HERTIE SCHOOL

MASTER THESIS

The effect of government support during the COVID-19 pandemic: Firm-level evidence from Germany

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HERTIE SCHOOL

Executive Summary

Master of Data Science for Public

The effect of government support during the COVID-19 pandemic: Firm-level evidence from Germany

by Marco SCHILDT

The Thesis Abstract is written here (and usually kept to just this page). The page is kept centered vertically so can expand into the blank space above the title too…

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List of Abbreviations

EU COM	**EU**ropean **COM**mission
SMEs	**S**mall and **M**edium-sized **E**nterprises

Chapter 1

Introduction to the government support in Germany

The Covid-19 pandemic has severely affected the entire world with many devastating consequences. Businesses in many parts of the economy were struggling to survive due to shocks in demand, lockdowns from governments and disrupted supply chains (EU COM, 2020).

To sustain the economy and prevent businesses them from bankruptcy during the pandemic, the German government responded with a range of policies. Beside the various measures like labor cost subsidies, temporary changes in the insolvency law and tax reliefs, the financial support through grants and loans was unprecedented. The financial support was available for businesses in all sizes that affected by the pandemic ranging from self-employed individuals to small and medium-sized enterprises (SMEs) up to very large companies. From spring 2020 to summer 2022, grants, loans, re-capitalizations and guarantees alone accounted for a total of around EUR 130 billion (BMWK, 2022). A fiscal effort of this magnitude is inconceivable under normal conditions.

Usually, governments are not permitted to provide extensive subsidies, due to concerns of distorting competing in the European single market (Claici, Eymard, and Vallée, 2022). The permissibility of subsidies is comprehensively regulated by European state aid laws. Before a subsidy is considered permissible under this legal framework an assessment of its necessity, incentive effect, proportionality and effect on trade and competition is needed (Claici, Eymard, and Vallée, 2022). In light of the ongoing pandemic, the EU relaxed rules on subsidies by introducing the Temporary Framework for State aid measures to support the economy in the current COVID-19 outbreak, by which provided national governments more freedom in order to come up with quick and extensive policy responses to support businesses (EU COM, 2020).

TABLE 1.1: Overview of support instruments

Beihilfeinstrument	aid
Andere Formen der Kapitalintervention	9,017,729,574.33
Bürgschaft	1,144,042,410.02
Eigenkapitalinstrumente	2,419,881,701.00
Kredite/rückzahlbare Vorschüsse	753,217,635.27
Sonstiges (bitte angeben)	14,244,894,962.69
Zinsgünstiges Darlehen	10,500,942,385.00
Zinszuschuss	9,383,307,910.00
Zuschuss	24,959,647,770.34

As part of the framework the German government had to justify the financial support measures by laying out the necessity, the appropriateness and proportionality to remedy the impact of the pandemic in the economy. Defining and deciding on the appropriateness as well as proportionality of support measures is a complex and challenging task. Due to the unpredictable scale of the pandemic, uncertainty is immense. On the other hand, the effect of support measures is nothing trivial to estimate, given that their scale was unprecedented. To ensure that the support measures are effective, efficient, a good understanding is inevitable.

The financial support measures introduced by the German government can mainly be categorized into the groups grants and loans. Grants are funds provided by the government to businesses that are not needed to be repaid. Grants are usually subject to the terms and conditions, but do not require any consideration in return. Whereas financial support measures based on loans have to be repaid, like standard bank loans. The advantage over a normal credit transaction are beneficial conditions that a company would not have received under normal circumstances from a bank. Especially not in a time where the company's future is uncertain and linked to the further development of the pandemic.

From the companies' point of view, both types of aid have the immediate effect of a liquidity injection, meaning that additional cash is available. However, in the long-term perspective the repayment obligation of loans is contrasting the effect of grants by the fact that a firm will have to service the debt and interest of the loan, regardless of whether the pandemic is over or not.

