



Corporate Performance of Family-controlled Firms. Evidence from Covid-19 Pandemic times

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Abstract

Title: Corporate Performance of Family-controlled Firms. Evidence from Covid-19 Pandemic times.

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The present report was developed to contribute to existing research on the potential impact of family presence in the firm management team in the company's profitability, measured using ROA (EBITDA based). Additionally, and more specifically, this study analysis if family presence exacerbated or attenuated the expected effects associated with COVID on firm profitability.

The analysis was deployed by using data from S&P 500 firms collected over the period of 2016 to 2021, in order to have data referring to pre-Covid era (2016 to 2019) and during Covid time (2020-2021), where the pandemic has exerted most of its pressure on firms' performance. Firms were then classified in family or non-family firms according to the presence of at least one family member on the board of directors, according to the 2021 family firm index developed by EY and the university of saint Gallen¹. Finally, the data was used to conduct univariate and multivariate analysis that included both simple regression models and difference in difference models that contributed to capture the potential effect of family presence in firm profitability. In sum, the achieved results in univariate analysis appear to denote that family firms, on average, depict lower ROA's than their non-family counterparts. Similarly, on the other hand, the results achieved with the regression models denote that family firms tend to decrease firm profitability. Furthermore, when considering the covid-19 pandemic event, results depict a similar negative contribution of family presence on firm performance.

Keywords: Family firms; ROA; COVID-19; Pandemic; Difference in Difference Regression.

¹ <https://familybusinessindex.com/>

Sumário

Título: Desempenho corporativo de empresas controladas por famílias. Evidências da Pandemia Covid-19.

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O Presente estudo foi desenvolvido por forma a contribuir para a literatura existente relacionada com o impacto potencial que a presença de familiares na equipa de gestão pode ter na performance da empresa, medida através do ROA. Mais especificamente, este estudo procura analisar se os efeitos esperados da pandemia na performance das empresas são exacerbados ou atenuados pela presença de família no board da empresa.

A análise desenvolvida utiliza dados de empresas do S&P 500, categorizadas em family e non-family com base no *2021 family firm index* produzido pela EY² e pela Universidade de Saint Gallen. Os dados referem-se ao período de 2016 a 2021, contend, desse modo, informação das empresas no período pre-COVID (2016-2019) e no período em que a pandemia terá exercido maior pressão sobre as empresas (2020-2021)

Por fim, para conduzir a análise pretendida, apresentam-se uma análise univariada e multivariada que inclui modelos de regressão simples e regressões *difference in difference* que contribuem para capturar o potencial efeito da presença de membros da família no *board* na profitabilidade da empresa.

Em resumo, os resultados da análise univariada apontam para que, em média, *family firms* denotem um ROA inferior ao verificado nas *non-family firms*. De forma semelhante, olhando para a análise multivariada, os resultados sugerem que a presença de membros da família no *board* tende a penalizar a profitabilidade. Adicionalmente, quando considerando a pandemia COVID-19, os resultados mostram, uma vez mais, que a presenças de membros da família contribuiu para exacerbar os efeitos negativos já associados à performance das empresas.

Keywords: Family firms; ROA; COVID-19; Pandemia; Regressão Difference in Difference.

² <https://familybusinessindex.com/>

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1. Introduction

1.1. Context

Existing literature has long been poring over the difference in firm performance when considering both family and non-family firms. In fact, many studies before tried to analyze whether family ownership had any impact on firm performance and value, and the extent to which family characteristics impacted corporate decision making and firm performance. Other studies, acknowledging specific issues and explanatory considerations of firm performance, have focused their approach on isolating one specific consideration, as was the case with Chrisman et al. (2004) who compared agency costs amongst family and non-family business. The extent to which such topic is approached and studied in literature highlights the relevance of the topic within the academic community. Additionally, when considering the existence of such firms across the business world, and more specifically, when acknowledging that a considerable number of firms are controlled by their founders or descendants of said founders further contributes to the relevance of understanding the practical implications of this family involvement in performance and value.

On the other hand, the recent circumstances surrounding Covid-19 outbreak have opened the way to understand how firms react and adapt upon being confronted with an exogenous shock with profound implications in a plethora of variables and dimensions of relevance for businesses, economies and people all around the world. It is a well-known fact that the outbreak has had different impacts across different industries and sectors, making it interesting to understand how such exogenous shock has impacted firms all around the globe. The time-window of data to be analyzed, however, is rather small, even when considering that the effects of the pandemic crisis have been brought about to linger, especially when acknowledging the potential effects, it had on shaping businesses going forward in order to face the pandemic consequences. Existing literature, even though scarce when compared to other topics, has already tried to encapsulate the effects and implications of the COVID-19 outbreak in firm performance: Hu & Zhang (2021) and Shen et al. (2020), amongst many others. The recent and contemporary nature of the outbreak, however, dictates that there are still few papers on the issue, thus paving the way for future studies to be developed and capitalize on already existing literature.

Given the importance of family firms, and the recent circumstances highlighted by the outbreak, the aim of this study is to deepen the knowledge base already developed in terms of family involvement and performance, while contributing to understand the impacts of Coronavirus in

firm performance, more specifically in order to understand whether there are significant differences in performance when considering both family and non-family businesses.

1.2. Research Questions and Structure

The focus of this research project is to analyze how differently family and non-family firms perform and whether there are significant differences in performance potentially driven by this distinction. Particularly, this study tries to grasp the effects of a specific external shock – in this case the Covid-19 Pandemic – in firm performance and which type of company, if any, has more pronounced positive or negative performance evolution between the two timeframes.

In order to address this problem, companies within the dataset have been classified as family and non-family using a dummy variable for the purpose. In addition, year-end financial data has also been retrieved, based on existing literature, in order to control for potential effects these variables might have when measuring the impact on ROA.

While the focus of this research project is highlighted above, the following research question will also be addressed in this study:

- Impact of Covid on family-owned companies comparing to non-family.

In what concerns the structure of this report, the next section will present relevant literature on the topics of family firm performance and how it compares to its non-family counterparts, as well as the effects of the Covid-19 pandemic in firm performance, particularly in what concerns family firms. In chapter 3, a brief overview of the data collected is laid-and an explanation is provided on some pre-processing steps undertaken to clean the data.

Continuing on building the analysis, chapter 4 focuses on the methodology employed, more specifically, on the mechanisms deployed to conduct the univariate and multivariate analysis. The created specifications will also be assessed on the robustness and a brief explanation on in how such models have been developed, will also be provided. Chapter 5 presents the main results obtained with the conducted study and answers the research questions proposed hereof. Finally, chapter 6 will conclude and sum up the report by covering the main conclusions of the study as well as assess specific limitations faced when building the report and potential future work to improve the analysis provided in this study.

2. Literature review:

2.1. Family firm performance

Family ownership of firms is still a relevant topic due to their prevalence around the world. Existing literature provides conflicting evidence on the role of family ownership in firm performance.

Anderson and Reeb (2003) developed a study to understand if family ownership and involvement impacts firm performance and value. Additionally, they wanted to capture if there exists any difference in performance between younger and older family firms. They used companies from the S&P 500 excluding banks and public utility companies because of the difficulty to calculate performance metrics and due to government regulations, that could potentially influence performance. Firm performance was analyzed through ROA and Tobin's q and the regression included several control variables, year and industry dummy variables to control for industry effects and a binary variable to identify family firms. The study concluded that profitability-based measures show that family firms perform better than non-family firms and that the level of performance is decreasing for greater levels of firm control by families. In 2007 Bennedsen et al. (2007) tried to isolate the causal effect of family CEOs on family performance and to understand the extent to which family characteristics impacted corporate decision making and firm performance. The analysis was conducted by comparing changes in performance of firms that named a family member as CEO and those that named an unrelated CEO. In order to address potential problems arising from endogeneity and omitted variables an instrumental variable (gender of the firstborn) was used to extract "good variation" on family CEO appointment, i.e., CEOs which are picked for reasons unrelated to performance and develop the regression on the remaining subset of data. The paper concluded that family characteristics have large effects on the decisions to appoint a family or an unrelated CEO. Additionally, the authors showed that family CEOs have large and negative causal effect on firm performance and that unrelated CEOs are of extreme relevance for firms. Finally, the authors concluded that addressing endogeneity and omitted variables is a relevant step in understanding the impacts of family in firm performance and outcomes. Previously Maury (2006) developed an analysis to test the impact of family ownership on firm performance. More specifically the aim was to understand how family firms perform in comparison to non-family firms and whether there were differences between active and passive family control, by analyzing Western European corporations. The regression analysis was complemented by

