
Goodwill's Moderating Effect on the Correlation Between the Covid-19 Pandemic and Cash Holdings: The Example of Tunisian Publicly Traded Firms

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Abstract:

Purpose: The company's operations will always be a part of its finances. Indeed, the topic of liquidity is essential to proper operation, even during times of crisis. This study examines the impact of goodwill on the relationship between the COVID-19 crisis and the amount of cash held by Tunisian-owned businesses.

Design/Methodology/Approach: The company is made up of 40 non-financial Tunisian businesses that are listed on the Bourse des Valeurs Mobilières de Tunis and belong to eight different activity sectors. The study period runs from 2016 to 2020. With the use of the DID method, we employed a methodological approach with panel data.

Findings: Our findings show a positive and significant correlation between the COVID-19 crisis and the amount of cash held by businesses. Furthermore, we found that the presence of two moderators goodwill and the devaluation of goodwill reduce the positive correlation between the COVID-19 crisis and the level of cash detention in a meaningful way.

Practical implications:

Originality/value:

Keywords: Goodwill, impairment of goodwill, COVID-19 crisis, the corporate cash.

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1. Introduction

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Following the announcement of the global health crisis (COVID-19) by the World Health Organization (WHO) in December 2019, the global economy experienced a significant impact on all plans, including a decline in sales, a lack of liquidity, limited production, and radical business changes. Businesses that are increasingly suffering from a lack of liquidity, particularly in times of crisis, face challenges as a result of uncertainty and risk growth.

The COVID-19 pandemic has had a devastating effect on the whole world, not only in terms of health but also in terms of the economy and society. It has exposed vulnerable populations to the pandemic and to the loss of income and jobs brought on by anti-virus prevention measures. 2020 will see the worst economic downturn since World War II and, for the first time in three decades, a reversal of global human development.

Like in every other country in the world, the health crisis has a significant effect on the liquidity of Tunisian businesses. The businesses in Tunisia were effectively subjected to a reduction in revenue, temporary closures, and disruptions or disruptions in supply chains during the pandemic. The Tunisian economy was already fragile due to political instability that accompanied the democratic transition process that the Tunisians chose in early 2011.

The onset of the pandemic will only make matters worse by lowering the main demand components in 2020 and causing a 4.4% decline in PIB. This leads to an increase in the amount of cash needed to cover various fixed and variable expenses. At this level, it is crucial that the business has the ability to generate future profits through its reputation or business relationships. Undoubtedly could come with significant challenges, particularly when it comes to the flow of funds necessary for the company's main operations.

The level of treasury holds a significant position in the field of business finance since it helps to ensure that an organization runs smoothly. Chen and associates (2020). In actuality, the most liquid asset that ensures businesses can fund ongoing operations and handle emergencies is the treasury.

For a number of reasons, the epidemic has a significant impact on the liquidity level of Tunisian businesses. Negative effects like lower sales and lower revenues have resulted from the decline and recession of economic activity in the various sectors of the Tunisian economy, including tourism, manufacturing, and services, which lowers liquidity and lowers the level of liquidity.

The issue is that throughout this crisis, Tunisian businesses have had to deal with additional costs, such as those associated with health security measures (disinfection, employee protective equipment, distancing). All of its unanticipated expenses have made businesses' liquidity problems worse. Additionally, throughout this time,

Tunisian businesses have had trouble recovering their investments, which has resulted in payment delays. As a result, strains on the finances of Tunisian businesses have increased.

In order to counteract the negative effects of this health crisis, the Tunisian government intervened by implementing several measures to support businesses, such as financial payment reports, reduced-interest loans, and public guarantees for business loans. The effects of the epidemic have been too great for the Tunisian economy, and it is crucial to emphasize the value of business liquidity, particularly during times of apparent crisis, in order to deal with unforeseen circumstances and, more importantly, to ensure that the business will resume its regular operations after the crisis.

The level of treasury holds a significant position in the field of business finance since it helps to maintain exceptional business operations (Chen and associates (2020)). In actuality, the most liquid asset that ensures businesses can fund ongoing operations and handle emergencies is the treasury.

During the COVID-19 pandemic, goodwill played a crucial moderating role in reducing the negative effects of the epidemic on businesses by bolstering their operational and financial stability and encouraging them to circulate in more stable and trusted environments. Thus, the following is our problem: What impact does goodwill have on the relationship between the COVID-19 crisis and the amount of cash held by Tunisian-owned businesses?

2. Literature Review

Based on earlier research, it is discovered that goodwill indicates that the amount of money offered by the buyer is greater than the price of comparable products on the market, resulting in a discrepancy between the offer price and the market value that makes up the acquisition prime (or *écart d'acquisition*) (Jensen and Fama, 1983).

Furthermore, Fu and Shen (2020) argue that goodwill is a unique measurable activity brought about by business acquisitions and mergers. It is the difference between the highest compensation and the fair market value of the target acquisition's assets. Additionally, the goodwill may be refunded in the buyer's combined financial states.

The cash ratio, also known as the level of cash detention, is determined by the ratio of liquidities to equivalent liquidities on the total assets (Farinha *et al.*, 2018; Al-Najjar and Clark, 2017). There are several reasons why businesses retain liquidity, including transactions, precautions, particularly during times of crisis, and speculation. Additionally, one of the factors that encourage businesses to have liquid assets is managers' preference for liquid assets.

Businesses have sought to preserve their liquidity and finances throughout the COVID-19 pandemic. Effectively, liquid money is essential to every business's

operation since it may be used to control a variety of expenses. The goal is to protect themselves from the risk of failure or a lack of liquidity and to be able to manage their investments without fear of losing them and without considering the cost of outside funding or their ability to obtain it.

