Table B.10: Descriptive Statistics – Outcome Variables

	Total	CONTROL	SOCIAL	FISCAL
Attitude towards Fiscal Stimulus				
Absolutely Not Justified	0.050	0.018	0.014	0.099
Not Justified	0.085	0.036	0.044	0.147
Neutral	0.121	0.097	0.096	0.156
Justified	0.459	0.444	0.484	0.439
Absolutely Justified	0.285	0.405	0.362	0.158
N	7,203	1,229	3,003	2,971
Medium-term Expected Tax Changes				
Corporate Tax				
Mean	0.012	0.004	0.000	0.027
SD	(0.072)	(0.076)	(0.075)	(0.064)
N	3,397	709	1,329	1,359
Business Tax				
Mean	0.017	0.008	0.005	0.033
SD	(0.081)	(0.086)	(0.083)	(0.072)
N	3,681	760	1,446	1,475
Income Tax				
Mean	0.017	0.008	0.006	0.033
SD	(0.077)	(0.080)	(0.080)	(0.068)
N	3,746	762	1,477	1,507
Capital Gains Tax				
Mean	0.035	0.023	0.023	0.052
SD	(0.079)	(0.079)	(0.080)	(0.073)
N	3,464	707	1,338	1,419
Desired Tax Adjustment				
Corporate Tax				
Mean	-0.022	-0.031	-0.032	-0.006
SD	(0.082)	(0.085)	(0.084)	(0.077)
N	3,798	791	1,483	1,524
Business Tax				
Mean	-0.031	-0.041	-0.043	-0.014
SD	(0.087)	(0.092)	(0.088)	(0.079)
N	4,024	847	1,567	1,610
Income Tax				
Mean	-0.023	-0.034	-0.035	-0.005
SD	(0.083)	(0.088)	(0.085)	(0.074)
N	4,040	845	1,577	1,618
Capital Gains Tax				
Mean	0.017	-0.004	0.006	0.036
SD	(0.097)	(0.099)	(0.098)	(0.092)
N	3,834	779	1,476	1,579

Note: Descriptive statistics for outcome variables for the total sample and the experimental groups, respectively.

B.4.2 Firm and Manager Characteristics

Table B.11: Descriptive Statistics and Balancing Tests – Firm and Manager Characteristics

	Total	CONTROL	SOCIAL	FISCAL	P-value for equality across groups
Sizegroups - Revenues/Employees					
Very Small	0.605	0.609	0.598	0.610	0.617
Small	0.268	0.260	0.278	0.261	0.277
Medium	0.080	0.089	0.079	0.077	0.452
Large	0.047	0.043	0.045	0.051	0.407
N	6,722	1,433	2,666	2,623	
Legal Forms					
Sole Proprietorship & Business Partnerships	0.149	0.152	0.147	0.150	0.891
Mixed Legal Forms (GmbH & Co. KG, KGaA)	0.099	0.099	0.097	0.101	0.853
Corporations	0.711	0.709	0.717	0.707	0.678
Other	0.040	0.040	0.039	0.042	0.883
N	7,822	1,779	3,027	3,016	
Economic Sector (1-digit WZ08)					
A Agriculture, forestry, and fishing	0.010	0.015	0.009	0.009	0.214
B Mining and quarrying	0.001	0.001	0.001	0.002	0.490
C Manufacturing	0.123	0.130	0.128	0.114	0.175
D Energy Supply	0.013	0.015	0.011	0.014	0.484
E Water supply/Waste Management/Pollution abatement	0.005	0.005	0.004	0.006	0.599
F Construction	0.074	0.071	0.071	0.078	0.529
G Trade	0.161	0.164	0.159	0.161	0.929
H Transport and Storage	0.023	0.025	0.025	0.021	0.529
I Accommodation and food service activities	0.045	0.047	0.046	0.044	0.895
J Information and communication	0.134	0.131	0.133	0.137	0.843
K Financial and insurance activities	0.032	0.033	0.026	0.037	0.085*
L Real estate activities	0.033	0.036	0.029	0.035	0.337
M Professional, scientific, and technical activities	0.108	0.090	0.119	0.107	0.011**
N Other economic service activities	0.075	0.079	0.072	0.075	0.694
O Public administration and defense/Social security	0.004	0.004	0.005	0.004	0.804
P Education	0.016	0.015	0.019	0.014	0.390
Q Health/Social Services	0.047	0.046	0.044	0.050	0.601
R Arts/Entertainment/Recreation	0.041	0.048	0.041	0.037	0.242
S Other services	0.047	0.039	0.050	0.050	0.160
T Goods/services by private households for own use	0.006	0.007	0.007	0.005	0.537
U Extraterritorial organisations and entities	0.001	0.001	0.001	0.001	0.830
N	6,727	1,428	2,675	2,624	
Gender					
Male	0.808	0.795	0.810	0.813	0.521
N	4,685	952	1,883	1,850	
Education					
University Degree or PhD	0.603	0.578	0.609	0.609	0.219
Master (technical vocations)	0.136	0.141	0.128	0.142	0.425
Apprenticeships or Other	0.239	0.258	0.241	0.228	0.193
No training	0.022	0.023	0.022	0.021	0.976
N	4,834	975	1,933	1,926	
Position					
Owner/CEO	0.912	0.914	0.906	0.918	0.401
Department Head	0.035	0.034	0.039	0.031	0.373
Clerk/Other	0.053	0.052	0.056	0.052	0.847
N	4,932	999	1,979	1,954	