Chapter 2

Literature Review

2.1 Pandemic effects

The negative consequences of the COVID-19 pandemic on the economy have become evident in many areas. Many businesses were severely affected by drops in demand and through lockdowns ordered by authorities. When business operations are halting while costs like rent or personal costs continue occurring the pandemic shock eventually leads to negative cash flows for many firms (Fernández-Cerezo et al., 2021). Depending on the affectedness of the business, the liquidity reserves will inevitably deteriorate and eventually liquidity shortfalls are inescapable with negative cash flows (Puhr and Schneider, 2021). Although the demand of liquidity is individual for every company, a simulation study from Italy quantified the total liquidity deficit of all Italian SMEs caused by the Covid-19 shock to 83.7 billion Euros at the end of 2020 (Bellucci et al., 2022). In comparison for the Belgian corporate sector, in a scenario without policy interventions, the drop in liquidity by September 2020 is quantified with 28.2 billion Euros (Tielens, Piette, and Jonghe, 2020).

Empirical results from Tielens et al. (2020) suggest that in Belgium even businesses that used to be profitable require a large amount of additional financing to offset their liquidity shortfall.

Without a return of profits, firms are in need of liquidity injection to, either through additional equity or via debt. For smaller unlisted firms it is usually not possible to easily raising equity, therefore they usually left with the debt option and rely on credits from banks (Pagano and Zechner, 2022). Pagano and Zechner (2022) analyzed the effects of covid 19 on companies' financial performance in the EU. Their evidence suggests differences in the effects between large firms and small and medium sized enterprises. By comparing the years 2019 and 2020 the authors found that smaller companies tend to increase their ratio of total debt to total assets (debt-ratio) whereas,

large companies also increase their leverage, but significantly less. Regarding liquidity, their findings suggest that small and medium sized enterprises increased their cash-to-total-assets-ratio more than large companies. Small companies did so even more than medium sized ones. However, the authors could only speculate over the reason behind of this observation. Plausible reasons were precautionary cash hording and greater risk aversion. Additionally, the authors raise the theory that smaller companies were able to raise cash more easily due to the claim, that loan guarantee programs favored small firms. However, the analyzed sample of small and medium sized enterprises was not representative of any specific industry, nor of aid recipients.

However, credits from banks, if obtainable, increases the firms leverage and could make the firm vulnerable to new liquidity shortfalls. And additional leverage only prevents from insolvency if there is a prospect that future cash flows will enable a firm to service the additional debt. Regarding the capital structure, increased leverage means a weaker equity ratio. An early Survey study from September 2020 analyzed the implications of the pandemic crisis on the equity of Germany companies and reported that for most companies the equity ratio did not change, however a strong sectoral heterogeneity with travel and gastronomy having a reduction in the equity ratio between 1.8 % and 1.5 % (Peichl et al., 2021). In Spain a survey looked at the indebtedness as well as the cash ratio of enterprises and reported findings that support the heterogeneity of the covid 19 shock across firms and, that the impact was larger for small, young and less productive firms located in urban areas (Fernández-Cerezo et al., 2021). Further support for the heterogeneity of the impact of the COVID-19 crisis on firms' sales and costs came from Belgium (Dhyne and Duprez, 2021).

A simulation on 14 relatively well-covered European countries estimated that an increase in the financial debt of companies has on average a negative impact on the growth of investment after the crisis, indicating negative long-term effects increased leverage (Demmou et al., 2021a).

2.2 Government support effects

The magnitude of policy responses has already provoked many researchers to look into the effects and effectiveness of various support measures. The difficult data situation has led scientists to explore different routes. Early attempts overcame the lack of data by conduction simulations studies. (Ebeke

et al., 2021) estimate that in Europe the share of illiquid firms would have tripled from pre-crisis levels in the absence of policy measures.

A modelling approach by (Puhr and Schneider, 2021) indicates that supporting measures in Austrian helped to reduce insolvencies by around one third.