In this sense, several earlier studies have focused on the moderating effect of goodwill on the relationship between the crisis and the level of cash detention. The findings of earlier research have confirmed that there is some coherence based on empirical evidence on the relationship between the level of corporate cash detention and the crisis in various contexts. Furthermore, the results indicate that in order to deal with such external shocks, any business should increase its level of liquidity retention at the preventive level during the crisis.

The concept of goodwill has been included in other recent research studies as a moderating element that influences the relationship between the crisis and the level of cash detention in China (Qin *et al.*, 2020). They are moving forward because there is a good correlation between the COVID-19 crisis and the level of cash detention. Additionally, they have demonstrated that goodwill can lessen the positive impact on businesses who have been severely impacted by the crisis; this may be related to the agency costs that these businesses must deal with.

In their 2020 study, Fu and Shen examined how the COVID-19 crisis affected Chinese energy companies' performance from 2014 to 2020 by including the moderating effect of goodwill depreciation on the relationship between the two variables. They discovered that COVID-19 has a significant negative impact on the performance of energy-related businesses. Additionally, businesses who had a decline in goodwill were more severely affected by the pandemic once the devaluation of goodwill was introduced as a moderator.

A recent study by Irwansyah *et al.* (2024) examines the impact of the COVID-19 pandemic on the liquidities held by consumer goods companies over the first three years of the pandemic. The information was gathered using data from the Wall Street Journal (WSJ) for the years 2018-2022.

And by using the model with fixed effects (FEM), the sample consists of 1,491 businesses from 80 countries. The findings show a strong and positive correlation between the COVID-19 pandemic and the liquidity held in the consumer goods sector.

As a result, businesses prefer to increase their liquidity reserves in response to the uncertainty caused by the pandemic. The findings show that the COVID-19 pandemic has had a widespread impact on liquidity across all industry sectors, market types, and geographical regions.

3. Methodological Approach and Results

Our goal in doing this empirical study is to examine the moderating role that goodwill

plays in the relationship between the COVID-19 crisis and the amount of cash held by Tunisian-owned businesses. The study conducted by Qin *et al.* (2020) on a sample of Chinese companies listed on a stock exchange between 2014 and 2020 is the one and only one that has been empirically examined to propose the moderating effect of goodwill on this relationship. To do this, we will present our study data, methodology, and empirical models in this part, along with the variables used in the research.

Study Data: The study's data will be broken down into three subsections, including the presentation of the sample, the data sources, and the research period.

Presentation of the Sample: Our empirical analysis is based on an initial sample of 52 non-financial Tunisian businesses. To ensure comparability between research entities, any businesses with missing data were eliminated. For this reason, we have chosen 40 businesses with complete data as our final sample for the study. These businesses fall under the following eight activity sectors of the Bourse des Valeurs Mobilières de Tunis (BVMT):

Data Sources: The information is gathered from two sources. A portion of the financial data is gathered from the Bourse de Tunis's official website (BVMT). On the other hand, data pertaining to each company's capital increase is gathered through the official website of the Council of Market Financiers (CMF).

Search Period: Our study's chosen time frame spans five years, from 2016 to 2020. Given that the COVID-19 pandemic mostly affected Tunisia in the first semester of 2020, we gathered the data using a semester-based approach. Additionally, the following justifies the choice of this research period.

4. Methodology and Econometric Models

This section will focus on two subheadings, including the methodology used to separate our inventory into treatment and control groups. Thus, our three empirical models are presented.

Following the description of our research framework, please see our sample, data source, and study period. It is appropriate to talk about the methodology we use to separate the two groups. Firstly, we calculated the ROA of businesses across the five years of the study. Next, using the Mediane method, we separated the sample into two groups: one for treatment (the heavily affected sectors) and one for control (the less affected sectors) based on their sectorial ROA (Duchin, 2010; Rashid and Ashfaq, 2017; Honda and Uesugi, 2021). Actually, this method's process is explained as follows:

Step1 :

We have determined the average ROA per sector from 2016 to 2019.

In 2016: $ROA/sector1 \text{ in } 2016 = \{(ROA_{company1} + ROA_{company2} + \dots + ROA_{company6})/6\}$

Using the same formula for the remaining years (The year 2017: ROA/sector 1 in 2017; The year 2018: ROA/sector1 in 2018; The year 2019: ROA/sector1 in 2019) for each of the 8 sectors. The result is :

$$ROA_{moyenne\ par\ secteur} = \frac{1}{T} \sum_{t=2016}^{T=20} (ROA_{it})$$

Step2 :

We deduced a median value for all the medians found previously. In other words:

Med totale = (Med1; Med 2; ...; Med8)

If a sector's median value is higher than the overall median, that sector will be deemed to be significantly impacted by COVID-19: **Med_i > Med_{Totale}**.

If the given sector's median value is less than the overall median, the sector will be deemed to be less affected by COVID-19: **Med_i < Med_{Totale}**.

4.1 Econometric Models

The three regression models that our study is based on were influenced by the models developed by Qin *et al.* (2020). However, the methodology and some of the variables' measurements have been contextualized.

Additionally, all three specifications are estimated using a traditional method known as the method of least squares generalized (MCG) and the method of base, which forms the basis of our study. This method is the method of double differences with the technique of appearance on score of propensity (Propensity Score Matching, or PSM). That is, a combination of the DID study approach and a PSM method that considers the DID results' robustness (Bénabou *et al.*, 2004).

The main justification for choosing this approach is that the pandemic's effects are often unique. As a result, it is challenging to ensure that the distribution of the échantillon across the groups with strong and low impacts is entirely random.

Thus, the DID method has been heavily developed in social sciences (Heckman *et al.*, 1985). She is also well-known for comparing the differences in the variable explained between the experimental treatment group and the control group before and after an intervention is implemented in order to assess the impact of a program or intervention (Zhu *et al.*, 2020).