developing robustness checks that address endogeneity and multicollinearity issues. The paper showed that family control as the potential to increase performance in Western European firms and that active family ownership improves profitability whereas passive ownership does not affect the profitability of family firms. Finally results also indicate that family ownership lowers the agency problems between owners and managers. McConaughy et al. (2000) examined the efficiency and value of firms whose CEO is the founder or a descendant. In order to do this, the study conducted a univariate analysis to investigate descriptive statistics of the sample and performed difference in mean tests across multiple variables between family firms and non-family firms. This analysis was complemented by a multivariate analysis that included multiple regressions to find the relationship between firm value and firm specific characteristics, which included a dummy to identify family control, a performance metric and an investment opportunity variable. Results showed that family control has a positive impact on value and efficiency when compared to non-founding family-controlled firms and that descendant-controlled firms are more efficient than founder-controlled firms. Miller et al. (2007) studied the impact of family ownership in performance and fine-tuned the definition of family ownership. Tobin's q was used as measure of performance and different definitions of family ownership were used as independent variables together with industry and other controlled variables. The study concluded that large U.S. family companies did not outperform in their market valuations and that the outperformance of family businesses was associated with the employed definition of these same businesses. On the other hand, lone founder businesses outperformed in their market valuations in all conducted analyses. On a final note, when analyzing a random sample of a smaller publicly traded US firms it was found that family firms within the sample did not outperform other companies. Vialonga & Amit (2006) used proxy data on Fortune-500 companies from 1994 to 2000 in order to try and shed light on conflicting evidence from previous literature on the performance level and value of family versus non-family firms. The authors initially defined family firms as companies where the founder or a well-positioned individual comes from blood lineage or marriage, having then examined how results would change when additional conditions were imposed for a company to qualify as family firm, such as minimum control thresholds. With this analysis, the authors found that family ownership creates value only in the case where the founder serves as CEO or as a chairman with a hired CEO. On the other hand, as descendants become CEOs, firm value tends to be destroyed.

2.2. Family firms and the COVID-19 pandemic

The COVID-19 pandemic posed as an unprecedented and unparalleled shock that together with the subsequent economic and social lockdown contributed to a global stock market shock with notorious effects across economies and firms around the world.

Albuquerque et al. (2020) tried to study the causal link between environmental, social and governance (ESG) and financial performance of firms using the COVID-19 pandemic as exogenous shock, because the unexpected nature and spread speed of the health crisis would suggest limited ability to respond to unfolding events apart from pre-existing conditions. The paper used two types of regressions to estimate the effect of environmental and social (ES) policies on corporate financial performance. First, cross-section regression was used to study the behavior of abnormal returns, return volatility and operating performance by using the ES rating as an independent variable and controlling for industry and firms' effects. A second set of regressions considers diff-in-diff regression to study abnormal returns and return volatility by capturing the effect of ES policies in stock performance during COVID-19 and the additional effect created by the fiscal and monetary interventions undergone by the US president. For this, two major periods in 2020 were considered: February 24 (which is the first trading day after lockdown) to March 31 and from March 18 (the day in which president Trump signed the second coronavirus emergency aid package) to March 31. The study concluded that stock prices of firms with high ES scores perform much better than the prices of other firms. In addition, the authors have also shown that the stock market performance during the market collapse is especially strong for high ES stocks with high advertising. Finally, the volatility of stock returns was shown to be lower for high ES stocks. Afterwards, Ding et al. (2021) examined the relationship between pre 2020 corporate characteristics in five major dimensions and stock price reactions to the COVID-19 pandemic. The study was conducted using a regression where the dependent variable was the weekly stock return of a given firm and the independent variables included an array of interactions between COVID-19 weekly cases growth and variables related to financial conditions, international exposure through suppliers and consumers, CSR, governance and ownership. The study also analysis the relationship between national stock returns and country characteristics. The authors have withdrawn five major conclusions. First, firms with stronger pre 2020 financial conditions were demonstrated to experience better stock price reactions to COVID-19 than otherwise similar firms. Furthermore, the pandemic induced drop in stock prices tends to be larger when considering companies that are more exposed to the pandemic through their supply chains and customer locations. In

addition, firms with stronger CSR activities, prior to the pandemic, were found to experience superior stock price performance when affected by the health crisis, and companies with less entrenched executives were shown to perform better in response to COVID-19. Finally, the study concluded that ownership was strongly associated with stock price reactions to COVID-19. More specifically, family-controlled firms, large corporations and governments tend to experience smaller stock price declines in face of the pandemic. Ramelli & Wagner (2020) have conducted a study to analyze the cross-section of stock price reactions to COVID-19 in order to gain insights into firm value drivers by making use of an exogenous shock such as the health crisis. The authors used such setting to pinpoint the benefits of corporate strength and to analyze how exogenous shocks may propagate through financial challenges. Taking cumulative returns as a dependent variable, the authors studied the time pattern of how investors would price the international trade of firms and how debt and cash holdings were perceived by investors over three distinct periods in 2020: January 2 to January 17 (the first trading day after the beginning of the health crisis in China), January 20 to February 21 (World Health Organization first report on the outbreak) and February 24 to March 20 (the first trading day after Italian lockdown to control the outbreak). The study concluded that stock market participant anticipated the amplification of the pandemic economic effects through financial channels and concluded on the linkage between international trade and corporate value, while finding the importance of preventive cash holdings for firm value in emergency scenarios. Baker et al. (2020) used text-based methods to understand how the COVID-19 outbreak has affected the stock market as no previous health crisis had. In addition, they evaluated possible explanations for such an impact on the stock market. The authors gathered evidence that commercial activity restrictions and voluntary social distancing measures have been the main reasons for stock market reactions in the midst of the health crisis and that the earliest jumps were attributed to reactionary measures in face of the pandemic namely regarding actual and proposed monetary and fiscal actions. Bretscher et al. (2020) attempted to understand how the economic activity collapse linked to COVID-19 outbreak affected equity valuation in the cross-section of firms and firm-level outcomes. The paper performs a diff-in-diff estimation of firm value returns, and uses a regression with the log of daily returns as the dependent variable and a COVID-19 together with a post COVID-19 dummies to capture the difference in returns in the event window around the first case of COVID-19 in the county a given firm is headquartered. Firms located in regions without reported cases of the pandemic in the sample period considered (31 December 2019 to 20 March 2020) were also considered as part of the control group. Furthermore, firm, industry, county and day fixed effects were included in the analysis to control for unobserved

heterogeneity. The authors concluded that firms with headquarters in counties affected by COVID-19 experienced lower daily returns when compared to firms headquartered in counties unaffected by the health crisis. The negative relationship was stronger for counties where the spread of the virus was more intense. In addition, the study found that labor intensive industries, and companies with high idiosyncratic exposure to COVID risk experienced more negative returns. Amore et al. (2021) developed a study to analyze how companies react to external events by using the COVID-19 pandemic as a starting point for the analysis. The authors used data from Italian firms to draw conclusions on how family presence in corporate ownership would affect firm reaction to the aforementioned crisis. Amore et al. (2021) considered stock market performance over two time periods: from January 2020 to April 2020 and the full year of 2020 to encapsulate the fall contagion wave. The study conducts a cross-section analysis of cumulative returns with a set of independent variables of which a dummy was included to identify family and non-family firms in addition to a number of financial metrics. A second analysis was developed using diff-in-diff methodology on daily abnormal returns to exploit the longitudinal variation by considering three time windows in 2020: February 24 to April 30 (Spring outbreak), early May to October 26 (Summer period) and October 27 to year end 2020 (Fall wave). With this analysis, the authors, found that family firms performed better and experienced higher daily stock returns and operating profitability when compared to non-family firms. In addition, they also found that the outperformance of family firms over their counterparts is especially relevant in labor intensive industries and in the absence of minority shareholders of relevance. Kraus et al. (2020) performed a study to withdraw initial conclusions on how family firms approach crisis management by using the COVID-19 pandemic to study its effects. By conducting qualitative expert interviews, the authors were aiming at capturing managers' subjective experience in dealing with the health crisis, while trying to determine how family firms were affected and specific measures undertaken due to COVID-19. The study concluded that companies applied measures in three different vectors: innovation and digitalization whereby external shocks may trigger adaptation through digital tools; focusing on family firms, there typical long-term orientation emerges in a strong focus on liquidity safeguarding; strategic management and crisis management strategies that can be traced back to firms' sector and firm size mostly.