For European companies a simulation by (Demmou et al., 2021b) suggests that the combination of different measures helped to reduce the share of illiquid companies significantly with relieves for wage bills being the most effective tool.

A model by (Chang, Gan, and Mohsin, 2022) suggests that deferring taxes is the single best option of income cuts of 25 %, but a combination of loan and equity based aid is the best option when revenue drops are larger than 50 %.

The modelling by (Parlapiano et al., 2020) support the effectiveness of Italian support measures in reducing illiquidity, but also report that loan based aid increased the indebtedness measured by a debt-to-asset like ratio of 1.2 %.

With a conceptual approach (Bischof et al., 2021) assessed the regulatory design of grants in Germany and argue for heterogenous effects for different industries based on their cost structure. Their justification is based transmission factors which are referring to the relationship between the average decrease in revenue and average decrease in profit of an industry. The factor can be crucial for the effect of aid schemes that are compensating costs proportionately because it has implications on the relative compensation of profits (Bischof et al., 2021). According to the numbers provided in the paper, Food and beverage service activities are industries with a higher transmission than Travel agency and tour operator activities, as well as creative, arts and entertainment activities. Even lower transmission is reported for the industry of sports activities and amusement and recreation activities.

Other assessments were based on survey data from various countries in many ways. Indications for positive effects aid for micro microenterprises as well as self-employed are reported by (Kochaniak, Ulman, and Zajkowski, 2023; Bertschek et al., 2022)

A firm-level assessment was conducted by (Bellucci et al., 2022) suggesting that remedy measures in Italy have almost halving the percentage of illiquid SMEs at the end of 2020.

In Slovakia government wage subsidies reduced the probability of illiquidity for recipients (Lalinsky and Pál, 2021).

Similar findings were also reported for Euro area firms by (De Santis, Ferrando, and Gabbani, 2021) and worldwide by (Igan, Mirzaei, and Moore, 2023).

(Harasztosi et al., 2022) find evidence that companies that got support expanded their balance sheet more than unsupported firms. In case of an expansion through debt, part of the change could be explained by the loan-based aid, but not in the case of equity, although the authors report that policy support raised the probability of an increase in the equity base (Harasztosi et al., 2022).

(Stien and Risan, 2022) analyzed the effect of tax deferrals in Norway and reports evidence for a significant decrease in the risk for bankruptcy.

The measures taken by the Belgian authorities to mitigate the impact of the pandemic on companies earnings have been effective in averting serious solvency issues (Piette and Tielens, 2022).

(Costa, 2021) used a difference-in-differences method to assess different types of support in Portugal. The reported average treatment effects for debt based that aid measures suggests considerable contribution to firms' liquidity.

Authors also investigated the effects of state aid on the productivity and firm performance. Firms in Italy with government grants in relation to the COVID-19 pandemic saw an 11 % increase in sales revenue by the end of June 2020 compared to those yet to receive the grant (Turkson et al., 2021). (**konings_impact_nodate**) employed a difference-in-differences model with Flemish beneficiaries of government support suggesting that the aid helped sustain and preserve productivity.

Chapter 3

Data Sources

3.1 Data on Government support

The thesis uses data from european state aid transparency database (EU COM, 2023). The data base contains information about individual award data like beneficiary name, amount, Date of Granting, and the purpose of the state aid (EU COM, 2023). The legal base for the transparency requirement aid payments is Temporary Framework for State aid, however payments under 100.000 EUR (10.000 EUR for agricultural firm) are exempted from the transparency requirement, insofar the data base is not comprehensive. Nevertheless, as of spring 2023 for Germany 135.478 cases of aid related to the COVID-19 pandemic were disclosed under the objective "Remedy for a serious disturbance in the economy". Unfortunately, the disclosed titles of the aid measures and case numbers doesn't allow for reconciliation to the official names of the aid programs due to amendments and overlaps. In addition, in case of bigger companies the aid was usually calculation on a group level but awarded and paid in full to just one company of the group. (Sample shows that smaller companies are strongly represented)

Another thing to be mentioned is that most direct grants were granted and paid on a provisional basis and are still subject to a final determination of the granted amount. For the research this doesn't pose an issue, since the effects of payments will be observable regardless whether the amount of aid got adjusted in later period.