Additionally, the evaluation is predicated on the main hypothesis that the treated and témoin groups are sufficiently similar to measure the net effect of the intervention in a reliable manner. In other words, to obtain an unbiased measure of the treatment's effect, it is sufficient to compare the results of the two groups.

Therefore, assuming this hypothesis is correct, the DID method can effectively control the differences between the two groups, allowing for a precise estimation of the treatment's effect. However, there may be a selection bias since the characteristics of the individuals in the treatment group and the témoin group may not be comparable (Heckman *et al.*, 1998).

In this regard, the score-of-propensity method is becoming more and more used in the management of selection bias. Its evaluation is based on two fundamental components, namely two groups (témoins and traitors) and at least two time periods (before and after the intervention).

The first specification of the regression model aims to test the first hypothesis, H1, which focusses on the effect of the COVID-19 crisis on the level of cash detention.

This basic model explains the amount of cash held by the company I at time t based on the interaction between the existence of the company treated and the treatment period at time t, the existence of the company treated at time t, the treatment period at time t, and a group of control variables at time t. This model is then presented as follows:

$$\text{Cashholdings}_{it} = \beta_0 + \beta_1 \text{Treated}_{it} + \beta_2 \text{Period}_{it} + \beta_3 \text{Treated}_{it} * \text{Period}_{it} + \beta_4 \text{SIZE}_{it} + \beta_5 \text{LEV}_{it} + \beta_6 \text{GROWTH}_{it} + \beta_7 \text{ROA}_{it} + \beta_8 \text{HF3}_{it} + \beta_9 \text{FCF}_{it} + \beta_{10} \text{TR}_{it} + \beta_{11} \text{IND} + \beta_{12} \text{YEAR} + \varepsilon_{it(1)}$$

The second and third specifications include two moderators, namely goodwill and deprecation of goodwill, by testing hypotheses H2 and H3 to analyze their effects on the relationship between the COVID-19 crisis and the level of financial detention. These two models are then presented as follows:

$$\text{Cashholding}_{it} = \beta_0 + \beta_1 \text{GW}_{it} * \text{Treated}_{it} * \text{Period}_{it} + \beta_2 \text{Treated}_{it} * \text{Period}_{it} + \beta_3 \text{Treated}_{it} + \beta_4 \text{Period}_{it} + \beta_5 \text{GW}_{it} + \beta_6 \text{SIZE}_{it} + \beta_7 \text{LEV}_{it} + \beta_8 \text{GROWTH}_{it} + \beta_9 \text{ROA}_{it} + \beta_{10} \text{HF3}_{it} + \beta_{11} \text{FCF}_{it} + \beta_{12} \text{TR}_{it} + \beta_{13} \text{IND} + \beta_{14} \text{YEAR} + \varepsilon_{it(2)}$$

$$\text{Cashholdings}_{it} = \beta_0 + \beta_1 \text{GWIM}_{it} * \text{Treated}_{it} * \text{Period}_{it} + \beta_2 \text{Treated}_{it} * \text{Period}_{it} + \beta_3 \text{Treated}_{it} + \beta_4 \text{Period}_{it} + \beta_5 \text{GWIM}_{it} + \beta_6 \text{SIZE}_{it} + \beta_7 \text{LEV}_{it} + \beta_8 \text{GROWTH}_{it} + \beta_9 \text{ROA}_{it} + \beta_{10} \text{HF3}_{it} + \beta_{11} \text{FCF}_{it} + \beta_{12} \text{TR}_{it} + \beta_{13} \text{IND} + \beta_{14} \text{YEAR} + \varepsilon_{it(3)}$$

4.2 Study Variables

In order to adequately explain the selection of variables included in our empirical models. This section will be divided into two subsections, including the selection of dependent and controlling variables. We will conclude with a table that includes all the variable measurements.

Choice of dependent variables:

Cash holdings 1: In accordance with the majority of previous studies (e.g., Ozkan et Ozkan, 2004; Al-Najjar et Clark, 2017; Farinha et al., 2018), we measured our primary dependent variable, which indicates the amount of cash held by businesses, as the ratio of liquidities and equivalent liquidities to total assets.

$$\text{Cash holdings 1} = \frac{\text{Cash and cash equivalents}}{\text{Total Assets}}$$

Cash holdings 2: Since the active net is calculated as the subtraction of the active liquidities and equivalent liquidities, we used the ratio of "Cash holdings 2" as an alternative variable to verify the robustness of the results obtained by the estimation of our method DID, which is the ratio between liquidities and equivalent liquidities and the active net (Opler *et al.*, 1999).

$$\text{Cash holdings 2} = \frac{\text{Cash and cash equivalents (Total assets - cash and cash equivalents)}}{\text{Total assets - cash and cash equivalents}}$$

Dittmar *et al.* (2003) state that the main reason we eliminate asset liquidities is that an organization's rentability is primarily correlated with the assets it owns, and its cash reserves must be measured in relation to this asset base. Accordingly, Khan et al. (2019) have advanced that net assets are also known as non-monetary assets. This measure allows us to determine how much liquidity each company has.

Choice of control variables:

Referring to earlier research by Opler *et al.* (1999), Gao *et al.* (2013), and Clarkson *et al.* (2020), we use factors to control the amount of liquidity held and that address operational, investment, and financing needs. More specifically, we define the following variables, namely:

SIZE: According to Suivant Lin and Fu (2017), Fu and Shen (2020), and Shen *et al.* (2020), the variable SIZE indicates the size of the business. It is measured as the logarithmic value of the whole action.

