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**Article**

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Journal of Risk and Financial Management

**Provided in Cooperation with:**

MDPI – Multidisciplinary Digital Publishing Institute, Basel

*Suggested Citation:* Nicolas, Christina; Brender, Nathalie; Maradan, David (2023) : How did Swiss small and medium enterprises weather the COVID-19 pandemic? Evidence from survey data, Journal of Risk and Financial Management, ISSN 1911-8074, MDPI, Basel, Vol. 16, Iss. 2, pp. 1-16,  
<https://doi.org/10.3390/jrfm16020104>

This Version is available at:

<https://hdl.handle.net/10419/275172>

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Article

# How Did Swiss Small and Medium Enterprises Weather the COVID-19 Pandemic? Evidence from Survey Data

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**Abstract:** The COVID-19 pandemic had unprecedented consequences on businesses and, in particular, small and medium enterprises (SMEs). The aim of this paper is to empirically study the impact of the COVID-19 sanitary crisis on Swiss SMEs two years after the onset of the pandemic. Using a sample of 149 SMEs operating in the French-speaking region of Switzerland, we find that revenue loss across the full sample averaged 14% in 2020 compared to 2019. Our findings show that firm characteristics are not significant in explaining turnover loss while business management strategies such as business restructuring, remote working, and prioritizing employee protection were significantly associated with revenue. Our results suggest that remote work should be gradually introduced in sectors of activity whenever possible to reduce the financial burden of any future pandemic on SMEs. Additionally, we quantify the impact of closure on SMEs and find that firms having reported to have closed partially or completely due to sanitary restrictions were impacted seven times more in terms of revenue loss compared to SMEs that did not cease their activity during the COVID-19 crisis. This paper contributes to our understanding of the magnitude of the financial impact of the COVID-19 pandemic on SMEs and highlights the importance of SMEs adopting efficient business management strategies, and implementing measures to support smaller firms by public authorities in times of crisis.

**Keywords:** COVID-19; small and medium enterprises; SME; firm performance; financial management; crisis management

**JEL Classification:** M1; M2; G3; G4



**Citation:** Nicolas, Christina, Nathalie Brender, and David Maradan. 2023. How Did Swiss Small and Medium Enterprises Weather the COVID-19 Pandemic? Evidence from Survey Data. *Journal of Risk and Financial Management* 16: 104. <https://doi.org/10.3390/jrfm16020104>

Academic Editors: Marcel Kordoš and Robert Brooks

Received: 22 December 2022

Revised: 27 January 2023

Accepted: 1 February 2023

Published: 8 February 2023



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## 1. Introduction

The COVID-19 pandemic and associated sanitary restrictions disrupted business operations and had unprecedented consequences on firms worldwide. Public health measures affected business activities, employees, and ultimately their performance to various degrees. Businesses had to adapt quickly and constantly to the rapidly evolving situation. Investors, employees, regulators, and consumers expect businesses to develop resilient business models to set them up for lasting recovery and, thereby, prepare them for future challenges.

The economic consequence of COVID-19 on businesses has been far more detrimental than expected, with small and medium enterprises (SMEs) being particularly vulnerable in such an unpredictable shock (OECD 2021). Specifically, SME survival during the COVID-19 pandemic has been more challenging given their liability of smallness (Carroll 1983), limited resources, restrictions in diversifying their operations, higher obstacles when it comes to capital market access, and, more relevant to the pandemic, lower awareness of existing support measures (Guerrero-Amezaga et al. 2022). Hence, the need to adequately restructure their business and adapt to a rapidly evolving situation might be crucial for survival.

In Switzerland, the economy was severely hit by the COVID-19 pandemic. The gross domestic product in Switzerland registered a record-low decline of 2.9% in 2020 since the start of the quarterly census back in 1980 (Swiss issues 2020). In an attempt to curb the COVID-19 pandemic, on 13 March 2020, the Swiss Confederation announced its first set of measures in order to provide immediate support to businesses, particularly SMEs that were at high risk of running out of liquidity to fulfill their obligations. Without the decisive and rapid support measures taken by the Swiss Confederation, the recession would undoubtedly have been even more severe, especially for small businesses. Still, despite the importance of the consequences of the pandemic on small businesses, no existing study explores the economic impact of the COVID-19 pandemic and associated restrictions on Swiss SMEs' performance, even after a sufficient amount of time has lapsed, which is necessary to evaluate SMEs' reaction and adaptation to the crisis. Given that SMEs constitute more than 99% of all firms operating in Switzerland and lead to the creation of more than two-thirds of the jobs in the country (FSO 2020), there is a crucial need to fill this specific gap in the literature. The purpose of this paper is thus to empirically analyze the impact of the COVID-19 pandemic on Swiss SMEs' performance.

To do so, we focus on firm performance in terms of revenues and profitability by adopting a comprehensive model in an attempt to unravel which variables associate with SME self-reported revenue loss and profitability. In so doing, we analyze whether COVID-19 restrictions, firms' characteristics, and management strategies such as business model restructuring and remote work have influenced SMEs' performance. Our objective is to depict what specific strategies and choices were the most effective in reducing the impact of the pandemic on revenue loss and profitability. Our study is based on a survey that we administered in the last quarter of 2021 using a sample of Swiss SMEs from the French-speaking region of Switzerland.

Our sample statistics show an average revenue loss of 14% across the whole sample in the year 2020 compared to 2019. Our findings show that this turnover variation was negatively associated with business restructuring. We also find that the possibility of remote work is significantly associated with lower revenue loss. A closer look reveals that restructuring was only beneficial when associated with a higher share of remote work. Among different business management strategies, we find that prioritizing employee protection and client satisfaction strategies significantly associates with higher revenues. Additionally, we quantify the impact of closure on SMEs and find that SMEs that reported to have closed partially or completely due to sanitary restrictions were seven times more impacted in terms of revenue compared to SMEs that did not have to cease their activity during the COVID-19 crisis.

The remainder of this paper is organized as follows: Section 2 presents the sample, variables, and model employed and discusses the methodology used. Section 3 presents the main empirical results, further investigations, and robustness checks. Finally, Section 4 provides some concluding remarks.