Note: Descriptive statistics of firm and manager characteristics for the total sample and the experimental groups, respectively. *P*-values in the last column from a Wald chi-square test for equality of means across all three experimental groups. Sizegroups - Revenues/Employees (SME- EU Definition 2003/361): Very small ($\leq$ 9 employees & $\leq$ 2 mio. revenues), Small ($\leq$ 49 employees & $\leq$ 10 mio. revenues), Medium ($\leq$ 249 employees & $\leq$ 50 mio. revenues), Large ($>$ 249 employees or $>$ 50 mio. revenues). The economic sector classification follows the classification of economic activities from the German statistical office (2008 edition; WZ 2008). ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

B.4.3 Sample vs. Population

Table B.12: Descriptives Sample Firms vs. Business Register (2020)

Panel A: Legal Form

	Sample	Business Register 2020
Sole Proprietorship	0.111	0.591
Business Partnerships (e.g. oHG, KG)	0.137	0.120
Corporations (e.g. GmbH, AG)	0.706	0.227
Other	0.046	0.062
N	7,822	3,374,583

Panel B: Revenues (in €)

	Sample	Business Register 2020
<= 2 Mio.	0.753	0.928
More than 2 Mio. - 10 Mio.	0.164	0.053
More than 10 Mio. - 50 Mio.	0.057	0.014
More than 50 Mio.	0.026	0.004
N	7,638	3,374,583

Panel C: Employees subject to social insurance (in full positions)

	Sample	Business Register 2020
0 - 9	0.651	0.869
10 - 49	0.259	0.105
50 - 249	0.066	0.022
More than 250	0.024	0.005
N	6,722	3,374,583

Panel D: Economic Sector (1-digit WZ08 Classification)

	Sample	Business Register 2020
A Agriculture, forestry, and fishing	0.010	†
B Mining and quarrying	0.001	0.001
C Manufacturing	0.123	0.065
D Energy Supply	0.013	0.021
E Water supply/Sanitation/Waste/Pollution abatement	0.005	0.003
F Construction	0.074	0.113
G Trade	0.161	0.171
H Transport and Storage	0.023	0.032
I Accommodation and food service activities	0.045	0.069
J Information and communication	0.134	0.039
K Financial and insurance activities	0.032	0.022
L Real estate activities	0.033	0.061
M Professional, scientific, and technical activities	0.108	0.148
N Other economic service activities	0.075	0.065
O Public administration and defense/Social security	0.004	†
P Education	0.016	0.022
Q Health/Social Services	0.047	0.074
R Arts/Entertainment/Recreation	0.041	0.030
S Other services	0.047	0.066
T Manufacture of goods/services by private households for own use	0.006	†
U Extraterritorial organisations and entities	0.001	†
N	6,727	3,374,583