3. Dataset & Sample

The dataset comprises year-end financial information for 446 companies divided into family and non-family firms, over the period of 2016 to 2021, in order to have data referring to pre-Covid era (2016 to 2019) and during Covid time (2020-2021), where the pandemic has exerted most of its pressure on firms' performance. The data, which assumes the form of cross-sectional time-series data, was retrieved for listed Standard & Poor's 500 companies given that existing literature acknowledge the presence of family firms within the index. To divide companies into family and non-family firms, the 2021 family firm index developed by EY and the university of saint Gallen³was used based on the presence of at least one family member in the board of directors or a family CEO was present. When doing so, it was noted that a small number of companies within the Standard & Poor's 500 met the criteria to be classified as family firms, so the list of companies was complimented based on the companies present in the aforementioned list, as long as such companies were either European or US American. Financial institutions as well as public entities have been excluded from the analysis given the specific peculiarities of financial institutions and the governmental actions and regulations public entities may be subject to that may affect firm performance Anderson and Reeb (2003). Furthermore, companies for which data was missing were also deleted from the analysis in order to preserve the quality of the data.

Financial information was retrieved from Refinitiv Eikon (table 1) and stock price data was retrieved from Yahoo Finance. Data was processed and grouped using Excel, whereas the analysis of the data, univariate and multivariate, was done using STATA.

The table below (appendix 9) breaks down the number of firms within each industry based on the two-digit SIC code. Industries related to chemicals, such as pharmaceuticals, business services and utilities appear to be considerably more preponderant than the remaining industries in the dataset.

Table 1 | Variables definition as reported by database

Variable	Variable definition
Family firm binary	Identifier of whether a firm has family board members or not.
Covid binary	Equals one if year equals 2020 to 2021 and zero if year equals 2016 to 2019.

³ <https://familybusinessindex.com/>

Long term debt	Represents all interest bearing financial obligations, excluding amounts due within one year.
Net sales or revenues	Represents gross sales and other operating revenue less discounts, returns and allowances.
Capital expenditures	Represents the funds used to acquired fixed assets other than those associated with acquisitions.
Net debt	Represents total debt minus cash and short-term investments.
Capex/Sales	Capital expenditures divided by net sales or revenues.
ROA	EBITDA divided by total assets
Long term debt/Total assets	Long term debt divided by total assets
Net income available to common	Represents the net income the company uses to calculate its earnings per share. And excludes extraordinary items.
Net income/sales	Net income divided by net sales or revenues.
Stock price	End of year stock price.
Sales growth	Annual percentage change of net sales or revenues over two consecutive years.
Price growth	Annual percentage change of stock price over two consecutive years.

4. Methodology

In this section, the main considerations on methodology will be discussed and presented. As stated previously, the analysis will be divided into two major categories, presented below: univariate analysis and multivariate analysis.

4.1. Univariate analysis

The first step in the study will be to perform exploratory analysis both on how the different variables relate to each other and on whether or not there are highlightable and/or significant differences between family and non-family firms, as categorized in this project, across a plethora of company specific information.

Initially, a correlation matrix will allow to understand if there are major relationship across the selected variables in the study and whether or not this relationship is positive or negative, meaning, what would be the anticipated movement in one variable, should the variable it is being correlated with increase. More specifically, the focus will be on the relationship between

the family classifier and the remaining variables, with special consideration for ROA and on the relationship that is anticipated to exist between the covid-19 binary and the same company specific datapoints. Furthermore, the correlation matrix will serve a second purpose: to develop an initial understanding of potential multicollinearity issues that may affect the regression models to be deployed. In fact, even though such issue does not jeopardizes the true result of predictive power of the regression models, it may produce estimates of the regression coefficients that are not statistically significant thus potentially leading to erroneous conclusions.

Finally, difference in means tests will be deployed to develop an initial understanding of the difference in absolute values across the different company specific data between companies that have been classified as family-firms and companies which were attributed the non-family firm label. More specifically, the objective is to find initial evidence of significant, positive or negative, differences between variables that may indicate different levels of performance associated to such groups.

4.2. Multivariate analysis

Following the univariate analysis, which will mainly serve as a starting point to grasp specific conclusions on the database chosen for the analysis, the next step will entail developing linear regression models to understand potential relationships between the dependent variable of choice and a set of financial variables.

The dependent variable in this study is ROA based on EBITDA, which is a profitability ratio that indicates how profitable a company in relation to its asset base. More specifically, ROA measures how efficiently a company deploys its assets to generate profits. The independent variables, on the other hand will include a set of financial ratios and variables, which will be used as control variables, as well as two binary variables to assess the specific effects of family ownership and the covid-19 pandemic in firm performance. Noteworthy at this point is that, some of the financial variables in the dataset were log transformed to reduce the impact of differences related to the scale of the variables in the analysis.

In total, there are five models to be developed:

- (1) The first regresses ROA on the family firm binary. The idea is to understand the potential impact of family presence in firm management in determining profitability.
- (2) The second model regresses ROA on both the family binary and covid binary. The present regression model entails grasping the effects of covid times in profitability,

while trying to gather information on whether the effects of family presence has any different results than the ones achieved in the previous model. More specifically, the regression aims at understanding if family presence has the potential to attenuate the anticipated negative impacts of COVID-19 in firm performance, while contributing to existing literature on the matter of whether family ownership has the potential to increase firm performance.

- (3) A third model will regress the profitability ratio on the same set of binary variables, while controlling for firm specific consideration, by including some financial ratios and variables that encapsulate different realities of the firm (eg. liquidity, performance, capital structure).
- (4) Finally, in order to more accurately understand the impact of COVID-19 in firm performance and more specifically if there are any differences between family and non-family firms, two difference in difference model will be developed. One, more simplistic in nature, which considers only the control-group variable and a second one which will include the already mentioned firm specific variables.

The models will be analysed on their robustness as well as evaluated in terms of potential issues that may jeopardize the veracity of the achieved results, such as heteroskedasticity and multicollinearity.

5. Results and future discussion

5.1. Univariate analysis

5.1.1. Correlation analysis

In order to assess the degree to which the variables, both dependent and independent, are related, table 1 shows the correlation coefficients between them.

In this particular study, major interest is given to the binary variable “Family” and the potential relationship that exists with the dependent variable that will be used to deploy the regressions in the multivariate analysis. Table 1 shows that the family and EBITDA ROA are negatively correlated, even if just slightly. Nonetheless, the correlation coefficient of -0.038 is considerably close to 0 which does not allow to assert in a concrete and meaningful way the specific relationship that exists between the two variables. When looking at the relationship between this binary and the remaining company specific variables, it is highlightable that the vast majority showcases a negative correlation coefficient, even though the magnitude of such correlation is markedly small. Furthermore, when considering the covid binary, the correlation

coefficient is also negative, as one would predict, but the magnitude of the negative correlation is also considerably small (-0.063) which seems to denote, once more, that no specific relationship between ROA and the covid variable exists.

Finally, there are no major correlation issues highlighted in the table, which may be an initial indication that there will be no problems related to multicollinearity. In fact, the higher correlation coefficients identified in the table appear to include total assets and/or EBITDA, which will not constitute a problem given that such variables will not be included in the regression models to be developed, as they are an integral part of ROA computation. Surprisingly enough, however, ROA and EBITDA and ROA and total assets display lower coefficients than expected, even if they present the anticipated sign – negative for ROA and total assets (-0.145) and positive for EBITDA and ROA (0.149).