## 2. Literature Review

A thorough review of the literature on the impact of exogenous shocks on SMEs, including the COVID-19 pandemic, is provided in the conceptual work of Mikilian and Hoelscher (2022). Perhaps one of the first and most relevant studies on the impact of COVID-19 on SMEs is the paper by Bartik et al. (2020), who conducted an early-stage survey on US-based SMEs and found a record loss of 22% of active business owners between February and April 2020 alone. The authors pointed out that the impact of the pandemic highly depended on the sector of activity. Additionally, the authors showed that no business was immune to pandemic-induced losses as these were spread across different demographic groups and business types. Cowling et al. (2020) explored the liquidity of firms in the UK and found that more than 60% of SMEs were on the edge of running out of liquidity. The authors concluded that precautionary savings are of high importance in SMEs when it comes to their ability to weather perfect storms. From an aggregate perspective,

[Pedauga et al. \(2022\)](#), using a structural model on Spanish small and medium businesses, found that SMEs account for as high as 43% of the 2020 Spanish GDP decline and almost two-thirds of the unemployment decline triggered by the COVID-19 pandemic.

SMEs are known to have less resilience compared to larger firms when it comes to weathering storms and unexpected crises ([Eggers 2020](#)) given their liability of smallness ([Carroll 1983](#)). [Katare et al. \(2021\)](#) studied small business survival in the United States and found that SME reorganization was essential for survival, but not all business reorganization led to better business outcomes during the first wave of the pandemic. According to a study on Italian firms by [Carletti et al. \(2020\)](#), distress due to the COVID-19 pandemic was observed to be much more frequent for SMEs compared to larger firms, especially those with high pre-COVID-19 leverage. A more recent [OECD \(2021\)](#) report confirmed the fragile situation SMEs faced and their precarious position one year after the debut of the pandemic, which rendered authority intervention indispensable for survival. From another perspective, [Gourinchas et al. \(2020\)](#) explore the impact of the COVID-19 crisis on SME failure rates in 17 countries. They found that failure rates would have been worse by nine percentage points without government support measures. Additionally, according to [Guerrero-Amezaga et al. \(2022\)](#), small firms were less aware of governmental support measures and, consequently, received less assistance from authorities<sup>1</sup>. In fact, government subsidies were essential for SME survival as the contagion effect of the pandemic exacerbated other periods of hardships ([Kawaguchi et al. 2021](#)). Still, [Paaso et al. \(2020\)](#) showed that the COVID-19 pandemic, despite its magnitude and persistence, didn't have any influence on the willingness of SMEs to increase their debt to boost their chances of survival.

In Switzerland, [Brühlhart et al. \(2020\)](#) explored the dependence of SMEs on financial support provided by authorities and found that the SMEs that had been more indebted prior to the crisis took out significantly more COVID-19 loans than those that had been debt free before the pandemic. Likewise, [Zoller-Rydzek and Keller \(2020\)](#) used theoretical and empirical analysis to study how Swiss firms reacted to the COVID-19 crisis and argued that giving out high amounts of COVID-19 loans can create “zombie” firms that have high failure probabilities once support measures end. However, this study was based on a survey administered right after the onset of the pandemic when SMEs perhaps had not had time to fully react to the crisis. More recently, [Eckert and Mikosch \(2022\)](#) focused on firm bankruptcies and new firm establishments using Swiss register data. Unlike previous crises, they found that bankruptcy rates in the first eighteen months of the pandemic were lower than pre-pandemic levels. This was partially explained by the legal freeze of bankruptcies (March 2020) and debt collection (April 2020) ordered by federal authorities. Interestingly, bankruptcy levels remained lower than pre-pandemic levels even after the termination of the legal freeze. As for the number of recorded start-ups, it was significantly higher than pre-pandemic level. Evidence suggested that entrepreneurial activity was higher in sectors where the pandemic induced structural changes, such as digital sales and e-commerce. Using another approach, [Bivona and Cruz \(2021\)](#) explored how a Swiss SME reacted to COVID-19 using a single case study methodology. Authors pointed out the importance of partnerships and internal and external knowledge during the COVID-19 sanitary crisis.

More relevant to our work is the paper by [Strakšienė et al. \(2021\)](#), which focuses on remote work in western Lithuania. The paper documents a more challenging impact of COVID-19 on SMEs partly due to the difficulties encountered in the transition to remote work. Using a sample of 73 SMEs, authors revealed that IT infrastructure and human factors were one of the main challenges in remote work for small businesses during the COVID-19 pandemic.

In terms of the strategies that seemed most promising during the COVID-19 pandemic, we found studies underlying the importance of gut instinct such as the work by [Ratten \(2020\)](#). Still, the importance of psychological factors in decision-making remains a controversial subject in SMEs. Additionally, an important argument found in the literature by [Katsos and Miklian \(2021\)](#) is on the limitations of studying small firms during the

crisis due to the fact that the outcome will differ depending on how equipped these firms were prior to the crisis in terms of contingency plans. Finally, according to Williams and Shepherd (2021), an important element of crisis resilience is the SMEs’ social embeddedness in their community, which might sometimes be as important as financial and strategic decision-making during crises.

### 3. Sample, Variables, and Methodology

#### 3.1. Sampling and Data

A survey containing 26 questions on the impact of the COVID-19 sanitary crisis was administered during the last quarter of 2021 to SMEs<sup>2</sup> in five French-speaking cantons of Switzerland (Geneva, Vaud, Jura, Neuchâtel, and Fribourg). The survey was administered in French and exclusively online via the newsletter of the chambers of commerce in each canton. A total of 251 respondents completed the survey. After data cleaning and the elimination of missing values, a final count of 149 SMEs was attained with a good spread across economic sectors of activity and size by full time equivalent (FTE).

Table 1 shows the firm distribution by economic sector according to the NOGA defined sectors<sup>3</sup>. All different NOGA sectors are represented in the sample. Of the 149 total firms, only two firms operate in the primary sector, 57 in the secondary sector, and 88 in the tertiary sector, which is in line with the distribution of the sectors in this region<sup>4</sup>. It is worth noting that in our sample the sector of the manufacturing industry includes the largest number of firms (38 FTE).