Note: Table B.12 presents distributions of firms with regard to legal form, revenues, number of full-time employees and economic sector (1-digit WZ08 classification (**?**)) for our firm sample and the population of firms in Germany (**?**). †:Information on marginal distributions for the respective industries not available from German company register.

B.4.4 Sample vs. Sample Frame

Table B.13: Sample Firms vs. Orbis Reference Group

	Sample Firms			**Orbis Reference Group**			
	N	Mean	Median	N	Mean	Median	t-statistic
Firm Age	5,133	20.76	15.00	934,930	24.10	18.00	9.90***
Number of Employees	1,237	27	8	173,217	43	10	0.64
Total Assets	756	9,165,497	853,606	120,305	16,397,061	1,024,368	0.34
Equity Ratio	699	0.12	0.04	114,106	0.36	0.04	0.26
Revenues (in €)	793	10,671,326	607,880	101,273	18,557,474	840,000	0.49

Note: Table B.13 compares the sample of firms, which are part of our experimental sample and an *Orbis* reference group of firms, for which information on firm age, number of employees, total assets, equity ratio or revenues is available, which operates in Germany and which are not part of our experimental sample (i.e. this sample includes non-participants, which did not take part in our experiment). Table B.13 compares the sample of firms with the *Orbis* reference group regarding the variables firm age, number of employees, total assets, equity ratio and revenues using *t-Tests* and presenting the number of observations, the mean and median of each firm characteristic. Only 5,163 of the 7,854 firms, which did not refuse to get their data in the survey linked with external data sources, are compared with the *Orbis* reference group. Equity ratio is defined as the ratio between capital (Paid In Capital plus New Stock Amount Paid) divided by total assets. For revenues, operating revenues (turnover) is used. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

C Appendix Chapter 5

C.1 Sample Composition and Timeline

Table C.1: Firm Characteristics

	(I) Company Register (2019)	(II) Early COVID-19	(III) COVID-19 Lockdown	(IV) Late COVID-19	(V) Ukraine War
Employees (%)					
0 - 9	87.4	64.99	67.47	67.33	68.14
10 - 49	10.1	26.58	24.79	25.59	25.15
50 - 249	2.1	6.39	6.03	5.94	5.61
250+	0.5	2.04	1.71	1.13	1.10
Total	3,559,197	7,971	6,653	3,349	2,191
Revenues (%)					
$<$ 2 M	92.1	75.33	77.50	77.51	78.49
2 M - 10 M	5.0	17.30	16.00	17.52	16.25
10 M - 50 M	1.3	5.14	4.73	3.86	4.25
$>$ 50 M	0.4	2.23	1.78	1.12	1.02
Total	3,559,197	7,885	6,582	3,317	2,166
Legalform (%)					
Sole proprietor	60.9	11.13	12.93	10.04	11.72
Private companies	11.3	13.80	13.38	11.80	12.31
Corporations	21.3	71.09	67.64	71.30	68.92
Other	6.4	3.98	6.06	6.87	7.05
Total	3,559,197	7,962	6,638	3,348	2,185

Notes: This table shows descriptive statistics of the German company register from 2019, representing the GBP's target population (column I), and of our sample during the relevant crisis periods (columns II – V). When comparing the population to the sample of the GBP, it becomes evident that the survey responses, in general, cover firms across all industries and size classes, but overrepresent larger businesses in terms of revenues and staffing numbers. This is due to the sample's greater share of corporations and its smaller share of sole proprietorships than in the German population of firms. To correct for such sampling bias, the GBP provides weights.