LEV: According to Lin and Fu (2017), Fu and Shen (2020), and Shen *et al.* (2020), the variable LEV denotes the end-to-end ratio. She is included because businesses need to have more liquid assets to balance the interests of their debtors (Gao *et al.*, 2013).

GROWTH: The growth rate of the business number is included since companies with high growth characteristics like to have more liquid assets to invest in new projects (Maury, 2006; Shen *et al.*, 2020; Fu and Shen, 2020).

ROA: We use the rentability net of the total amount as a control variable because it helps us maintain a high level of liquidity, which helps us grade rentable projects. According to Clarkson *et al.* (2020), Shen *et al.* (2020), and Fu and Shen (2020), this results in a lower rentability.

HF3: This variable's measurement is taken from Kouki and Ben Said's (2011) study. We include the focus of the three main action questionnaires that may help to improve access to external funding, transparency, and information asymmetry (Gao *et al.*, 2013).

FCF: The study by Kouki and Ben Said (2011) provided us with the measurement of this variable. Since we believe that the flow of cash may act as a source of liquidity, businesses are less likely to need to set up liquidity reserves (Kim *et al.*, 1998).

TR: The management of the company's routemen funds is gauged by the revenue of the customer creations. Leaders will lower the level of cash holdings if the company has an efficient routemen fund management system (Gao *et al.*, 2013).

Table 4. List of study variables

Variables	Types	Définitions	Mesures
Cash holdings1	Dependent variable	This is the level of cash held by the company.	The equivalents
Cash holdings2	Dependent variable Alternative	This is the level of cash held by the company.	Cash and cash equivalents (Total assets – Cash and cash equivalents)
Treated	Variable of interest	This is the ‘degree of impact of the epidemic’.	Is 1 if the company belongs to the high-impact sector, otherwise it is 0.
Period	Variable of interest	This is the ‘epidemic moment’.	Is 1 after the epidemic, or 0 otherwise
GW	Moderating variable	It indicates whether the company has goodwill.	Existence is 1, otherwise 0
GWIM	Moderating variable	It indicates whether there has been any impairment of goodwill in the company.	Existence is 1, otherwise 0
SIZE	Control variable	The size of a company.	Log(totalActif)
LEV	Control variable	The gearing ratio is the proportion of assets financed by debt.	Total liabilities/Total assets

GROWTH	Control variable	This is the sales growth rate.	$(\text{Sales } t - \text{Sales } t - 1) / \text{sales } t - 1$
ROA	Control variable	Net return on assets is a company's ability to generate income from its resources.	Net profit / Total assets
HF3	Control variable	The squares of the proportions of the three main shareholders.	$HF10 = \sum_{t=1}^{n=3} P^2_{t=1 \ i}$ With HF: Concentration Pi: the share (%) of capital held by shareholder i and i ranging from 1 to 3
FCF	Control variable	FREE CASH FLOW is a financial performance indicator that shows how much money a company receives or spends over a period of time.	$(\text{Operating cash flow} - \text{investment}) / \text{total assets}$
TR	Control variable	The receivables turnover ratio or (debtors turnover ratio) is used to measure a company's working capital management.	$[\text{Sales} / \text{average receivables}]$. Where: average receivables = $\text{Trade receivables at beginning and end of period} / 2$

Source: Authors.

5. Empirical Analysis and Interpretation of the Findings

Following the successful implementation of our methodological approach in the first section we aim to determine our goal through this study by empirically examining the moderating effect of goodwill on the relationship between the COVID-19 crisis and the level of cash detention of Tunisian companies listed on stock exchanges between 2016 and 2020 confirming our three research hypotheses, which are as follows:

H1: The COVID-19 pandemic has had a positive effect on the level of cash holdings for businesses in heavily impacted sectors.

H2: The presence of goodwill has contributed to the positive impact of COVID-19 on business cash retention.

H3: The occurrence of a decline in goodwill has weakened the positive impact of COVID-19 on business cash retention.

5.1 Statistical Analysis

In this section we present two tables, specifically, the descriptive statistics and the correlation matrix (Table 5 and Table 6).

Table 5. *Descriptive statistics*

Variables	Obs	Mean	Std. Dev.	Min	Max
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Cash-holding1	200	0.041	0.055	0	0.305
Cash-holding2	200	0.047	0.071	0	0.439
ROA	200	0.036	0.056	-0.165	0.245
SIZE	200	8.045	0.447	7.095	9.019
LEV	200	0.581	0.565	0.021	4.242
GROWTH	200	-0.444	0.195	-0.947	0.34
HF3	200	0.293	0.184	0.043	0.734
FCF	200	0.031	0.092	-0.286	0.602
TR	200	0.011	0.039	0	0.383

Source: STATA software output.

Table 5 presents the findings of descriptive statistics for all variables included in the models. It includes the number of observations, the average value, the standard deviation value, the minimum value, and the maximum value. Based on the results shown above, it can be observed that:

In terms of computation, the dependent variables "Cash-holdings 1" and "Cash-holdings 2" are quite close; on average, they are 0.041 for Cash-holdings 1 and 0.047 for Cash-holdings 2. Their minimum values are zero, and their maximum values are respectively 0.305 (Cash-holdings 1) and 0.439 (Cash-holdings 2). This indicates that our sample has a level of liquidity retention that is quite uniform.

The rentability of assets, or ROA, makes it possible to gauge how rentable businesses are. This ratio is the result of a minimum value (-0.165), a maximum value (0.245), and a mean value (0.036). This shows that all businesses listed on a stock exchange are in a low-rentability state. This is consistent with the findings of Qin *et al.* (2020), which showed that Chinese companies listed on stock exchanges had an average ROA of 0.0461 between 2014 and 2020.