Table 2 | Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) LONGTERMDEBT	1.000																
(2) EBITDADEPRECATION	0.699	1.000															
(3) Price	-0.028	0.118	1.000														
(4) NETSALESORREVE~S	0.554	0.684	0.093	1.000													
(5) CAPITALEXPENDI~S	0.647	0.756	0.144	0.636	1.000												
(6) TOTALASSETS	0.873	0.819	0.040	0.711	0.779	1.000											
(7) MARKETVALUE	0.450	0.795	0.191	0.549	0.550	0.583	1.000										
(8) NETDEBT	0.810	0.322	-0.144	0.329	0.384	0.585	0.038	1.000									
(9) CAPEXSALES	0.132	0.034	-0.050	-0.080	0.287	0.090	-0.014	0.158	1.000								
(10) EBITDATASSETS	-0.131	0.149	0.132	-0.035	-0.040	-0.145	0.113	-0.167	-0.197	1.000							
(11) LDEBTTASSETS	0.166	-0.017	-0.035	-0.063	-0.018	-0.030	-0.041	0.202	0.064	0.160	1.000						
(12) NETINCOMEAVAI~N	0.455	0.921	0.136	0.544	0.561	0.604	0.806	0.050	-0.027	0.237	-0.049	1.000					
(13) NETINCOMESALES	-0.015	0.125	0.066	-0.026	0.001	0.011	0.090	-0.059	-0.198	0.421	-0.021	0.211	1.000				
(14) SALESGROWTH	-0.031	0.033	0.029	-0.003	-0.013	-0.012	0.029	-0.047	-0.042	0.090	-0.055	0.057	0.058	1.000			
(15) PRICEGROWTH	-0.088	0.010	0.105	-0.039	-0.046	-0.071	0.102	-0.117	-0.064	0.116	-0.039	0.052	0.078	0.213	1.000		
(16) COVIDIBI	0.064	0.041	0.121	0.035	0.015	0.060	0.106	0.032	-0.005	-0.063	0.019	0.042	0.015	0.047	0.087	1.000	
(17) FAMILY	0.018	-0.005	0.021	0.041	-0.026	-0.009	-0.046	0.061	-0.065	-0.038	-0.046	-0.023	-0.028	-0.019	-0.071	0.000	1.000

5.1.2. Difference in means

The data encapsulates financial variables of 446 companies over the period of 2016 to 2021. Table 2 and table 3 present the results of difference in means tests performed between family and non-family firms for two distinct periods: pre-covid era and during covid. The means tests were performed based on the times series average for each firm in the dataset.

The panel data at hands is balanced in a way that all companies display datapoints across all years considered but unbalanced considering the distribution of family and non-family firms.

Given the quite recent phenomenon of covid-19, data availability for post covid times is limited, which means that pre-covid era encapsulates a considerable percentage of the total datapoints in the dataset (c.67%). A first look at pre-covid times (table 2) shows that a considerable number of variables display significant differences at the 5% significance level, with special

consideration for market value and ROA (EBITDA/Total assets) which denotes that non-family firms appear to be more valuable and better performers, respectively, than their family counterparts. Curiously enough, even though both the price growth and the price variables denote significant difference in means between family and non -family firms, the direction of such differences is the opposite. The average unit price of one share of family firms appears to be greater than that of a non-family firm. However, the price growth is considerably greater for non-family firms than it is for family firms.

Shifting attention to the post-covid times, most variables which previously indicated to have significant differences in means between the two types of firms, now appear to be more similar as highlighted by the act that the significance of the differences is either inexistant or significant at a higher threshold. Average ROA decreased for both family and non-family firms, but no significant differences are detected in the difference in means test. Market value displays significant differences at the 10% significance level, however both types of firms appear to have an average market value greater than the one achieved in pre-covid era. Price growth still depicts significant differences at the 5% significance level and both family and non-family firms display higher average growth than in pre-covid times.

As a general result, firms financials improved from pre-covid to post covid era, namely the market value average as noted above, which at first sight might be counter-intuitive, but in this case, could be the result of the dataset used for the developed analysis whereby most preponderant sectors, which include utilities, pharmaceuticals or health related industries and hardware and software (appendix 9) may have thrived during the pandemic in comparison to least represented sectors, which may have been more severely and negatively affected, such as tourism related industries (airlines, accommodation, etc) and automotive industry. Additionally, significant differences between the two types of firms disappeared/smoothed which should be expected given the transversal impact of the pandemic across all companies and sectors.

Table 3 | Difference in means summary table for pre covid times

COVID = 0	Family Firms	Non-Family Firms	t-stat	DF
N	228	1556	N.A	N.A
Long term debt	10 600 000	9 321 541	-1,1148	1782
EBIT	3 965 235	4 138 429	0,3263	1782
Price	156,3891	116,4127	-2,0944	1782
Net Sales	27 000 000	21 300 000	-1,9357	1782
CapEx	1 265 556	1 463 583	0,946	1782
Total Assets	33 000 000	33 900 000	0,2339	1782
Market value	32 657,66	45 700,28	2,1775	1782
Net Debt	10 400 000	6 677 070	-3,2121	1782
CapEx/sales	0,0645125	0,0839914	2,6335	1782
EBITDA/T.Assets	0,1364451	0,1483922	1,7349	1782
Long term debt/T.Assets	0,2621428	0,2955382	1,9098	1782
Net Income Available to common	1 513 088	1 941 277	1,4332	1782
Net Income/sales	0,0779055	0,1011701	1,2689	1782
Sales growth	0,0866452	0,084473	-0,144	1782
Price Growth	0,092621	0,1700921	3,4268	1782

Table 4 | Difference in means summary table for covid times

COVID = 1	Family Firms	Non-Family Firms	t-stat	DF
N	114	778	N.A	N.A
Long term debt	12 000 000	11 700 000	-0,1378	890
EBIT	4 798 544	4 865 276	0,0655	890
Price	186,635	205,932	0,4826	890
Net Sales	29 800 000	24 700 000	-1,0039	890
CapEx	1 211 109	1 587 905	0,9957	890
Total Assets	38 600 000	41 400 000	0,4522	890
Market value	48 578,16	77 915,32	1,4864	890
Net Debt	10 100 000	8 079 322	-1,0733	890
CapEx/sales	0,0566361	0,0804095	2,1285	890
EBITDA/T.Assets	0,1260806	0,1352327	0,9671	890
Long term debt/T.Assets	0,2713569	0,30511	1,4579	890
Net Income Available to common	2 168 565	2 373 423	0,3025	890
Net Income/sales	0,0906535	0,1088489	0,7409	890
Sales growth	0,0564249	0,1509994	1,0663	890
Price Growth	0,1531313	0,241203	1,8561	890

5.2. Multivariate analysis

5.2.1. Simple regressions

The first regression model, follows the following equation:

$$(1) ROA_{it} = \beta_0 + \beta_1 * FAMILY_{it} + \varepsilon_{it}$$

Results for the previous regression are reported in table 4. The results suggest that family members presence in management roles have a negative impact on firm profitability, measured

using ROA. In fact, the variable coefficient is significant at the 5% significance level. Interpreting the coefficient, family presence appears to diminish profitability when compared to non-family firms, more specifically, ROA decreases by -0.011 when family members are present in company management. This output is aligned with the results achieved in the difference in means analysis performed within the univariate analysis section, whereby average ROA was greater for non-family firms than family companies. Results, however, need to be interpreted cautiously, given that the adjust R squared (0.1%) suggests that the model as is has a very low explanatory power of the variability around the dependent variable.

The second regression includes a covid-19 identifier and is defined by the following equation:

$$(2) \text{ROA}_{it} = \beta_0 + \beta_1 * \text{FAMILY}_{it} + \beta_2 * \text{COVIDBI}_{it} + \varepsilon_{it}$$

Given the panel data included in the study, datapoints referring to any year from 2016 to 2019 will have the mentioned variable equal to zero, and one otherwise.

As expected, COVID-19 has a negative impact on firm profitability, which is given by the negative coefficient associated to the binary variable in the regression (-0.0128). This goes to say that, ROA, was, on average 0.0128 lower during covid times when compared to pre-pandemic levels. When analysing the results presented in table 4, one can highlight not only that the covid-19 negative impact on profitability is significant at the 1% significance level, but also that family management presence continues to have the same negative impact highlighted in the former regression model, while maintaining the same significance level (5%). The impact of covid-19 in firm's ROA is similar, in terms of conclusions, to that found in the univariate analysis performed, whereby on average, covid-19 decreased firm ROA.

Finally, in what regards the results of this regression model specifically, the adjusted R squared continues to be considerably low (0.5%), even though marginally higher than the one achieved in the previous regression model. This means that the vast majority of the variance around the dependent variable is not being captured by this model.