Table C.2: Industry Composition

	Company Register (2019)	Early COVID-19	COVID-19 Lockdown	Late COVID-19	Ukraine War
Industry Classification (%)					
B (Bergbau und Gewinnung von Steinen und Erden)	0.1	0.23	0.35	0.30	0.27
C (Verarbeitendes Gewerbe)	6.4	11.70	17.48	16.03	17.34
D (Energieversorgung)	2.2	1.38	0.69	0.66	0.59
E (Wasserversorgung, Abwasser- und Abfallentsorgung und Beseitigung von Umweltverschmutzungen)	0.3	0.51	0.60	0.72	0.68
F (Baugewerbe)	11.0	7.75	6.61	9.85	10.45
G (Handel; Instandhaltung und Reparatur von Kraftfahrzeugen)	17.1	15.83	14.60	15.29	15.88
H (Verkehr und Lagerei)	3.2	2.58	2.88	3.19	4.02
I (Gastgewerbe)	7.1	4.72	5.06	3.37	3.01
J (Information und Kommunikation)	3.9	12.90	12.27	9.94	8.99
K (Erbringung von Finanz- und Versicherungsdienstleistungen)	2.1	3.37	3.77	2.66	3.56
L (Grundstücks- und Wohnungswesen)	5.3	3.40	2.77	3.31	2.42
M (Erbringung von freiberuflichen, wissenschaftlichen und technischen Dienstleistungen)	15.0	10.60	12.33	15.59	14.61
N (Erbringung von sonstigen wirtschaftlichen Dienstleistungen)	6.4	7.45	6.85	5.70	4.70
P (Erziehung und Unterricht)	2.3	1.44	2.15	2.30	1.60
Q (Gesundheits- und Sozialwesen)	7.1	4.86	2.64	3.34	3.61
R (Kunst, Unterhaltung und Erholung)	3.4	4.05	3.53	2.99	2.97
S (Erbringung von sonstigen Dienstleistungen)	6.9	4.91	3.13	3.19	3.06
Total	3,559,197	7,971	4,508	3,349	2,191

Notes: This table shows the distribution of the sample along the industry classification scheme of the German Statistical Office. The distributions in the separate crisis periods are compared against the numbers from the German company register in 2019. The sampling weights provided by the GBP account for any deviations in industry coverage.