3.2 Company level financial information

In Germany corporations are legally required to disclose their annual financial statements in the Federal Gazette. Although the discloser of financial

information is legally required for corporations, in there are various exemption for example for companies that are consolidated into other companies' balance sheets, and also non-compliant companies. The requirement on the disclosed financial information is depending on the size of the company. Bigger companies above certain thresholds additionally need disclose their profit and loss statements and management report additionally. However, all companies that are subject of regulation must disclose at least their balance sheet. To not exclude SMEs systematically, due to missing profit and loss statements, the data collection process is limited to balance sheet information.

The main constraint in processing the financial information from the Federal Gazette is the vastly unstandardized formatting of balance sheets causing limited readability in the data parsing step. By scraping and parsing the data for benefices of pandemic government support X.XXX company balance sheets for at least one year in the period 2018 - 2022 could be obtained.

Chapter 4

Methods

4.1 Balance Sheet Ratios

To evaluate the financial position and performance of firms in a comparable way across the data set a selection of balance sheet ratios were chosen. Ratios allow a consistent view on the companies despite their different sizes. Even though balance sheets only offer a reporting date view on the firm's financial information and can't reflect events or extreme situations during a fiscal year, they provide comparable view on companies that is standardized by accounting standards. The selection of ratios was made to get a picture of the liquidity and solvency the of firms. The ratios are calculated for each beneficiary of government support for each available year between 2018 and 2022. Calculations are shown in table 4.1.

4.1.1 Liquidity Ratios

Liquidity ratios are chosen to measure a firm's financial position to meet its obligations in the short run. As outlined in chapter 1the pandemic shock had a significant effect on companies' liquidity and was a key consideration for the EU to loosen state aid regulation and enable large scale support measures (EU COM, 2020). The first and most representative liquidity ratio is the cash ratio, comparing the most liquid asset, cash holdings, to the total assets of a firm. Cash is the starting buffer against running costs in a crisis shock. Although usually the current liabilities are used instead of the total assets, with the available data total assets serve as a more robust denominator that has been utilizes in similar research (Fernández-Cerezo et al., 2021; Costa, 2021; Igan, Mirzaei, and Moore, 2023). The quick and the current ratio provide a more conservative view on a firms liquidity by including assets that are still considered relatively liquid against the current (short-term) liabilities. However, the key Component is short term debt, is not disclosed

TABLE 4.1: The calculation of Balance Sheet Ratios.

Category	Ratio	Calculation
Liquidity	Cash Ratio	$\frac{Cash}{TotalAssets}$
	Quick Ratio	$\frac{CurrentAssets-Inventory}{CurrentLiabilities}$
	Current Ratio	$\frac{CurrentAssets}{CurrentLiabilities}$
Liability	Debt-to-Equity Ratio	$\frac{Debt}{Equity}$
	Equity Ratio	$\frac{Equity}{TotalAssets}$
	Debt-to-Assets Ratio	$\frac{Debt}{TotalAssets}$

consistently in balance sheets due to the fact that accounting standards allow alternative discloser in the balance sheet appendix. For practicability, such a case the calculation had to use the total liabilities, which reduced the informative value in comparisons across firms, but still allows for comparisons on a firm level between different years.

4.1.2 Solvency Ratios

The other factor of interest is the indebtedness of firm in context with the pandemic and the remedy measures. The indebtedness, or also leverage, of a firm has implications that are rather relevant in the long-term, since debt payments are long term obligations that need to be serviced by cash flows. High levels of debt can challenge a company and can reduce profits. The debt-to-asset and the equity ratio compare the respective capital to the total assets and are behaving in opposite directions. The debt-to-equity ratio give a magnified picture on the companies leverage compared to the debt-to-asset ratio. For the simplification purposes negative ratios were omitted since result either from errors in the data parsing process or from exceptional cases like loss transfer agreements with parent companies.