**Table 1.** SME distribution by economic sector.

Economic Sector	Number of SME
Agriculture, forestry and fishing	1
Manufacturing industry	38
Electricity, gas, steam and air conditioning_	2
Construction	15
Wholesale and retail trade; repair of motor vehicles and motorcycles	7
Transportation and storage	6
Accommodation and food services activities	4
Information and communication	9
Financial and insurance activities	11
Real estate activities	3
Legal, accounting, scientific, engineering, and technical activities	9
Administrative and support service activities	2
Education	3
Human health and social work activities	1
Arts, entertainment and recreation	3
Other service	20
Other	15
<b>Total</b>	<b>149</b>

Table 2 shows the distribution of firms in our sample by canton and size<sup>5</sup>. We distinguish very small firms with FTE between 2 and 9, small firms with FTE between 10 and 49, and medium firms with FTE between 50 and 249. Our sample consists of 66 very small firms, 38 small firms, and 45 medium firms. Hence, despite the small sample size, the spread by firm size is satisfactory. As for the geographical distribution, the sample consists of 10 firms in Fribourg, 54 in Geneva, 50 in Jura, 5 in Neuchâtel, and 22 in the canton of Vaud. Concerning the SME age cycle, 122 SMEs were created before 2010 while only 11 were created after 2011. We deliberately excluded SMEs created after 2019 from our sample in order to restrict the sample to SMEs existing before the onset of COVID-19. When it comes to exports, 101 SMEs out of 149 have no exports, 17 export only in Europe, and 31 export in/or outside of Europe. Finally, we present the distribution by the canton of the number of firms having responded “yes” when asked if they were considered hardship

cases. 22 SMEs in total were considered hardship cases, and 12 of them were in the canton of Geneva. It is worth noting that 15 SMEs responded that they do not know if they were considered hardship cases according to the criteria defined by authorities<sup>6</sup>. This means that about 10% of respondents were misinformed about existing authority support schemes.

**Table 2.** SME distribution by size, age, and exports in each canton.

	Canton					Total
	Fribourg	Geneva	Jura	Neuchâtel	Vaud	
	<b>Size (FTE)</b>					
2–9	2	31	18	3	12	66
10–49	1	13	15	0	9	38
50–249	7	10	25	2	1	45
<b>Total</b>	<b>10</b>	<b>54</b>	<b>58</b>	<b>5</b>	<b>22</b>	<b>149</b>
	<b>Age</b>					
Before 1980	5	18	29	4	9	65
1980–2010	4	25	20	0	8	57
2010–2016	0	5	8	0	3	16
2017–2019	1	6	1	1	2	11
<b>Total</b>	<b>10</b>	<b>54</b>	<b>58</b>	<b>5</b>	<b>22</b>	<b>149</b>
	<b>Exports</b>					
No exports	6	40	32	4	19	101
Europe	0	7	9	0	1	17
Europe and/or world	4	7	17	1	2	31
<b>Total</b>	<b>10</b>	<b>54</b>	<b>58</b>	<b>5</b>	<b>22</b>	<b>149</b>
	<b>Hardship</b>					
No	9	36	49	2	16	112
Yes	0	12	5	1	4	22
I do not know	1	6	4	2	2	15
<b>Total</b>	<b>10</b>	<b>54</b>	<b>58</b>	<b>5</b>	<b>22</b>	<b>149</b>

### 3.2. Variable Description

As mentioned previously, all variables in this study were constructed based on self-reported data from a survey we administered to SMEs. Appendix A provides a detailed description of the variables used in this paper as well as the construction of indices.

Table 3 displays the descriptive statistics of variables employed in this study.

**Table 3.** Sample main descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
activity cease	149	0.57	0.497	0	1
remotework_perc	149	30.423	32.888	0	100
turnover20VS19	149	−13.738	31.479	−90	100
profitability index	149	3.886	1.148	1	5
exports d	149	0.322	0.469	0	1
size	149	1.859	0.854	1	3
GE	149	0.362	0.482	0	1
VD	149	0.148	0.356	0	1
NE	149	0.034	0.181	0	1
JU	149	0.389	0.489	0	1
FR	149	0.067	0.251	0	1
age index	149	1.819	0.901	1	4
bus_restruct	143	1.951	0.664	1	3
sector1 d	146	0.014	0.117	0	1
sector2 d	146	0.384	0.488	0	1
sector3 d	146	0.582	0.495	0	1

The main dependent variable used is *turnover20VS19* which is a continuous variable for revenue variation in percentage during the year 2020 compared to the year 2019. This variable was bound by construction between  $-100\%$  and  $+100\%$ , whereby any increase in revenue by more than  $100\%$  corresponded to a  $100\%$  increase. This issue was not problematic since only one SME responded having an increase of  $100\%$  in revenue. Hence, the variable can be considered unbounded and treated as such. In the scope of this paper, we use revenue variation as a main indicator of firm performance.

The main independent variables were selected based on previous literature on SME performance. In addition, some independent variables employed are specific to the COVID-19 sanitary crisis period, such as remote work, which was an important aspect of employee dynamics during the sanitary crisis (Heidt et al. 2022). To analyze the importance of remote work in determining firm performance, we asked SMEs about the percentage of their total activity that was completed remotely. We expect firms who had executed more work remotely to have suffered less in terms of revenue loss. On average,  $30\%$  of SMEs' work was performed remotely. A closer look shows that only  $23\%$  of total SMEs were able to perform more than  $50\%$  of their work remotely and that the median is at  $75\%$ . To quantify the direct impact of closures during the pandemic on revenue loss, SMEs were asked to report whether they had completely or partially ceased their activities since the start of the pandemic. The variable *activity\_cease* codes answers for this variable. We found that 66 SMEs ( $43\%$ ) answered "no" to this question, hence almost half of the sample firms had to cease their activity due to the pandemic. To measure SME adaptation to the crisis, firms were asked whether they restructured their business to adapt to the different consequences and restrictions induced by the pandemic. Answer options ranged from "1" for no business restructuring, "2" for light business restructuring, and "3" for important business restructuring. We dubbed this index *bus\_restruct*, with a higher value indicating more important restructuring.