Table C.3: Timeline of Specific Crisis Events in Germany

Date	Event
COVID-19 Pandemic	
Jan 27, 2020	First COVID-19 case is confirmed in Germany.
Mar 8, 2020	The first death of a German COVID-19-patient is confirmed. Some German states react by prohibiting major events with >1000 participants.
Mar 11, 2020	The WHO classifies the outbreak of COVID-19-related diseases as a pandemic.
Mar 13, 2020	Germany closes down all schools and daycare facilities for children.
Mar 16, 2020	Across Germany, widespread closures of businesses are mandated. An entry ban for third country nationals is enacted while non-essential travel within the EU is restricted.
Mar 22, 2020	Germany introduces large-scale contact restrictions. Except for the family nucleus, meetings of more than two people in the public are prohibited.
Mar 23, 2020	To support financially strained firms, the German government announces the launch of a first, large-scale aid program.
Apr 15, 2020	Germany's states agree on contact restrictions until at least May 3. Schools are supposed to open gradually beginning on May 4. While stores under 800 sq. ft. are supposed to open on April 20 (or later), major events are prohibited until September. Wearing everyday masks is strongly recommended.
Apr 27, 2020	Mask requirements on public transit and in stores are step-wise introduced in Germany.
May 4, 2020	Business restrictions for stores, outdoor recreational sports, visits to clinics, nursing homes and facilities for the disabled are loosened. Yet, minimum distance remains in place. Contact restrictions are generally extended until June 5, but members of two households are allowed to meet. Up to a cap of 50 new infections per 100,000 residents per week, states are largely given responsibility for a further easing of restrictions.
Oct 7, 2020	The German government reaffirms its "hotspot strategy": Restrictions on social contact are based on the infection rates in each county.
Nov 2, 2020	Introduction of a "lockdown light": Renewed nationwide restrictions on public life and social contacts. Businesses offering leisure activities are being closed.
Dec 16, 2020	All but essential businesses are required to close following the announcement of a "hard lockdown" with tight, nationwide contact restrictions lasting until February 14, 2021.
Apr 23, 2021	Germany reacts to again rising infection rates with a federal "emergency brake" that entails contact restrictions starting at a seven-day incidence of 100.
Aug 10, 2021	"3-G" rules are established in numerous locations. These rules prohibit people that are not vaccinated, tested, or priorly infected with COVID-19 access to in-store shopping or indoor activities.
Dec 2, 2021	"2-G" rules are introduced in numerous public places, restricting access to vaccinated or priorly infected people. Again, contact restrictions are put in place.
Jan 7, 2022	"2-G+" rules apply for food services. These rules require a negative COVID-19 test in addition to being vaccinated or recovered from the disease.
Mar 20, 2022	Most Corona restrictions are step-wise abolished.
Russo-Ukrainian War	
Feb 22, 2022	The U.S., EU and allies impose punitive measures against Russia in response to Russia's deployment of troops close to the Ukrainian border. For example, Berlin puts the Nord Stream 2 Baltic Sea gas pipeline on hold for an indefinite period. The sanctions target banks, businessmen and decision-makers who support Putin's policies.
Feb 24, 2022	The full-scale war begins: Russia attacks Ukraine from several directions. Tanks advance into the former Soviet republic and airstrikes are carried out throughout Ukraine. Selenskyj declares a state of war and orders general mobilization.
Feb 28, 2022	Moscow and Kiev officially speak to each other for the first time since the war began − with no tangible results. Further sanctions are imposed on Russia.
Mar 8, 2022	The European Commission unveils REPowerEU, a plan to reduce dependence on Russian natural gas by two-thirds by the end of the year. The U.S. imposes a ban on Russian crude oil imports.
May 4, 2022	Ukrainian and Russian reports say a Ukrainian counteroffensive north and east of Kharkiv has pushed Russian troops 40km back from the city, in the first significant Ukrainian success since winning the battle of Kyiv. The European Commission unveils a sixth round of sanctions, including a complete import ban on all Russian oil effective by the end of the year.
Jun 15, 2022	Russia cuts gas deliveries to Europe through NordStream 1 pipeline to 40 % of capacity.

Notes: This table presents relevant events during the COVID-19 pandemic and the Russo-Ukrainian war. These serve as baseline for our categorization of crisis periods in Section 5.3.

C.2 Outcome Variables and Survey Questions by Survey Round

Table C.4: Outcome Variables & Survey Questions

Survey Round One: July 06 to October 03, 2020

Firm Characteristics

a) ΔRevenue, ΔProfit, ΔEmployees
- Original question: "In welchem Ausmaß wurden die folgenden Kennzahlen durch die Corona-Krise beeinflusst? Bitte geben Sie an, um wie viel % sich die Kennzahlen aktuell im Vergleich zum 31.01.20 verändert haben."
- Translation: "To which extent have the following operating figures been affected by the corona crisis? Please indicate by how much % the operating figures have changed with respect to 31.01.20."
- Range: [-100,100]

b) Revenue
- Original question: "Bitte geben Sie den Jahresumsatz (in €) im Jahr 2019 Ihres Unternehmens an."
- Translation: "Please indicate the annual revenue (in €) of your company in 2019."
- Range: [0,∞]

c) No. of Employees
- Original question: "Wie viele sozialversicherungspflichtige Mitarbeiter (in vollen Stellen) hat Ihr Unternehmen?"
- Translation: "How many employees (in full-time) in your firm are subject to social security?"
- Range: [0,∞]