The logarithm of the total active is used to calculate the "SIZE" of an organization. This variable has a range of values, including a minimum (7.095), a maximum (9.019), a mean (8.045), and a sample-type (0.447). This variable's standard deviation is quite low compared to its average, indicating that our sample is heterogeneous in terms of size (the market is made up of businesses of various sizes). This is comparable to the findings of the study by Qin *et al.* (2020), which discovered a standard deviation of the variable SIZE of 1,2814, which is regarded as extremely low in comparison to its average (22,3694).

The proportion of assets financed by debt is measured by the LEV ratio. It ranges from a minimum value of 0.021 to a maximum value of 4.242, with a mean of 0.581. This suggests that, on average, firms maintain a relatively balanced financial structure, with debt representing a moderate share of total assets. In other words, assets are approximately twice as high as liabilities, indicating a generally sound financial position. This finding is consistent with research by Qin *et al.* (2020), who found a mean LEV ratio that is close to 0.5 of (0,4166).

The "GROWTH" rate of business growth indicates the degree of expansion of an organization. It ranges from a low of -0.947 to a maximum of 0.34, with a mean of -0.444 and a standard deviation of 0.195. This suggests that businesses have noticed a trend towards a decline in their revenue.

The "Herfindhal-Hirshman" index, or "HF3," shows the degree of concentration of the three main actioners among the companies listed on the Tunisian Stock Exchange. It ranges from a minimum of 0.043 to a maximum of 0.734, with an average of 0.293. This indicates that there is a lack of concentration among the Saoudienne-owned businesses.

The state of an organization's finances is described by the "FCF" ratio. It fluctuates between -0.286 and 0.602, with a very low average of 0.031. This demonstrates the brittleness of the financial flow of Tunisian businesses.

The client rotation ratio, or "TR," reaches a maximum of 0.383, a mean of 0.011, and an écart-type of 0.039, which is regarded as a significant difference in the customer rotation speeds of the various Tunisian businesses.

In conclusion, Tunisian-owned businesses are characterized by a somewhat uniform level of liquidity retention, low rentability, a heterogeneous inventory in terms of size, a level of end-statement deemed acceptable, a trend towards a decline in business numbers, a low concentration of the parts held by the main actioners, and a fragile state of cash-flow.

Table 3. *Corrélation Matrix*

Variables	Cash-holdings1	Cash-holdings2	ROA	SIZE	LEV	GROWTH	HF3	FCF	TR
Cash-holdings1	1.000								
Cash-holdings2	0.994	1.000							
ROA	0.290	0.282	1.000						
SIZE	-0.120	-0.106	0.023	1.000					
LEV	-0.119	-0.115	-0.414	0.034	1.000				
GROWTH	-0.163	-0.141	0.326	0.262	-0.151	1.000			
HF3	-0.009	0.002	-0.183	0.223	0.201	-0.105	1.000		
FCF	0.039	0.037	0.102	-0.133	-0.106	0.077	0.059	1.000	
TR	0.027	0.017	0.059	-0.018	-0.102	0.078	0.080	0.092	1.000

Source: STATA software output.

The correlation matrix is a statistical test used to analyze the collinearity between the model's variables and confirm the existence of multi-collinearity using a linear correlation coefficient, also known as the Pearson coefficient and denoted by the

symbol " ρ ," which is composed of values between -1 and 1. This coefficient provides a measure of the strength and significance of the linear relationship between two variables, x and y .

It is said that there is a strong linear positive relationship between the variables if the coefficient ρx is close to 1.

It is said that there is a strong linear negative relationship between the variables if the coefficient ρx is close to -1.

It is said that there is a weak linear relationship between the variables if the coefficient ρx is close to 0.

The purpose of this Table is to interpret the correlation coefficients between the dependent variables "Cash-holdings 1" and "Cash-holdings 2" and the control variables listed in the above matrix. Indeed, there is a strong correlation between the two Cash-holdings variables (0.994), and they share blocks of negative correlation coefficients, such as those with the variables "SIZE," "LEV," and "GROWTH."

Thus, a negative correlation coefficient of "HF3" only for Cash-holdings 1. Additionally, they have blocks of positive correlation coefficients, particularly with "ROA," "FCF," and "TR."

These findings make it impossible to draw firm conclusions about the relationship between the dependent and controlling variables. The results of our DID method's estimate will validate these explanations.

In conclusion, every variable in the models shown in the table has a correlation coefficient below the upper limit of 0.7. This shows that the multi-collinearity issue mentioned by Kervin (1992) is not present.

5.2 Econometric Tests

Prior to moving further with the estimate of panel data regressions, we conducted the tests required for each method, that is, the MCG and DID methods.

Econometric Tests for the GLS Method:

This method requires the verification of several diagnostic tests before estimation, including tests for heteroskedasticity, multicollinearity, and autocorrelation of the error terms.

Heteroskedasticity Test:

The Breusch–Pagan test (1979) is used in statistics, specifically within the context of linear regression models. This test is useful for examining the nature of the variance of the error term by testing the null hypothesis of homoskedasticity of the residuals. In fact, the test is based on the following hypotheses:

H_0 : The residuals are homoskedastic, meaning they have constant variance.

H_a : The residuals are heteroskedastic, meaning their variance is not constant.

Table 4. Breusch-Pagan Test

Spécifications	Valeu of $\chi^2(1)$	Probability	Conclusion
Spécification 1	9.56***	0.0020	Reject H_0
Spécification 2	20.61***	0.0000	Reject H_0
Spécification 3	14.78***	0.0001	Reject H_0

Source: STATA software output.

According to the test results shown in the above table, it can be seen that there is a probability of less than 0.5% in each of the three specifications, indicating the presence of heteroscedastic error variances (variances that are not the same for every observation). Therefore, the null hypothesis on the existence of homoscedastic variances is rejected.