Table 4 shows the average values for *turnover20VS19* by canton and economic sector. As expected, the highest revenue loss is observed in the arts, entertainment, and recreation sector with an average loss of around  $80\%$  across cantons. On the contrary, the financial services and insurance sector seem to have benefited from the sanitary crisis, recording a year over year increase of turnover of  $1.7\%$  in 2020. This can be explained by the rise in advisory solicitation of accounting firms, especially in terms of partial unemployment assistance to firms, COVID-19 loans, and other pandemic related financial and insurance services. It is also worth noting that the manufacturing industry suffered high losses, with an average revenue loss of  $23.4\%$ . Across cantons, revenue variation 2020 versus 2019 was negative, with the highest revenue loss being in the canton of Vaud ( $16.5\%$ ) followed by the canton of Geneva ( $14\%$ ).

### 3.3. Model and Methodology

To estimate our data, we adopt the following econometric model (1):

$$\begin{aligned}
 \text{turnover20VS19} &= \alpha_0 + \alpha_1 \text{age}_{index} + \alpha_2 \text{size} + \alpha_3 \text{exports}_d \\
 &+ \alpha_4 \text{remotework}_{perc} + \alpha_5 \text{sector3}_d \\
 &+ \sum_{j=1}^5 k_j \text{CANTONDUM}_j + \alpha_6 \text{activity}_{cease} + \alpha_7 \text{bus}_{restruct} \\
 &+ \mu_i
 \end{aligned} \tag{1}$$

where: *turnover20VS19* is the variation of revenue of the year 2020 versus the year 2019 in percentage<sup>7</sup>; *age\_index* is a variable coding for the age of the SME; *size* is a variable for the size of the firm in terms of full-time equivalent employees; *exports\_d* is a dummy variable for exports; *remotework\_perc* is a variable for the proportion of work that was performed remotely; *sector3\_d* is a dummy variable coding for the tertiary sector; *CANTONDUM* is a vector containing dummy variables coding for the five cantons; *activity\_cease* is a dummy variable for the cease of operations; and *bus\_restruct* is an index constructed to measure business restructuring.

**Table 4.** Average values for turnover 2020 % by canton and economic sector.

Average of turnover20VS19						
NOGA Sector	Fribourg	Genève	Jura	Neuchâtel	Vaud	Total
A—Agriculture, forestry and fishing		−38				−38
Other		−28.375	−16		−20.333	−23.466
C—Manufacturing industry	−0.25	−9	−13.928	−7	−21.25	−12.947
D—Production/distribution of electricity, gas			0			0
F—Construction	−10	−8.2	−14.333		0	−9
G—Trade; repair of motor vehicles and motorcycles		−30	2.5	−17.5	2	−8
H—Transport and storage	−15	−29.333	0		−25	−21.333
I—Accommodation and food services		−18.333	−59			−28.5
J—Information and communication	5	1	0			1.111
K—Financial and insurance activities	−2	14.333	−15	−20		1.727
L—Real estate activities		0			−5	−1.666
M—Legal and accounting activities	−25	−21.25	0		0	−12.222
N—Administrative and support service activities		−44.5				−44.5
P—Education					−18.333	−18.333
Q—Human health and social work activities			−20			−20
R—Arts, entertainment and recreation		−79	−70		−90	−79.666
S—Other service activities	−60	−11	−10	0	−9.2	−12.15
<b>Total</b>	<b>−10.8</b>	<b>−14.222</b>	<b>−12.862</b>	<b>−12.4</b>	<b>−16.5</b>	<b>−13.738</b>

The data being only cross-sectional and having a continuous dependent variable, we estimate our model using Ordinary Least Square (OLS). We present the correlation matrix of independent variables in Table 5. No major correlation issues exist between variables.<sup>8</sup>

**Table 5.** Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) age_index	1.000										
(2) size	−0.437	1.000									
(3) exports_d	−0.101	0.249	1.000								
(4) remotework_perc	0.251	−0.206	−0.005	1.000							
(5) GE	0.137	−0.220	−0.101	0.136	1.000						
(6) VD	0.042	−0.176	−0.165	0.069	−0.314	1.000					
(7) NE	−0.045	−0.013	−0.049	0.003	−0.140	−0.078	1.000				
(8) FR	−0.035	0.202	0.045	0.046	−0.202	−0.112	−0.050	1.000			
(9) sector3_d	0.304	−0.384	−0.367	0.302	0.253	0.085	0.083	−0.045	1.000		
(10) bus_restruct	0.149	−0.048	0.074	0.299	0.188	−0.089	0.014	0.020	0.219	1.000	
(11) activity_cease	0.006	0.016	0.192	−0.151	0.118	−0.059	0.011	−0.201	−0.037	0.193	1.000

## 4. Results and Discussion

### 4.1. Main Model Results

The main model estimation results are displayed in Table 6.



**Table 6.** Main model results.

turnover20VS19	Coef.	St.Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
age_index	0.294	3.192	0.09	0.927	−6.022	6.609	
size	−0.973	3.482	−0.28	0.78	−7.863	5.917	
exports_d	−1.787	5.866	−0.30	0.761	−13.394	9.82	
remotework_perc	0.156	0.084	1.86	0.066	−0.01	0.322	*
GE	2.392	6.225	0.38	0.701	−9.926	14.709	
VD	−3.653	7.968	−0.46	0.647	−19.419	12.113	
NE	5.502	13.813	0.40	0.691	−21.828	32.833	
FR	−2.163	10.363	−0.21	0.5	−22.668	18.341	
sector3_d	−9.147	6.038	−1.51	0.132	−21.094	2.8	
bus_restruct	−9.234	4.112	−2.25	0.026	−17.37	−1.097	**
activity_cease	−16.877	5.391	−3.13	0.002	−27.545	−6.209	***
Constant	14.812	13.142	1.13	0.262	−11.191	40.815	
Mean dependent var		−14.929		SD dependent var		30.496	
R-squared		0.171		Number of obs		140	
F-test		2.394		Prob > F		0.010	
Akaike crit. (AIC)		1351.029		Bayesian crit. (BIC)		1386.329	

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

All firm characteristic variables are not significant in explaining profitability. The impact of the crisis on revenue did not differ according to SME characteristics, size, age, and economic sectors. Likewise, the dummy variable coding for the tertiary sector is positive but not significant. The services sector did not seem to have significantly suffered more than the manufacturing sector. Geographical presence is not significant either; all canton dummy variables are not significant in explaining revenue variation.