4.2 Diff and Diff

Policy intervention to "prevent" the effects and save businesses for a fast economic recovery. First assessments were modeling approaches. Already lots of early assessments of state aid, also at a firm level. For getting a better understanding on the effect of aid schemes in Germany a paper analyses the

effect of a company's cost structure on the effectives of aid measures (Bischof, Karlsson, Rostam-Aschar, Simon, 2021). This paper assumes that companies within the same sector have a similar cost structure. Since aid in Germany is based on the cost structure of companies, the authors conclude that based on the generalized approach of aid schemes, the effectiveness of aid is varying between business sectors.

4.3 Causal Curve

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Chapter 5

Results

5.1 Balance Sheet Ratios

The average observed liquidity ratios shown in Figure 5.1 for all companies of the dataset are showing an increase in liquidity in 2020 and 2021 compared to the pre pandemic years indication that companies are holding relatively more cash at the year-end since the pandemic. A study conducted by the German Federal Bank reported an increase in the average cash ratio for German companies in 2020 as well as in 2021 (Deutsche Bundesbank, 2022). For example, for SME corporations the study reported a change in the cash ratio from 0.104 (2019) to 0.110 (2020). For the current ratio and quick ratio, the same trend was reported. Further support for an increase in the quick ratio was found by another study (Bley et al., 2022). Although the exact ratios are varying between studies, there is strong support for the general trend of increasing liquidity in 2020 and 2021.

Solvency ratios are showing a less clear trend after the COVID-19 pandemic. Although minimal, the opposite trends in the equity ratio and debt-to-asset-ratio are as expected. The only visible change happened in 2020, while in 2021 the ratios are very similar to 2018 and 2019. The change in the debt-to-asset ratio is amplified in the debt-to-equity ratio, as expected. Survy Data from the KFW found an Equity Ratio of 0.318 in 2019, a decrease to 0.301 in 2020 and a recovery to 0.314 in 2021 (KfW, 2022). For very small companies with less than 10 employees, the drop in 2020 was stronger, and the recovery in 2021 was above pre-pandemic levels. Lager companies did not have a recovery after the crisis year and decreased their Equity Ratio in 2021 on average further. This could indicate that the recovery of the indebtedness in 2021 might have been driven by smaller companies. Similar observations were reported by the German Federal Bank were the debt-to-asset-ratio for SME corporations decreased in 2020.

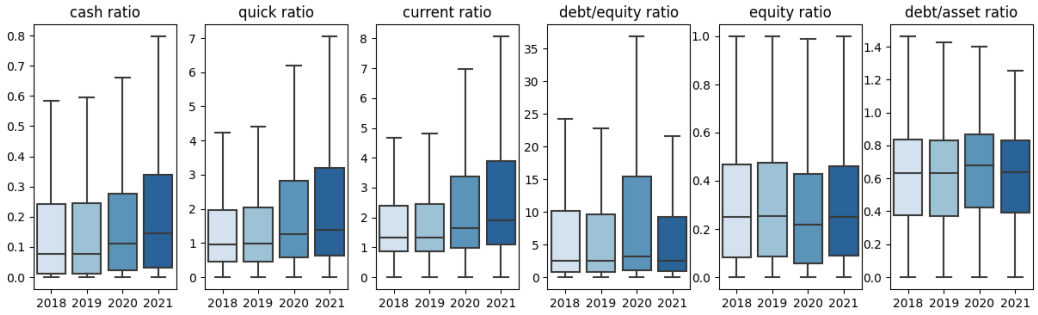

FIGURE 5.1: Boxplot with balance sheet ratios from the obained dataset.