Multi-collinearity Test:

The multi-collinearity test is also known as the variance inflation factor (VIF) or factors of inflation of variance (FIV) in English. Examining the presence of a relationship between two or more variables in a regression is helpful. In other words, it indicates the existence of a linear combination between at least two explanatory variables (multi-collinearity). This might have an impact on the model's reliability.

The rule of five is widely accepted in practice. In fact:

When VIF is equal to 1, there is no correlation.

If $1 < \text{VIF} < 5$, there is a weak correlation.

If VIF is more than 5, there is a high correlation.

Table 5. VIF Test

Spécifications	VIF	Conclusion
Spécification 1	1.36<5	Absence of multi-collinearity
Spécification 2	1.62<5	Absence of multi-collinearity
Spécification 3	1.79 <5	Absence of multi-collinearity

Source: STATA software output.

The test results show that the average VIF value for each of our three study models is less than 5. This shows that the multi-collinearity effect is absent, indicating the reliability of regression estimations.

Auto-correlation Test:

Only panel data may be used with the auto-correlation test, also known as the auto-correlationse test (Wooldridge 2002). It is helpful in identifying the existence of autocorrelation among the residuals. In fact, it has the following hypotheses:

H_0 : There is auto-correlation among the residuals. $H_0: \varepsilon_{it} = \rho \varepsilon_{it-1} + \omega_{it}$

H_a : There is no autocorrelation among the residuals. $H_a: \varepsilon_{it} \neq \rho \varepsilon_{it-1} + \omega_{it}$

Table 6. Error autocorrelation test

Spécification	(1 : 10)	Probability	Conclusion
Spécification 1	19.606 ***	0.0001	Reject H_0
Spécification 2	20.107 ***	0.0001	Reject H_0
Spécification 3	23.711 ***	0.0000	Reject H_0

Source: STATA software output.

Based on the results shown in the above table, it is noted that the statistical test probability is lower in the three specifications at the significance level of α (5%), hence H_a is accepted. This indicates that the autocorrelation of errors hypothesis is rejected in the three specifications, where these models have a serial auto-correlation issue. We will estimate our models using the Generalized Least Squares (GLS) method based on the results of previously conducted experiments.

Econometric tests of the DID method:

The Difference-in-Differences (DID) method is a statistical technique used to estimate the causal effect of a policy, treatment, or intervention by comparing changes over time between two groups.

Unit root test:

To ensure the stability of the variables, we ran them through a single-unit test before estimating the regressions. Dickey-Fuller's (1979) simple test, often known as the unit root test or test of non-stationarity, has as its null hypothesis the non-stationarity of an autoregressive process of order "AR (1)". Dickey-Fuller's general principle is to test the null hypothesis that a single race exists. The hypotheses are really presented as follows:

H_0 : There is a single race in the series. Where the series is not stationary: $H_0: \rho = 1$

H_a : The show is stationary and does not include a single unit: $H_a: |\rho| < 0$

Table 7. Unit root test

Variables	Statistic Chi-square (80)	Probability	Conclusion
Cash-holdings1	320.7879***	0.0000	Stationary
ROA	126.9032***	0.0007	Stationary
SIZE	168.5791***	0.0000	Stationary
LEV	161.0601***	0.0000	Stationary
GROWTH	315.2172***	0.0000	Stationary
HF3	228.8538***	0.0000	Stationary
FCF	248.9028***	0.0000	Stationary
TR	232.9480***	0.0000	Stationary

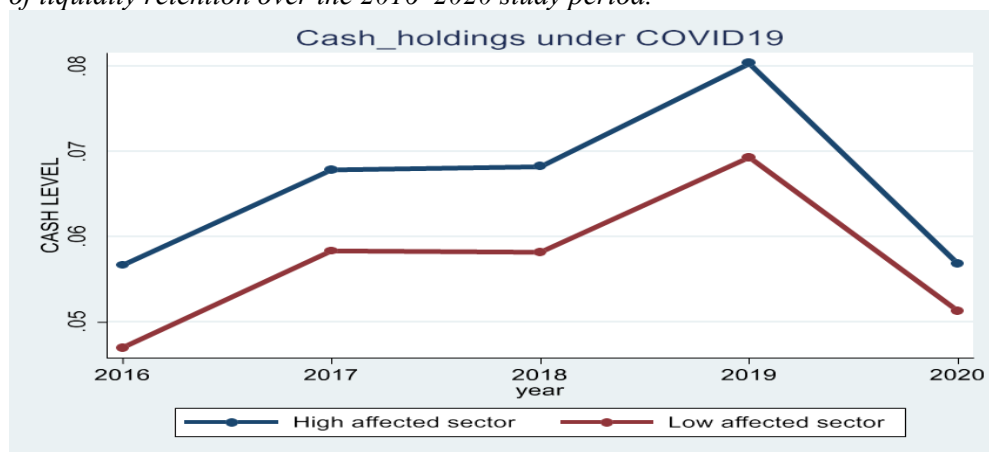
Source: STATA software output.

The results of the racine unitaire test shown in the above table demonstrate that all of the variables that were tested were stable during the study period since they were all stationed at the 1% seuil level.

DID test:

Prior to moving further with the DID test (John Snow, 1850, it is advisable to confirm that the results of our study follow the same pattern regardless of the pandemic's effects. Additionally, the treatment group and the control group are in similar states. To do this, we have illustrated Figure 1 as follows:

Figure 1. The trend of the two treatment and control groups according to their level of liquidity retention over the 2016–2020 study period.



Source: STATA software output.

Figure 1 demonstrates that the heavily and weakly touched sectors showed the same trend over the course of the study, indicating that the DID method is suitable for our analysis. Once the main need of the DID method has been confirmed, the two groups follow a parallel trend for the duration of the study without accounting for the pandemic's effects. To properly provide this graphic representation, we ran the DID test.