As for the variable business restructuring, we find that it is negatively significant at the 5% confidence level. This implies that firms that had to restructure their business models suffered more in terms of revenue during the pandemic compared to firms who decided not to restructure or were not capable of undergoing any restructuring.

As expected, the variable that codes for an activity cease due to pandemic restrictions is negatively significant at the 1% confidence level. Performing a student test to compare SMEs that ceased their activity (group 1) to those that did not (group 0) in terms of turnover can be more intuitive in terms of quantification. We display the results in Table 7.

**Table 7.** Mean test on revenue by activity cease.

Two-Sample <i>t</i> Test with Equal Variances						
Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	66	−1.651515	2.57027	20.88098	−6.7847	3.481669
1	87	−23.48276	3.804669	35.48759	−31.04619	−15.91933
combined	153	−14.06536	2.577767	31.88521	−19.15824	−8.972482
diff		21.83124	4.910495		12.12909	31.53339
diff = mean(0) − mean(1)					t =	4.4458
H0: diff = 0					Degrees of freedom =	151
Ha: diff < 0				Ha: diff ≠ 0	Ha: diff > 0	
Pr(T < t) = 1.0000				Pr( T  >  t ) = 0.0000	Pr(T > t) = 0.0000	

Table 7 shows that 66 SMEs had declared to have partially or completely ceased their activity since the onset of the pandemic, while 87 declared not to have ceased their activity. The *t*-test results show that the mean difference in revenue of 21.83% between the two groups of SMEs is statistically significant at the 1% confidence level. In other words, SMEs that ceased their operations for a certain period of time suffered from a revenue loss by about 22 percentage points larger than those that did not cease their activity in 2020. Hence,

from a general perspective, pandemic related closure restrictions induced by themselves a loss of about a quarter of revenues in 2020 among SMEs.

Concerning remote work, we find a positive significant effect on revenues. To portray a closer look at the importance of remote work in shielding SMEs from important losses, we plot the marginal effects of remote work on revenue variation for various levels of remote work (Appendix B). The upward-sloping line of the linear predictions curve confirms that remote work had a positive impact on revenue at different levels. For example, SMEs who were able to conduct only 10% of their work remotely were expected to suffer around a 17% loss in revenue, while SMEs capable of conducting 90% of their work on a remote basis suffered on average an 8% revenue loss. Hence, in sectors where remote work was possible, such strategy has significantly contributed to reduce revenue loss during this pandemic since remote work has allowed SMEs to pursue activities despite restrictions. When remote work was not possible, business restructuring might have been even more essential to implement, such as offering contact-less activities like delivery in restaurants or access to contactless rooms in hotels.

Understanding the impacts of remote work and the best practices for remote work management can help SMEs to improve productivity, employee satisfaction, and employee retention in the long term. Our results suggest that remote work should be gradually introduced in sectors of activity where it is possible to implement. When SMEs become readily equipped to work remotely as needed, a better resiliency to adverse and unforeseen circumstances, such as pandemics, might be achieved.

#### 4.2. Further Investigations and Robustness Checks

To further explore our data, we substitute the dependent variable, turnover variation, with a self-reported variable we named the *profitability index*. We construct this index by coding the answers to the question, “What was the impact of the COVID-19 crisis on your firm’s profitability?” Answers ranged from 1 for “high positive impact on profitability” to 5 for “high negative impact on profitability”. Hence, the higher this index, the more the firm suffered in terms of profitability. Next, we run our main regression substituting the variable *turnover20VS19* by *profitability\_index* as follows (2):

$$\begin{aligned}
 \text{profitability}_{index} &= \alpha_0 + \alpha_1 \text{age}_{index} + \alpha_2 \text{size} + \alpha_3 \text{exports}_d + \alpha_4 \text{remotework}_{perc} \\
 &+ \alpha_5 \text{sector3}_d + \sum_{j=1}^5 k_j \text{CANTONDUM}_j + \alpha_6 \text{activity}_{cease} \\
 &+ \alpha_7 \text{bus}_{restruct} + \mu_i
 \end{aligned} \tag{2}$$

Since *profitability\_index* is an ordinal variable, we estimate our model using ordinal logistic modeling. Estimation results are displayed in Table 8.

The result of this regression shows similar findings to the main regression using revenue variation as the dependent variable. Business restructuring shows a significant positive effect at the 5% confidence level. Higher restructuring appears to significantly associate with lower profitability. The sign on the *activity\_cease* variable is also positive and significant at the 1% confidence level. All other firm-level characteristic variables also remain non-significant.

To quantify the impact of the activity cease on profitability and facilitate coefficient interpretation, we present the odds ratios of the regression in Table 9 below.

The coefficient on the *activity\_cease* variable confirms that SMEs that had to shut down their activities partially or completely due to sanitary restrictions had a likelihood of revenue loss seven times higher than businesses that did not shut down their activities. SMEs that had restructured their business were likely to have suffered two times more than those that did not opt for restructuring.

**Table 8.** Ordinal logit model results with profitability index.

Profitability_Index	Coef.	St.Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
age_index	0.016	0.212	0.07	0.941	−0.401	0.432	
Size	−0.267	0.235	−1.14	0.255	−0.728	0.193	
exports_d	0.163	0.391	0.42	0.676	−0.604	0.93	
remotework_perc	−0.002	0.006	−0.35	0.724	−0.013	0.009	
GE	0.058	0.421	0.14	0.891	−0.768	0.884	
VD	0.178	0.543	0.33	0.743	−0.886	1.242	
NE	1.68	1.235	1.36	0.174	−0.741	4.1	
FR	0.094	0.674	0.14	0.89	−1.227	1.414	
sector3_d	0.27	0.401	0.67	0.501	−0.516	1.057	
bus_restruct	0.668	0.288	2.32	0.02	0.105	1.232	**
activity_cease	1.946	0.381	5.10	0	1.199	2.694	***
Mean dependent var		3.864		SD dependent var		1.170	
Pseudo r-squared		0.127		Number of obs		140	
Chi-square		49.101		Prob > chi2		0.000	
Akaike crit. (AIC)		368.935		Bayesian crit. (BIC)		413.060	

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 9.** Ordinary logit model results with profitability index—Odds ratios.