The third model, with results summarized in table 4 controls for firm specific considerations and follows the specification presented below:

$$(3) \text{ROA}_{it} = \beta_0 + \beta_1 * \text{FAMILY}_{it} + \beta_2 * \text{COVIDBI}_{it} + \delta_{3-15}(\text{Firm Control Variables}) + \varepsilon_{it}$$

Where Firm Control Variables = Log (long term debt); Log(sales); Log(capex); Log(price); Log(market value); Net debt; Capex/Sales; Long term debt/Sales; Net income available to common; Net income sales; Sales growth; Price growth.

Almost all variables included in the model are significant at the 1% significant level. Exceptions to this result include the price growth variable as well as the capex to sales ratio. Interestingly, when CapEx is considered as a standalone independent variable, it becomes significant at the 1% level and, in this specific study, has a negative contribution on the return on assets, as explained by the negative sign of the variable coefficient. Furthermore, analysing the remaining financial ratios, it is possible to highlight that, not surprisingly, increasing sales has a positive impact on ROA, which is denoted by the sales variable coefficient. The impact of sales in ROA also increases the highest the visible growth manifested in sales, as given by the sales growth variable. Price, net income to sales and long-term debt to assets also have positive contribution on ROA, whereas net debt and long-term debt have negative contribution on ROA, which may suggest that the higher the indebtedness of firms, the lower its profitability. Additionally, and considering the scope of this project is to understand the potential impact of family presence in the company in firm profitability, the family firm binary variable shows contradictory results to those achieved in the previous two regressions. In fact, the regression results show that, when firm specific characteristics are factored in the model, family members presence becomes a profitability enhancer, as shown by the positive sign of sign of the coefficient associated to the variable (0.0119), which means that on average family presence increases firm ROA by 0.019. Furthermore, these results are significant at the 1% significance level. Finally, the covid-19 binary, in this specification, continues to depict the negative impact of the pandemic on company ROA. In this case, the variable continues to be significant at the 1% significance level, but the magnitude of impact on ROA increases considerably (from -0.0128 to -0.0221 in this model). On average, ROA was 0.0221 lower during the pandemic than in pre COVID-19 times. Noteworthy at this point is the fact that, despite of the relevance of the chosen variables in predicting ROA, the model adjusted R square falls in the 40% region, suggesting that only 40% of the variability around the dependent variable can be explained with the set of chosen predictors. Although relevant, the precision of predictions is not high when considering the set of financial ratios and variables inputted in the model.

Additionally, it is important to note that, when controlling for firm specific effects, the model adjusted R squared increases significantly, which highlights that this specific model is able to encapsulate more of the variability around the dependent variable than the first specifications used.

As a final remark, it was interesting to find that despite the conclusions withdrawn in the univariate analysis section, which displayed improvements on most firm financials when comparing pre-pandemic times with covid-19, the same conclusion was attained in terms of ROA. Both analyses displayed that covid-19 had a negative contribution for firm profitability.

Table 5 | Simple regressions for firm profitability measured using ROA

This table reports the results of simple regressions under four different specifications: (1) Without firm control variables and family binary only; (2) Without firm control variables and family and covid binary; (3) With firm control variables and family and covid binary. The variables' standard errors are reported in parathesis. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

VARIABLES	(1)	(2)	(3)
	ROA	ROA	ROA
LOG_LONGTERMDEBT			-0.00970*** (0.000544)
LOG_SALES			0.0131*** (0.00312)
LOGCAPEX			-0.0115*** (0.00245)
LOG_PRICE			0.0140*** (0.00182)
LOG_MARKETVALUE			0.00856*** (0.00221)
NETDEBT			-3.32e-10*** (1.01e-10)
CAPEXSALES			0.0100 (0.0220)
LDEBTSALES			0.135*** (0.00675)
NETINCOMEAVAILABLETOCOMMON			4.20e-09*** (3.83e-10)
NETINCOMESALES			0.113*** (0.00612)
SALESGROWTH			0.00864*** (0.00273)
PRICEGROWTH			0.000983 (0.00408)
FAMILY	-0.0110** (0.00558)	-0.0110** (0.00557)	0.0119*** (0.00463)
COVIDBI			-0.0128*** (0.00394)
CONSTANT	0.144*** (0.00199)	0.148*** (0.00239)	0.0251 (0.0307)
OBSERVATIONS	2676	2676	2676
R-SQUARED	0,001	0,005	0,413

5.2.2.Difference in Differences

Following the simple regression models, difference in difference specifications were deployed in order to try and capture a causal effect between family presence in firm management and firm performance during covid-19 pandemic. The specifications created are based on the work of Albuquerque et al. (2020), whereas treatment has been changed to family presence ownership, instead of environmental and social policies or rankings.

The first specification, is represented by the equation below:

$$(4) ROA_{it} = \beta_0 + \beta_1 * FAMCOV_{it} + \varepsilon_{it}$$

Where $FAMCOV = FAMILY_{it} * COVIDBI_{it}$

The treatment group of companies is represented by famcov, which equals 1 if family presence was detected within firm management and 0 otherwise (or if a pre covid pandemic period is being considered). Looking at table 5, the famcov interaction term is negative and significant at the 10% significance level. In terms of magnitude, the variable beta -0.0173 signifies that EBITDA based ROA tends to be lower, on average, 1.73% for family firms during COVID-19 times, than for their non-family counterparts. However, the model adjusted R squared is considerably low, which implies that the model itself is not capable, as is, to justify the variability highlighted around the dependent variable. The conclusions on family presence in the firm's management herewith withdrawn do not differ considerably from those highlighted in the first two specifications considered in the simple regression models sections – ultimately, family presence is penalizing firm profitability.

Finally, a second difference in difference regression was developed, which controls for firm-specific effects. This specification follows the equation below:

$$(5) ROA_{it} = \beta_0 + \beta_1 * FAMCOV_{it} + \delta_{2-14}(Firm\ Control\ Variables) + \varepsilon_{it}$$

Where $FAMCOV = FAMILY_{it} * COVIDBI_{it}$ and Where Firm Control Variables = Log (long term debt); Log(sales); Log(capex); Log(price); Log(market value); Net debt; Capex/Sales; Long term debt/Sales; Net income available to common; Net income sales; Sales growth; Price growth.

Table 5 summarizes the specification results. In this specific case, when controlling for firm specific effects, the famcov variable, which measures the impact of family presence in firm profitability pre and during covid, reduces its impact in terms of magnitude on firm profitability (-0.0086) when compared to the previous specification, even if just marginally. The impact of family presence is negative and around 0.9% on firm ROA when compared to non-family firms during covid times. However, interestingly enough, the variable is no longer significant.

Looking at firm specific effects, long term debts has a negative impact on firm profitability, and results are significant at the 1% significance level. Similarly, CapEx appears to continue depicting a negative impact of firm ROA and results suggest such impact is significant at the 1% significance level. Finally, contrary to simple regression specifications, even though sales value appear not to be significant for firm profitability, sales growth is, which means that the higher ability of the firm to increase revenues, appears to have a positive and significant contribution on firm performance.

Table 6 | Difference in difference regressions for firm profitability measured using ROA

This table reports the results of difference in difference estimations of firm ROA under two specifications: (1) Excludes firm control variables and regresses ROA on family binary*covid binary; (2) Includes firm control variables and regresses ROA on family binary*covid binary.

Family binary equals one if there are family members in the board, zero otherwise. Covid binary equals one for covid times and zero for pre covid times. The variables' standard errors are reported in parathesis. *p < 0.1; **p < 0.05; ***p < 0.01.

VARIABLES	(1)	(2)
	ROA	ROA
FAMCOV	-0.0173*	-0.00860
	(0.00922)	(0.00783)
LOG_LONGTERMDEBT		-0.00508***
		(0.000531)
LOG_SALES		-0.000849
		(0.00299)
LOGCAPEX		-0.00845***
		(0.00263)
LOG_PRICE		0.0143***
		(0.00194)
LOG_MARKETVALUE		0.00463**
		(0.00228)
NETDEBT		-1.00e-10
		(1.05e-10)
CAPEXSALES		-0.0245
		(0.0237)
LDEBTSALES		0.135***
		(0.00679)
NETINCOMEAVAILABLETOCOMMON		3.75e-09***
		(3.78e-10)
NETINCOMESALES		0.121***
		(0.00654)
SALESGROWTH		0.00608**
		(0.00296)
PRICEGROWTH		-0.00180
		(0.00442)
CONSTANT	0.143***	0.214***
	(0.00190)	(0.0276)
OBSERVATIONS	2676	2676
R-SQUARED	0,001	0.307

5.2.3.Robustness and results quality

As stated before, in order to assess the quality of the results achieved, two analyses were performed in order to test for heteroskedasticity and multicollinearity, complementing the correlation matrix developed before.