Table 8. DID Test

Variable	Cash-holdings1	Stant. Dev.	t-Student	Probability
Baseline				
Control	-1.007			
Treated	-1.152			
Diff(T-C)	-0.145	0.081	-1.80	0.075*
Follow-up				
Control	-1.109			
Treated	-1.356			
Diff(T-C)	-0.248	0.076	-3.25	0.001***
Diff-in-Diff	-0.102	0.055	-1.87	0.063*

Source: STATA software output.

The results of the DID test showed that there was a significant difference between the treatment and control groups at a 10% significance level (the probability was 0.063), indicating that the DID method is suitable for our investigation.

5.3 Model Estimation

This part will focus on the estimate of our three economic models, including using the MCG and DID methods.

Model estimation using the MCG method:

The results of the estimate using the MCG method of three regressions the basic model and the two models with the effects of goodwill moderators and goodwill depreciation are shown in the table below. The "Cash-holdings 1" variable is the dependent one.

The results of the original regression without moderating effects are displayed in the first column. However, the results of the regression with the goodwill moderators and goodwill depreciation effects are shown in the second and third columns. Additionally, the standard deviations are the values included in parenthesis. Thus, the regression coefficients denoted by " α " determine the levels of meanings, which are shown as follows:

$\alpha < 1\%$: The variable is highly significant (***).

$1\% < \alpha < 5\%$: The variable is moderately significant (**).

$5\% < \alpha < 10\%$: The variable is weakly significant (*).

Table 9. Results of three regressions estimated using the GCM method

VARIABLES	Cash-holdings 1		
	BASELINE	GW	GWIM
TREATED*PERIOD	0.00526** (0.02525)	0.0128*** (0.00822)	0.00791** (0.00548)
GW*TREATED*PERIOD		-0.0148*** (0.0100)	

GW		-0.00851**	
		(0.00760)	
TREATED	0.00641**	0.00238**	0.00372*
	(0.00390)	(0.00494)	(0.00344)
PERIOD	-0.00657**	-0.00708**	-0.00767***
	(0.00310)	(0.00312)	(0.00277)
SIZE	-0.0159***	-0.0172***	-0.00707
	(0.00564)	(0.00563)	(0.00599)
LEV	-0.00906	-0.00483	-0.0173**
	(0.00877)	(0.00951)	(0.00693)
GROWTH	-0.0268***	-0.0228***	-0.0164**
	(0.00803)	(0.00832)	(0.00687)
ROA	-0.0503***	-0.0507***	-0.1136***
	(0.0186)	(0.0191)	(0.0196)
HF3	0.0269**	0.0186	0.0293**
	(0.0126)	(0.0149)	(0.0124)
FCF	-0.00235	-0.00915	0.00145
	(0.0134)	(0.0145)	(0.0131)
TR	0.0449	0.0330	0.0319
	(0.0288)	(0.0285)	(0.0259)
GWIM*TREATED*PERIOD			-0.0373***
			(0.0112)
GWIM			-0.00335***
			(0.00138)
CONSTANT	0.152***	0.156***	0.0880*
	(0.0471)	(0.0454)	(0.0483)
OBSERVATIONS	200	200	200
NUMBER OF id	40	40	40
IND	YES	YES	YES
YEAR	YES	YES	YES

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: STATA software output.

Based on this Table, it can be said that:

The results shown in the first line of each column correspond to the coefficients of interaction (TREATED*PERIOD) of the main effect that describes the impact of the pandemic on the level of liquidity retention of businesses without accounting for moderators, the presence of a goodwill moderator effect, and the presence of a goodwill depreciation moderator effect, and are all positive and significant at the 5% level, unless the coefficient of the goodwill moderator effect is significant at 1%.

This suggests that the level of liquidity detention has significantly increased since the pandemic's emergence. This enables the first hypothesis, H1, to be validated.

Additionally, the interaction coefficient of the goodwill moderator effect

(GW*TREATED*PERIOD) is negative (-0.014) and significant at the 1% level. This supports the second hypothesis, H2, which holds that goodwill contributes to the positive impact of the pandemic on the level of cash retention.

Furthermore, the interaction coefficient of the moderator of goodwill depreciation effect (GWIM*TREATED*PERIOD) is negative (-0.037) and significant at the 1% level. This indicates that the devaluation of goodwill has also contributed to the positive effect of the pandemic on the level of treasurer retention and has validated the third hypothesis, H3.

Estimation of models using the Difference-in-Differences (DID) method:

The results of the estimate of three regressions, including the original model and two models with moderating effects goodwill and goodwill depreciation are shown in the table below. The "Cash-holdings 1" variable is the dependent one.

Table 10. Results of three regressions estimated using the DID method

	Cash-holdings 1		
VARIABLES	BASELINE	GW	GWIM
TREATED*PERIOD	0.00661*** (0.00095)	0.00281** (0.00149)	0.00392** (0.0019)
PERIOD	-0.00459*** (0.0020)	-0.00457** (0.0022)	-0.00394* (0.0021)
TREATED	-0.0318** (0.0136)	-0.0300** (0.0133)	-0.0300** (0.0132)
GW*TREATED*PERIOD		-0.00684* (0.0056)	
GW		-0.00876* (0.0065)	
SIZE	-0.00773 (0.0117)	-0.00523 (0.0118)	-0.00630 (0.0137)
LEV	-0.0148*** (0.00545)	-0.0164** (0.00632)	-0.0151*** (0.00575)
GROWTH	-0.0559*** (0.0151)	-0.0546*** (0.0160)	-0.0496*** (0.0156)
ROA	-0.709*** (0.0754)	-0.601*** (0.0549)	-0.620*** (0.0599)
HF3	0.00570 (0.0203)	-0.00218 (0.0214)	0.00410 (0.0206)
FCF	0.00904 (0.0480)	0.00637 (0.0485)	0.0119 (0.0491)
TR	0.0393 (0.0302)	0.0264 (0.0366)	0.0370 (0.0314)
GWIM*TREATED*PERIOD			-0.00847** (0.0043)
GWIM			-0.0160** (0.0135)

CONSTANT	-0.0582	-0.0579*	-0.111**
	(0.0491)	(0.0512)	(0.0486)
OBSERVATIONS	200	200	200
NUMBEROFid	40	40	40
IND	YES	YES	YES
YEAR	YES	YES	YES
R-SQUARED	0.065	0.075	0.075

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: STATA software output.