5.2 Diff and Diff

Policy intervention to "prevent" the effects and save businesses for a fast economic recovery. First assessments were modeling approaches. Already lots of early assessments of state aid, also at a firm level. For getting a better understanding on the effect of aid schemes in Germany a paper analyses the effect of a company's cost structure on the effectives of aid measures (Bischof, Karlsson, Rostam-Aschar, Simon, 2021). This paper assumes that companies within the same sector have a similar cost structure. Since aid in Germany is based on the cost structure of companies, the authors conclude that based on the generalized approach of aid schemes, the effectiveness of aid is varying between business sectors.

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Chapter 6

Conclusion

6.1 Policy Implications

Research unambiguous concluded that COVID-19 crisis negatively influenced the economy in countries around the world. Many businesses were severely affected by drops in demand and lockdowns by the authorities. The pandemic shock leads to negative cash flows for many firms (Fernández-Cerezo et al. 2021). Depending on the affectedness of the business and the cash holding, liquidity shortfalls are inescapable. Without continuation of their business and positive cash flows, firm's equity and the liquidity (cash and bank) positions will inevitably deteriorate. At some point, firms are in need of Liquidity injection, either through additional equity or via debt. However, debt, if obtainable, increases the firms leverage and could make the firm vulnerable to new liquidity shortfalls. And, additional leverage only prevents from insolvency if there is a prospect that future cash flows will enable a firm to service the additional debt. The effect of the COVID-19 outbreak is widely described as an economic shock,

Pagano and Zechner empirically analyzed the effects of covid 19 on companies' financial performance in the EU (2022). Their finding shows significant differences in the effects between large firms and small and medium sized enterprises. By comparing the year 2019 and 2020 the authors found that smaller companies tend to increase their ratio of total debt to total assets (debt-ratio) whereas, large companies also increase their leverage, but significantly less. Regarding liquidity, small and medium sized enterprises increased their cash to total assets ratio more than large companies. Small companies did so even more than medium sized ones. However, the authors could only speculate over the reason behind of this observation. Plausible reasons were precautionary cash hording and greater risk aversion. Additionally, the authors raise the theory that smaller companies were able to raise cash more easily due to the claim, that loan guarantee programs favored

small firms. However, the analyzed sample of small and medium sized enterprises was not representative of any specific industry, nor of aid recipients. A study by Peichl et al. analyses the implications of the pandemic crisis on the equity of Germany companies (2021). They found in their early survey from September that for most companies the equity ratio did not change, however a strong sectoral heterogeneity with travel and gastronomy having a reduction in the equity ratio between 1.8 (Tielens et al. 2021) conducted a significant short-run impact on firms' liquidity buffers in Belgium by the covid 19 Pandemic. (Narrow liquidity ratio) And heterogeneous impact of the COVID-19 crisis on the cash position of Belgian firms in comparison to a business-as-usual counterfactual. In Spain a survey looked at amongst other indicators looked at indebtedness and cash ratio of enterprises. Findings support the heterogeneity of the covid 19 shock across firms and that the impact was larger for small, young and less productive firms located in urban areas. (Fernández-Cerezo et al. 2021). Heterogeneous impact of the COVID-19 crisis on firms' sales and costs, see Dhyne and Duprez (2021)

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Appendix A

Frequently Asked Questions

A.1 How do I change the colors of links?

The color of links can be changed to your liking using:

`\hypersetup{urlcolor=red}`, or

`\hypersetup{citecolor=green}`, or

`\hypersetup{allcolor=blue}`.

If you want to completely hide the links, you can use:

`\hypersetup{allcolors=.}`, or even better:

`\hypersetup{hidelinks}`.

If you want to have obvious links in the PDF but not the printed text, use:

`\hypersetup{colorlinks=false}`.

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Statement of Authorship

I hereby confirm and certify that this master thesis is my own work. All ideas and language of others are acknowledged in the text. All references and verbatim extracts are properly quoted and all other sources of information are specifically and clearly designated. I confirm that the digital copy of the master thesis that I submitted on 02.05.2023 is identical to the printed version I submitted to the Examination Office on 03.05.2023.

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