Heteroskedasticity was tested using two different approaches. The first, uses the Breusch-Pagan and Cook-Weisberg test for heteroskedasticity, the second, more visual, plots the residual versus fitted plot which graphs residuals against fitted values, shedding light on whether the datapoints display constant variance or not. On the other hand, multicollinearity was approached using the variance inflation factor and tests on this matter were only performed when two or more variables were included in the regression model.

The achieved results do not display major issues on either of the considered tests that could potentially affect results. In fact, paying closer attention to the results achieved when analysing multicollinearity, it is possible to conclude that no major issues were identified in this arena, with the mean VIF across all regressions displaying values below 3. A rule of thumb, when considering the variance inflation factor, which is used across the literature, points out to the fact that values higher than 10 might signify multicollinearity considerations that may affect the quality of results, more specifically related to the significance of the different independent variables. The VIF values for the different regressions can be found in the appendix section under (Appendix 3 and 6).

Shifting attention to heteroskedasticity, the Breusch-Pagan and Cook-Weisberg test did not display major issues in this arena, with all regressions passing the test with achieved results being significant at the 1% level. The RVF plots, which complement the heteroskedasticity analysis, can also be found in appendix.

Finally, even though the overall results on the performed tests display no significant issues that undermine the quality of the models, their predictive power is considerably low, as per the achieved R squared. However, given that the scope of this specific project is to understand whether family presence in the board of the company affects performance, the objective of these tests lied in highlighting potential problems associated with the specific variable created to measure such impact.

6. Conclusions limitations and future work

The aim of this report was to study the potential impact of family members presence in the company's board in firm performance as measured using EBITDA ROA. More specifically, this report uses the Covid-19 pandemic as a specific external event to understand if the suspected negative impacts such an event would have had in firms' performance would be aggravated or attenuated by the presence of family members in the firm. To do so, univariate analysis was included to gather initial evidence on the matter. Not only was a correlation matrix presented to identify how closely linked the specific variables in this study were, but it were also developed difference in means tests to potentially highlight whether or not there were significant differences on firm performance and firm specific characteristics across family and non-family firms.

An initial univariate analysis points out that non-family firms display higher market values and higher ROAs, on average, when compared to their family counterparts in pre-covid times. When the same difference in means test is performed in the time frame that refers to the period when the pandemic has exerted most influence on economic and firm-specific variables, results highlight curious conclusions. First, and counterintuitively, some financials have improved, on average, for both types of companies. Second, and most importantly, ROA has decreased when considering family and non-family firms, as classified in this study even though the latter group still continues to display higher values than the former, meaning that, firm performance is still lower for family firms.

Secondly, a set of regression specifications were developed to further investigate the impact that family members presence in the company's board would have in performance. The achieved results are in line with those attained in the univariate analysis: family firm presence tends to harm performance. In fact there is consensus across almost regressions preformed. The specifications used start by including the family binary alone and finally by introducing several firm specific variables that are meant to serve as control variables in order to potentially extract more meaningful results related to the impact of family members presence in the company's ROA, especially considering that the attained R squared in the specification considering only the binary variable that identifies firms as family or non-family was very low which indicated a very dim ability of the regression to predict ROA. Furthermore, in what concerns the multivariate analysis, difference in difference regressions were also performed in order to understand if firm presence would have either more pronounced negative or positive contribution to firm performance when introducing the pandemic as an external event.

Similarly, to the simple regression specifications, family presence is highlighted as a performance harming characteristic during covid-19 times

Finally, a set of tests were developed to attest the quality of the models regarding multicollinearity and heteroskedasticity in order to verify if the achieved results were potentially erroneous in any way or form. No issues were found across all the models in what concerns the aforementioned issues. However, given the small adjusted R squared achieved across all regressions, there is space for potential improvement on the created specifications, namely on the control variables that are introduced in the model.

Notwithstanding the achieved results, this study encountered some limitations. First and foremost, the covid-19 pandemic is a relatively recent event which entails a limited number of research papers on the topic, and more specifically, on the potential impact it has on firm performance and on whether family presence has positive or negative contribution during such time. Additionally, the availability of data is still scarce which can also be problematic when analysing these data to achieve specific results. Finally, the “family” classification of firms is bounded to potentially generate inaccuracies given the plethora of methodologies that could be used to classify firms which may generate different results than those achieved in this study.

Finally, considering future work, it is possible to potentially expand results to different industries in order to understand if there is transversality of results across sectors or if specific industries respond differently to family firm presence. Additionally, it may be relevant to include characteristics of the family members present in the board to control for individual features that may be relevant in contributing or shaping firm performance. To conclude, using a more refined method of firm classification, that includes a multitude of assumptions deemed necessary for the classification may produce different and potentially more accurate results than those herewith achieved. However, the larger the conditions imposed the narrower might be the dataset if family firms which may also constitute a problem related to the lack of relevant datapoints to generate accurate results.

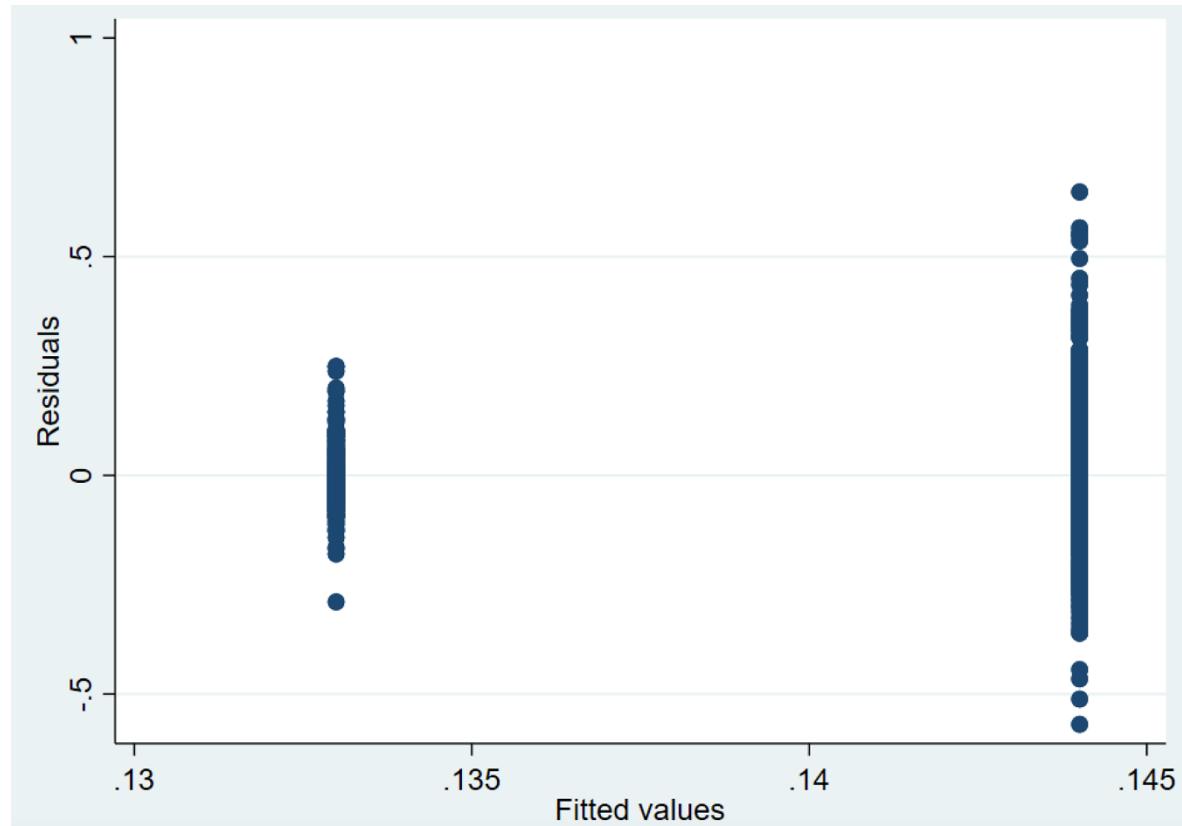
7. Appendix

Appendix 1 | Breusch-Pagan and Cook-Weisberg test for specification (1)