Outcomes

a) Price Increases
- Original question: "Welche Maßnahmen ergreifen Sie kurzfristig (0-12 Monate), um die Mehrbelastung durch die Corona-Krise zu decken? Mehrfachnennungen sind möglich."
- Translation: "What measures are you taking in the short term (0-12 months) to cope with the burden of the corona crisis? Multiple answers are possible."
- Range: [0,1]; 0=No, 1=Yes

b) Investment Plans, Hiring Plans
- Original question: "Planen Sie derzeit, kurzfristig (0-12 Monate) Investitionen zu tätigen / zusätzliche Mitarbeiter einzustellen?"
- Translation: "Are you currently planning to make investments / hire additional employees in the short term (0-12 months)?"
- Range: [0,1]; 0=No, 1=Yes

c) Survival Probability
- Original question: "Was schätzen Sie: Wie viel Prozent der Unternehmen Ihrer Branche werden die Corona-Krise bis zum 31.12.2020 überstehen?"
- Translation: "Please provide your estimate: What percentage of companies in your industry will survive the Corona Crisis through 31.12.20?"
- Range: [0,1]

d) Supply Chain Constraints (based on ΔProduction Inputs)
- Original question for ΔProduction Inputs: "In welchem Ausmaß wurden die folgenden Kennzahlen durch die Corona-Krise beeinflusst? Bitte geben Sie an, um wie viel % sich die Kennzahlen aktuell im Vergleich zum 31.01.20 verändert haben."
- Translation: "To which extent have the following operating figures been affected by the corona crisis? Please indicate by how much percent the operating figures have changed with respect to 31.01.20."
- Range for Supply Chain Constraints: [0,1]; We set the dummy to one if ΔProduction Inputs $<$ -20 %.

e) Costs (based on ΔRevenue and ΔProfit)
- Calculated as ΔRevenue - ΔProfit.

C.3 Robustness

In Section 5.5, we have identified a significant increase in supply constraints following the COVID-19 Lockdown phase. Yet, during that time period, the GBP's survey question inquiring about issues along the supply chain has only been asked to firms with a revenue increase greater than 5 %. To mitigate concerns that the identified time trend related to supply chain constraints might be biased through selection, we run the following robustness test.

Specifically, for the Late COVID-19 phase and the period of the Ukraine War we use the same restriction on the display of survey questions as in the COVID-19 Lockdown phase. Although the question on supply chain constraints has been originally posted to all survey participants, we thus limit the sample to firms that experienced an increase in revenues larger than or equal to 5 % during the later two crisis periods. We use the COVID-19 Lockdown phase as baseline time period and test whether firms (with revenue increases) more often indicated problems along the supply chain in later crisis phases. For the purpose of this test, we omit answers early during the pandemic as during that phase firms were not asked directly about supply chain constraints. The results of the corresponding regression are reported in Table C.5.

Table C.5: Robustness Check – Supply Chain Constraints

	Supply Chain Constraints
Late COVID-19	0.063***
	(0.018)
Ukraine War	0.113***
	(0.020)
Baseline Mean	0.312
Industry FE	Yes
Firm Size	Yes
Observations	3,628
R^2	0.191

This table presents results from an OLS regression to analyze a potential increase in supply chain constraints compared to the COVID-19 Lockdown period for firms with a revenue increase $\geq$ 5 %. We control for each firm's number of employees (in logs) and include county and industry fixed effects. The table reports coefficient estimates and robust standard errors. ***, **, * indicate statistical significance at the 1, 5, and 10 % levels (two-tailed), respectively.

The results of our robustness test verify an increase in the share of firms which experienced supply chain constraints following the COVID-19 Lockdown period. Specifically, during the Late COVID-19 phase, problems along the supply chain are indicated by 20.2 % (6.3 pp.) more firms.

Comparing the COVID-19 Lockdown period to the Ukraine War, we find that the share of businesses experiencing supply chain constraints rose by more than 36 % (11.3 pp.). Since this robustness test is restricted to the same sub-sample of survey respondents, i.e., those with growing revenues, the results strengthen our argument that supply chain constraints increasingly became an issue after the COVID-19 Lockdown period.

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