Profitability_Index	Coef.	St.Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
age_index	1.016	0.216	0.07	0.941	0.67	1.54	
size	0.765	0.18	−1.14	0.255	0.483	1.213	
exports_d	1.177	0.461	0.42	0.676	0.547	2.535	
remotework_perc	0.998	0.006	−0.35	0.724	0.987	1.009	
GE	1.06	0.447	0.14	0.891	0.464	2.42	
VD	1.195	0.649	0.33	0.743	0.412	3.464	
NE	5.363	6.624	1.36	0.174	0.477	60.361	
FR	1.098	0.74	0.14	0.89	0.293	4.112	
sector3_d	1.31	0.526	0.67	0.501	0.597	2.878	
bus_restruct	1.951	0.561	2.32	0.02	1.111	3.428	**
activity_cease	7.001	2.671	5.10	0	3.315	14.786	***
Mean dependent var		3.864		SD dependent var		1.170	
Pseudo r-squared		0.127		Number of obs		140	
Chi-square		49.101		Prob > chi2		0.000	
Akaike crit. (AIC)		368.935		Bayesian crit. (BIC)		413.060	

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Second, we add to our main model an interaction term between business restructuring and remote work dummy ( $bus_{restruct} * remote\_work\_d$ ).  $remote\_work\_d$  is a dummy variable we construct based on the  $remote\_work\_perc$  variable in order to simplify the interpretation of the interaction variable and render it with one continuous and one dummy variable, instead of two continuous variables. It takes the values of 1 if more than 75% of the work can be done remotely and zero if it cannot. The split is chosen according to the median of the sample. Our model can thus be written as follows (3):

$$\begin{aligned}
 turnover_{20VS19} &= \alpha_0 + \alpha_1 age_{index} + \alpha_2 size + \alpha_3 exports\_d + \alpha_4 remotework\_d \\
 &+ \alpha_5 sector3_d + \sum_{j=1}^5 k_j CANTONDUM_j + \alpha_6 activity_{cease} \\
 &+ \alpha_7 bus_{restruct} + \alpha_6 bus_{rest} * remote\_work\_d + \mu_i
 \end{aligned} \tag{3}$$

We estimate model (3) and present the results in Table 10 below.

**Table 10.** Regression results—interacting business restructuring and remote work.

turnover20VS19	Coef.	St.Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
age_index	0.436	3.19	0.14	0.891	−5.875	6.748	
Size	−1.188	3.462	−0.34	0.732	−8.038	5.663	
exports_d	−2.485	5.767	−0.43	0.667	−13.897	8.927	
remotework_d	−1.048	10.471	−0.10	0.92	−21.768	19.672	
GE	3.531	6.117	0.58	0.565	−8.573	15.636	
VD	−4.03	7.846	−0.51	0.608	−19.555	11.495	
NE	8.598	13.882	0.62	0.537	−18.871	36.067	
FR	−2.681	10.209	−0.26	0.793	−22.882	17.52	
sector3_d	−10.441	5.965	−1.75	0.082	−22.244	1.361	*
bus_restruct	−13.397	4.583	−2.92	0.004	−22.466	−4.329	***
activity_cease	−15.943	5.323	−3.00	0.003	−26.477	−5.41	***
bus_restruct*remote_work	0.276	0.145	1.90	0.06	−0.011	0.563	*
Constant	20.834	13.258	1.57	0.119	−5.401	47.068	
Wald test	−13.121	4.51	−2.91	0.004	−22.05	−4.189	***
Mean dependent var		−14.929		SD dependent var		30.496	
R-squared		0.202		Number of obs		140	
F-test		2.673		Prob > F		0.003	
Akaike crit. (AIC)		1347.700		Bayesian crit. (BIC)		1385.941	

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Results in Table 10 show that the Wald test of joint significance is negative and significant at the 1% confidence level. Still, the positive significant sign on the interaction term between remote work and business restructuring confirms that the restructuring of operations can positively influence the performance of businesses with high remote work capacities.

Third, to assess which management strategy was significant in explaining revenue loss, we asked firms to provide the following information: “At the onset pandemic (March 2020), indicate the importance of the following crisis management strategies you implemented.” Respondents were able to attribute a score to each strategy from 1 for “no importance” to 5 for “very important.” Table 11 presents details of the different management strategies and provides the main descriptive statistics.

**Table 11.** Management strategies.

Strategy	Strategy Definition	Mean	St.Dev
bus_startegy_employees	Protection of Employees	4.46	1.04
bus_startegy_activity	Continuity of operations	4.57	0.8
bus_startegy_costs	Cost management	3.13	1.44
bus_startegy_satisfaction	Client satisfaction	4.46	0.96
bus_startegy_innov	Innovation in services/products	3.07	1.48

We add the above ordinal variables to our main regression model as follows<sup>9</sup>:

$$\begin{aligned}
 turnover20VS19 &= \alpha_0 + \alpha_1 age_{index} + \alpha_2 size + \alpha_3 exports_d \\
 &+ \alpha_4 remotework_d + \alpha_5 sector3_d \\
 &+ \sum_{j=1}^5 k_j CANTONDUM_j + \alpha_6 activity_{cease} \\
 &+ \alpha_7 bus_{restruct} + \sum_{s=1}^5 \alpha_s BUSMGMTSTRAT_s + \mu_i
 \end{aligned} \tag{4}$$

where *BUSMGMTSTRAT* is a vector containing different business management strategies. Table 12 displays the results of estimating model (4).