H0: Constant variance

chi2(1) = 58.40
Prob > chi2 = 0.0000

Appendix 2 | RVF Plot for specification (1)



Appendix 3 | VIF for specification (2)

. vif

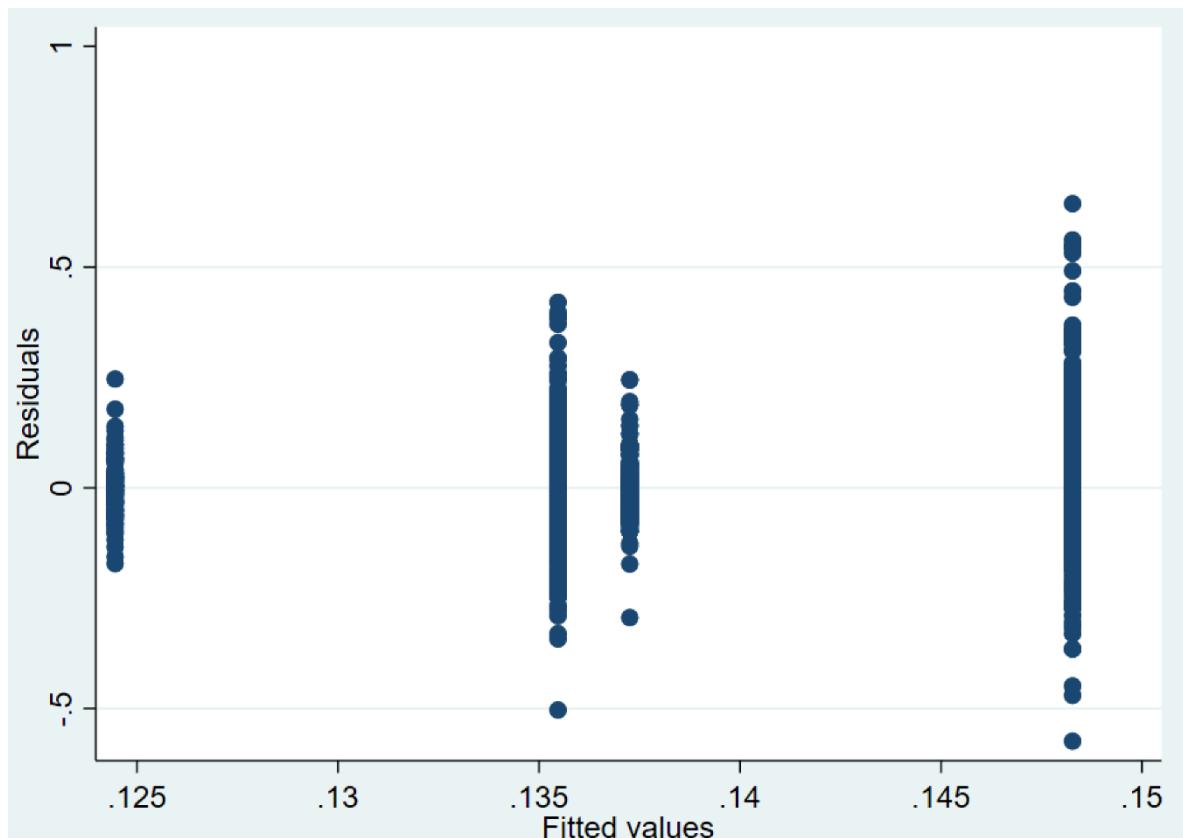
Variable	VIF	1/VIF
COVIDBI	1.00	1.000000
FAMILY	1.00	1.000000
Mean VIF	1.00	

Appendix 4 | Breusch-Pagan and Cook-Weisberg test for specification (2)

H0: Constant variance

chi2(1) = 23.37
Prob > chi2 = 0.0000

Appendix 5 | RVF Plot for specification (2)



Appendix 6 | VIF for specification (3)

. vif

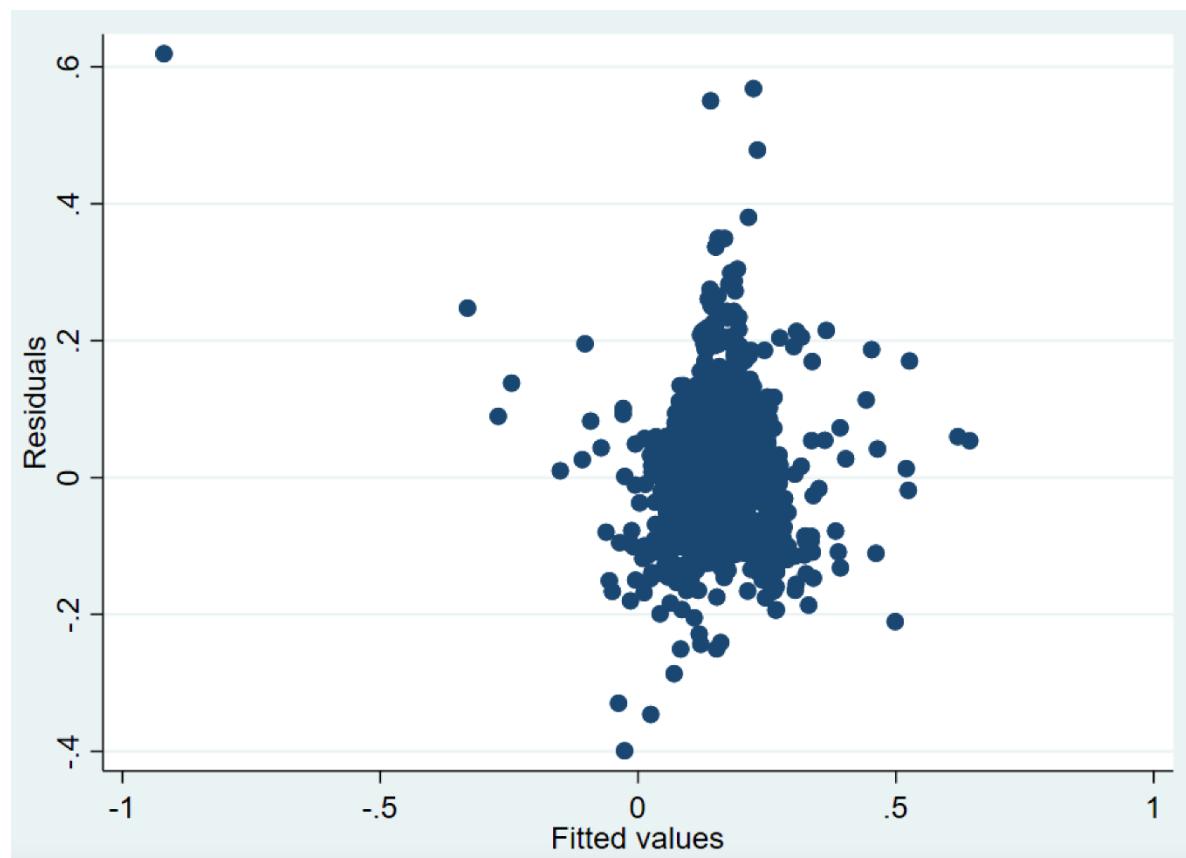
Variable	VIF	1/VIF
log_CapEx	6.67	0.150018
log_Sales	5.56	0.179942
log_market~e	3.32	0.301636
CAPEXSALES	3.01	0.332684
log_longtentr~t	1.72	0.581528
NETINCOMEAN~N	1.61	0.621558
log_price	1.50	0.665645
NETDEBT	1.42	0.704675
LDEBTTASSETS	1.29	0.772395
FAMILY	1.16	0.858415
PRICEGROWTH	1.16	0.859897
NETINCOMES~S	1.14	0.875717
COVIDBI	1.08	0.929425
SALESGROWTH	1.06	0.947788
Mean VIF	2.26	

Appendix 7 | Breusch-Pagan and Cook-Weisberg test for specification (3)

H0: Constant variance

chi2(1) = 60.35
Prob > chi2 = 0.0000

Appendix 8 | RVF Plot for specification (3)



Appendix 9 | Distribution of companies in the dataset by SIC code.