**Table 12.** Regression results with business management strategies.

turnover20VS19	Coef.	St.Err.	t-Value	p-Value	[95% Conf	Interval]	Sig
age_index	2.816	3.608	0.78	0.437	−4.341	9.974	
size	1.82	3.699	0.49	0.624	−5.52	9.16	
exports_d	−0.729	5.881	−0.12	0.902	−12.397	10.94	
remotework_d	4.396	7.068	0.62	0.535	−9.627	18.418	
GE	5.327	6.293	0.85	0.399	−7.158	17.813	
VD	−6.565	8.464	−0.78	0.44	−23.357	10.227	
NE	8.016	16.709	0.48	0.632	−25.134	41.166	
FR	−1.399	9.99	−0.14	0.889	−21.219	18.422	
sector3_d	−0.819	6.333	−0.13	0.897	−13.384	11.746	
bus_restruct	−16.696	4.889	−3.42	0.001	−26.395	−6.997	***
activity_cese	−12.828	5.801	−2.21	0.029	−24.337	−1.32	**
bus_startegy_employees	6.313	2.955	2.14	0.035	0.449	12.176	**
bus_startegy_activity	−5.724	3.707	−1.54	0.126	−13.078	1.631	
bus_startegy_costs	−1.785	2.049	−0.87	0.386	−5.85	2.279	
bus_startegy_satisfac	5.667	3.081	1.84	0.069	−0.446	11.78	*
bus_startegy_innov	2.365	1.989	1.19	0.237	−1.58	6.31	
Constant	−14.362	23.05	−0.62	0.535	−60.092	31.368	
Mean dependent var		−16.282		SD dependent var		29.137	
R-squared		0.281		Number of obs		117	
F-test		2.447		Prob > F		0.004	
Akaike crit. (AIC)		1115.421		Bayesian crit. (BIC)		1162.378	

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Our results show that out of the five different strategies, only employee protection and client satisfaction are significantly associated with performance. Both variables show a positive significant sign, meaning that SMEs prioritizing employee protection and client satisfaction endured significantly lower losses. All other variables remain of similar significance compared to the basic regression except for *remotework\_d*, which loses significance when adding business strategies while the significance of *bus\_restruct* (restructuring index) increases. There is no collinearity between the five strategy variables, *remotework\_d*, and “*bus\_restruct*” variables. Therefore, we might conclude that the fact that some firms had to restructure because of the pandemic constituted a better determinant of the decrease in the performance of firms between 2019 and 2020 as compared to the difficulty to work remotely when we identify and control the strategy effectively implemented by firms. Essentially, our results show that SMEs that set strategies aimed at protecting their employees were more successful during the pandemic.

Finally, we use simultaneous equations to ensure the reliability of our findings. Specifically, to deal with the existence of endogeneity due to potential inverse causality between turnover variation and business restructuring, we use the three-stage least square estimator (Zellner and Theil 1962) to simultaneously regress turnover variation on business restructuring and control variables and business restructuring on turnover variation and control variables. Table 13 shows the results of our findings using the 2SLS estimator. The results confirm the robustness of our findings and provide additional support to our main model.

**Table 13.** Regression results with simultaneous equations.

Three-stage least-squares							
Equation	Obs	Params	RMSE	“R-squared”	chi2	P > chi2	
turnover20VS19	143	3	55.87838	−2.1074	4.82	0.1852	
bus_restruct	143	2	1.407493	−3.5212	1.53	0.4652	
		Coefficient	Std. err.	z	P > z	[95% conf.	interval]
turnover20VS19							
bus_restruct		−81.51756	37.6405	−2.17	0.030	−155.2916	−7.74353
Controls					Yes		
_cons		128.3336	67.20838	1.91	0.056	−3.392401	260.0596
bus_restruct							
turnover20VS19		0.0383004	0.0639983	0.60	0.550	−0.0871339	0.1637348
Controls					Yes		
_cons		1.881135	0.2222626	8.46	0.000	1.445509	2.316762

### 5. Conclusions

This paper focused on analyzing the impact of the COVID-19 pandemic on Swiss small and medium businesses two years after the onset of the crisis. Using a sample of 149 firms operating in the French-speaking area of Switzerland, our results show that remote work is significantly associated with lower revenue loss. A closer look reveals that business restructuring was beneficial only when associated with a higher share of remote work. Additionally, we quantify the impact of the closure on SMEs and find that SMEs having reported having closed partially or completely due to sanitary restrictions were seven times more impacted in terms of turnover loss compared to SMEs who did not have to cease their activity during the COVID-19 crisis. Finally, we show that SMEs prioritizing employee protection strategies during the pandemic performed better compared to firms prioritizing other strategies.

This paper’s findings will find resonance both at the academic and practical levels. Concretely, we expect our results to provide important policy implications to public authorities, as well as business managers. Public authorities will be able to weigh the benefits and effectiveness of sanitary measures and closing restrictions with the pitfalls of financial losses that small and medium businesses have endured. This is expected to contribute to better management by authorities of future pandemics. As for business managers, they might be able to orient their business in a way that minimizes the activity cease despite restrictions and to operate more remotely when possible while prioritizing employee protection strategies in order to decrease the impact of future crises on businesses.

The principal limitation of this study is that it is based on a sample that is limited to the French-speaking region of Switzerland. Considerable future work will be needed to extend the scope of this research to the national and international level, thus developing a broader context for analysis and generalization of the results. This will also allow intra-sector analysis as well as a comparison between different sectors of activity, thus giving more insights into the exact mechanisms that render some strategies more efficient than others during times of uncertainty. Another limitation of our work is the time frame since our study was administered in the last quarter of 2021 which makes it harder to infer long-run trends. The remote work trend, for example, has been highly accelerated by the COVID-19 pandemic and it is important to understand the long-term effects of this shift on SMEs.

Overall, our work constitutes a first approach toward a more comprehensive understanding of the impact of pandemics on smaller businesses in Switzerland and may provide a prelude for further investigations in this field. Future research might be oriented to focus on studying at the micro level the beneficial effect of remote work in times of crisis by using case study analysis, for example. Studies on the long-run impact of remote work on SME productivity could provide valuable insights for SMEs as they adapt to this “new normal.” Additionally, investigations focusing on the importance of establishing contingent crisis

plans in small and medium businesses also seem to be of high importance on research agendas. Finally, analyzing how SMEs adapted to e-commerce and new technologies after the pandemic and the implications of the acceleration of this digital transformation for the future of SMEs is a promising area of research.