SIC Code	SIC description	# firms	% dataset	% accum
10	Metal Mining	2	0.4%	0.4%
13	Oil and Gas Extraction	11	2.5%	2.9%
14	Mining and Quarrying of Nonmetallic Minerals, Except Fuels	2	0.4%	3.4%
15	Construction - General Contractors & Operative Builders	5	1.1%	4.5%
17	Construction - Special Trade Contractors	3	0.7%	5.2%
20	Food and Kindred Products	24	5.4%	10.5%
21	Tobacco Products	2	0.4%	11.0%
23	Apparel, Finished Products from Fabrics & Similar Materials	6	1.3%	12.3%
24	Lumber and Wood Products, Except Furniture	1	0.2%	12.6%
25	Furniture and Fixtures	2	0.4%	13.0%
26	Paper and Allied Products	7	1.6%	14.6%
27	Printing, Publishing and Allied Industries	1	0.2%	14.8%
28	Chemicals and Allied Products	42	9.4%	24.2%
29	Petroleum Refining and Related Industries	3	0.7%	24.9%
30	Rubber and Miscellaneous Plastic Products	4	0.9%	25.8%
31	Leather and Leather Products	2	0.4%	26.2%
32	Stone, Clay, Glass, and Concrete Products	3	0.7%	26.9%
33	Primary Metal Industries	1	0.2%	27.1%
34	Fabricated Metal Products	5	1.1%	28.3%
35	Industrial and Commercial Machinery and Computer Equipment	24	5.4%	33.6%
36	Electronic & Other Electrical Equipment & Components	26	5.8%	39.5%
37	Transportation Equipment	14	3.1%	42.6%
38	Measuring, Photographic, Medical, & Optical Goods, & Clocks	33	7.4%	50.0%
39	Miscellaneous Manufacturing Industries	2	0.4%	50.4%
40	Railroad Transportation	3	0.7%	51.1%
42	Motor Freight Transportation	6	1.3%	52.5%
44	Water Transportation	1	0.2%	52.7%
45	Transportation by Air	8	1.8%	54.5%
47	Transportation Services	5	1.1%	55.6%
48	Communications	15	3.4%	59.0%
49	Electric, Gas and Sanitary Services	35	7.8%	66.8%
50	Wholesale Trade - Durable Goods	10	2.2%	69.1%
51	Wholesale Trade - Nondurable Goods	8	1.8%	70.9%
52	Building Materials, Hardware, Garden Supplies & Mobile Homes	4	0.9%	71.7%
53	General Merchandise Stores	5	1.1%	72.9%
54	Food Stores	3	0.7%	73.5%
55	Automotive Dealers and Gasoline Service Stations	5	1.1%	74.7%
56	Apparel and Accessory Stores	5	1.1%	75.8%
57	Home Furniture, Furnishings and Equipment Stores	1	0.2%	76.0%
58	Eating and Drinking Places	6	1.3%	77.4%
59	Miscellaneous Retail	7	1.6%	78.9%
70	Hotels, Rooming Houses, Camps, and Other Lodging Places	4	0.9%	79.8%
72	Personal Services	1	0.2%	80.0%
73	Business Services	62	13.9%	93.9%
75	Automotive Repair, Services and Parking	1	0.2%	94.2%
78	Motion Pictures	3	0.7%	94.8%
79	Amusement and Recreation Services	2	0.4%	95.3%
80	Health Services	5	1.1%	96.4%
82	Educational Services	1	0.2%	96.6%
86	Membership Organizations	1	0.2%	96.9%
87	Engineering, Accounting, Research, and Management Services	8	1.8%	98.7%
89	Services, Not Elsewhere Classified	1	0.2%	98.9%
99	Nonclassifiable Establishments	5	1.1%	100.0%
	Total	446	100%	100%

8. References

- Amit, Belen Villalonga & Raphael. "How do family ownership, control and management affect firm value?" *Journal of Financial Economics* (2006): 385-417. <<https://doi.org/10.1016/j.jfineco.2004.12.005>>.
- Daniel L. McConaughy, Michael C. Walker, Glenn V. Henderson Jr., Chandra S. Mishra. "Founding family controlled firms: Efficiency and value." *Review of Financial Economics* (1998): 1-19. <[https://doi.org/10.1016/S1058-3300\(99\)80142-6](https://doi.org/10.1016/S1058-3300(99)80142-6)>.
- Danny Miller, Isabelle Le Breton-Miller, Richard H. Lester & Albert A. Cannella. "Are family firms really superior performers?" *Journal of Corporate Finance* (2007): 828-859. <<https://doi.org/10.1016/j.jcorpfin.2007.03.004>>.
- Lorenzo Bretscher, Alex Hsu, Peter Simasek & Andrea Tamoni. "COVID-19 and the Cross-Section of Equity Returns: Impact and Transmission." *The Review of Asset Pricing Studies* (2020): 705-741. <<https://doi.org/10.1093/rapstu/raaa017>>.
- Mario Daniele Amore, Valerio Pelucco, Fabio Quarato. "Family ownership during the Covid-19 pandemic." *Journal of Banking & Finance* (2022). <<https://doi.org/10.1016/j.jbankfin.2021.106385>>.
- Maury, Benjamin. "Family ownership and firm performance: Empirical evidence from Western European corporations." *Journal of Corporate Finance* (2006): 321-341. <<https://doi.org/10.1016/j.jcorpfin.2005.02.002>>.
- Morten Bennedsen, Kasper Meisner Nielsen, Francisco Perez-Gonzalez & Daniel Wolfenzon. "Inside the Family Firm: The Role of Families in Succession Decisions and Performance." *The Quarterly Journal of Economics* (2007): 647-691. <<https://doi.org/10.1162/qjec.122.2.647>>.
- Reeb, Ronald C. Anderson and David M. "Founding-Family Ownership and Firm Performance: Evidence from the S&P 500." *The Journal of Finance* (2003): 1301-1328. <<https://www.jstor.org/stable/3094581>>.
- Ronald C. Anderson, Sattar A. Mansi & David M. Reeb. "Founding family ownership and the agency cost of debt." *Journal of Financial Economics* (2003): 263-285. <[https://doi.org/10.1016/S0304-405X\(03\)00067-9](https://doi.org/10.1016/S0304-405X(03)00067-9)>.
- Rui Albuquerque, Yrjo Koskinen, Shuai Yang, Chendi Zhang. "Resiliency of Environmental and Social Stocks: An Analysis of the Exogenous COVID-19 Market Crash." *The Review of Corporate Finance Studies* (2020): 593-621. <<https://doi.org/10.1093/rcfs/cfaa011>>.

- Sascha Kraus, Thomas Clauss, Matthias Breier, Johanna Gast, Alessandro Zardini & Victor Tiberius. "The economics of COVID-19: initial empirical evidence on how family firms in five European countries cope with the corona crisis." International Journal of Entrepreneurial Behavior & Research (2020): 1069-1092. <<https://doi.org/10.1108/IJEBR-04-2020-0214>>.
- Schoar, Marianne Bertrand and Antoinette. "The Role of Family in Family Firms ." Journal of Economics Perspectives (2006): 73-96. <<https://www.aeaweb.org/articles?id=10.1257/jep.20.2.73>>.
- Scott R Baker, Nicholas Bloom, Steven J Davis, Kyle Kost, Marco Sammon & Tasaneeya Viratyosin. "The Unprecedented Stock Market Reaction to COVID-19." The Review of Asset Pricing Studies (2020): 742-758. <<https://doi.org/10.1093/rapstu/raaa008>>.
- Stefano Ramelli, Alexander F. Wagner. "Feverish Stock Price Reactions to COVID-19." The Review of Corporate Finance Studies (2020): 622-655. <<https://doi.org/10.1093/rcfs/cfaa012>>.
- Wenzhi Ding, Ross Levine, Chen Lin, Wensi Xie. "Corporate immunity to the COVID-19 pandemic ." Journal of Financial Economics (2021): 802-830. <<https://doi.org/10.1016/j.jfineco.2021.03.005>>.