**Author Contributions:** Conceptualization, C.N., N.B. and D.M.; Formal analysis, C.N. All authors have read and agreed to the published version of the manuscript.

**Funding:** The authors acknowledge the financial support of the HES-SO, RCSO E&M 103540 obtained by Prof. Nathalie Brender.

**Data Availability Statement:** The dataset used in this study can be made available from the corresponding author upon reasonable request.

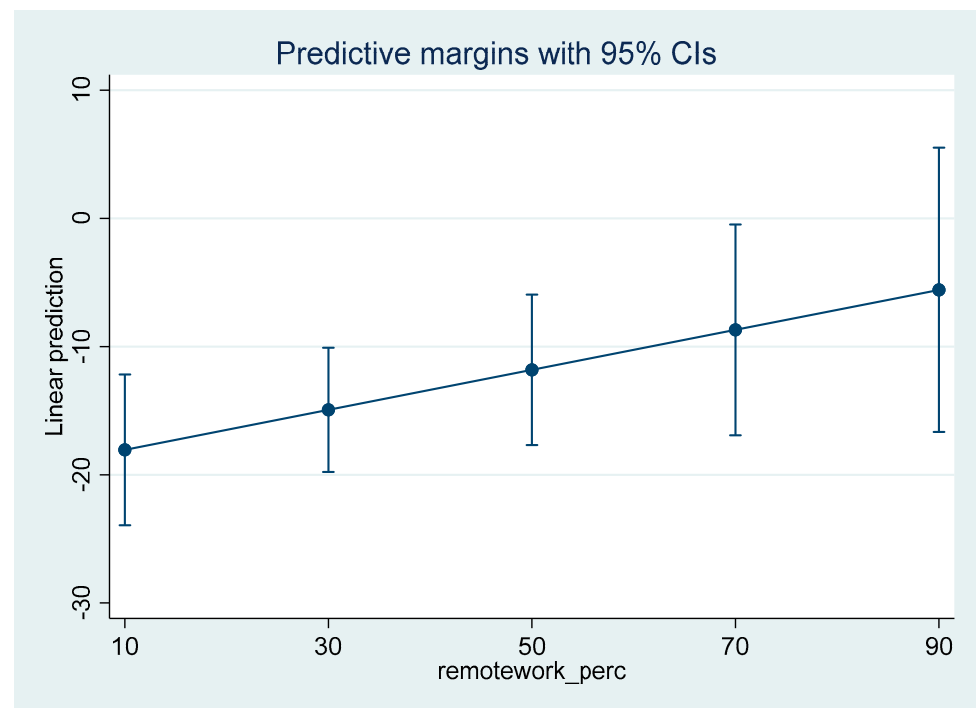
**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

**Table A1.** Full Variable Description.

Variable Code	Variable Description	Variable Type	Corresponding Survey Question	Details of Calculation
turnover20VS19	Turnover variation %	continuous	How has the COVID-19 crisis affected your 2020 revenue compared to your 2019 revenue (% change)?	−100% to +100%
age_index	Age	ordinal	During what period was your company's initial registration date?	1 for before 1980 2 for 1980–2010 3 for 2010–2016 4 for 2017–2019
size	Size by full time equivalent (FTE)	ordinal	What is the size of your company in terms of full-time equivalent (FTE) jobs?	1 for 2–9 2 for 10–49 3 for 50–249
exports_d	Exports	dummy	Does your company export any of its production?	1 for “yes” 0 for “no”
remotework_perc	Percentage of remote	continuous	What percentage (%) of your activity was done remotely (in FTE)?	0 to 100%
GE, VD, NE, JU, FR	Canton	dummy	In which canton is your company's head office located?	Dummy equals 1 or zero otherwise for respectively: Geneva, Vaud, Neuchatel, Jura, and Fribourg
Sector3_d	Tertiary sector	dummy	To which economic sector does your company belong?	1 for an answer belonging to the tertiary sector and zero otherwise
bus_restruct	Business restructuring index	Ordinal	To what extent has the COVID-19 crisis led to a restructuring of work in your company?	1 for no business restructuring 2 for light business restructuring 3 for important business restructuring
activity_cease	Activity cease	Dummy	Have you been forced, as a result of the sanitary situation, to cease completely or partially the activity of your company?	1 for “yes” 0 for “no”

## Appendix B



**Figure A1.** Marginal effects of remote work on turnover variation for different levels of remote work.

### Notes

- <sup>1</sup> Refer to Miklian and Hoelscher 2022 for a thorough review of the literature on SMEs and exogenous shocks including the COVID-19 crisis.
- <sup>2</sup> In Switzerland, small and medium enterprises include firms having less than 250 employees in full time equivalent. <https://www.bfs.admin.ch/bfs/fr/home/statistiques/industrie-services/entreprises-emplois/structure-economie-entreprises/pme.html> (accessed on 3 February 2023).
- <sup>3</sup> General Classification of Economic Activities (NOGA) Available at: <https://www.bfs.admin.ch/bfs/en/home/statistics/industry-services/nomenclatures/noga.html> (accessed on 3 February 2023).
- <sup>4</sup> Figures on SMEs, (FSO 2020).
- <sup>5</sup> We deliberately exclude sole proprietorship firms as different legal aspects apply to this type of firms.
- <sup>6</sup> COVID-19 Hardship cases regulations in Switzerland, Available at: <https://www.fedlex.admin.ch/eli/cc/2020/875/fr> (accessed on 3 February 2023).
- <sup>7</sup> The survey was conducted during the last quarter of 2021 to ensure all SMEs had their accounts of year 2020 finalized in an attempt to collect the most accurate self-reported data possible on turnover loss.
- <sup>8</sup> Correlation coefficients between age\_index and size do not impact our results: We remove age and size variables from the regression one at a time in order to make sure that the correlation between these two variables doesn't influence our results; results remain the same.
- <sup>9</sup> No major correlation between business strategies which allows simultaneous inclusion in the regression model.

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