Based on the results shown in this table, which are based on the estimate of regressions using the DID method, it is possible to observe that:

The first column details the impact of the pandemic on the level of liquidity retention for businesses without the goodwill moderator effect and the goodwill depreciation. The interaction's coefficient of regression (TREATED*PERIOD) is positive (0.006) and significant at the 1% level, supporting our first research hypothesis, H1.

This result is consistent with the findings of most previous studies (Bates *et al.*, 2009; Lian *et al.*, 2011; Ranajee and Rajesh, 2019; Qin *et al.*, 2020; Honda and Uesugi, 2021), which show that financial distress characterizes the financial constraints that an organization may encounter, which justifies its tendency to hold significant liquidities to lower the risk of failure.

In fact, since the COVID-19 pandemic began, businesses have increased their liquidity to withstand the systemic risks associated with the crisis. This risk has the potential to upset the market's equilibrium between supply and demand and completely impact businesses' production capacity, which will cause issues with capital flows between acquisitions and depletions (Mustafa, 2020).

Additionally, businesses have used short-term credit to increase liquidity in an effort to prevent it; thus, it can be said that triggers for the prevention motif of liquidity detention manifest themselves clearly during times of crisis (Keynes, 1936). Additionally, this is in line with the hierarchical finance theory (Myers and Majluf, 1984), which holds that leaders would rather use their own capital than outside funding due to the latter's higher costs. This emphasizes the need to hold onto more liquid assets so that the business can weather tough times and deal with rising fixed costs.

The second column highlights the moderating effect of goodwill on changes in the level of liquidity retention by businesses during the COVID-19 pandemic. At the 5% level, the interaction's coefficient of regression (TREATED*PERIOD) is significantly positive (0.002). This indicates that throughout the pandemic, the company's level of cash retention increased by a moderate amount.

Additionally, the coefficient of the term of interaction of (GW* TREATED*PERIOD) is significant at the 10% level with a negative coefficient (-0.006), indicating that the

presence of goodwill has attributed the positive effect of the pandemic on the level of treasurer's detention and has validated the second research hypothesis, H2.

This result is consistent with the research of Qin *et al.* (2020), since businesses that have goodwill have more significant expenses and funding issues than those that don't. This may be explained using the free cash flow theory (Jensen, 1986). As a matter of fact, the retention of liquidities enables leaders to have greater control and discretion over investment decisions.

This may lead to principal-agent conflicts of interest since executives may use liquidity to achieve private gains rather than achieving post-fusion and acquisition goals (Nurul *et al.*, 2020). Accordingly, agency conflicts have a negative impact on the policy of liquidity retention, and it is believed that the presence of goodwill somewhat reflects potential operational risks for businesses (Qin *et al.*, 2020).

The third column shows the moderating effect of goodwill depreciation on the level of business liquidity retention during the pandemic. The interaction's coefficient of regression (TREATED*PERIOD) is positive (0.003) and significant at the 5% level, indicating that the level of cash detention increased in a moderately significant way under the pandemic's effect.

The coefficient of the interaction term (GWIM* TREATED*PERIOD) is negative (-0.008) and significant at the 5% level, indicating that the devaluation of goodwill has a negative regulatory role. Ceci has supported the third research hypothesis, H3, which states that the devaluation of goodwill is what frees up the increase in the level of a company's cash detention during the pandemic. This outcome supports the prediction of the signal theory (Spence, 1973) and is consistent with the research of Qin *et al.* (2020). Indeed, this theory is based on the idea that information is not equally distributed. This results in an investment strategy that is less than ideal, which lowers the company's value.

The devaluation of goodwill in the context of tax treatment is typically regarded as a sign of poor performance observed following mergers and acquisitions. This is explained by the fact that businesses fail to fulfil the performance commitments made during mergers and acquisitions, sending a negative signal to the market and the parties involved (Harford *et al.*, 2012).

Therefore, certain financial decisions will be made to address this knowledge asymmetry and will be considered a signal (Spence, 2002). Therefore, as the primary lender, the bank will reassess the creditworthiness of businesses throughout the pandemic and take into consideration all available data to monitor the ability of businesses to borrow money when goodwill degradation is seen (Qin *et al.*, 2020). Therefore, the devaluation of goodwill is a clear reflection of the decline in performance following the merger and acquisition, which alerts all parties involved, including the creators. As a result, the systemic risk increases and investors will be

more cautious when assessing the loan risk during the COVID-19 crisis (Fu and Shen, 2020).

Additionally, regarding the control variables, the findings show that:

The variable SIZE indicates that there is a negative and non-significant effect (-0.007) on the level of cash retention for Tunisian businesses; this negative coefficient demonstrates that as size increases, cash is reduced. This negative and non-significant relationship between the company's size and liquidity retention supports the findings of a number of authors (Kim *et al.*, 1998; Pinkowitz and Williamson, 2001; Dittmar *et al.*, 2002; Ferreira and Vilela, 2004; Bates *et al.*, 2009).

It also agrees with the prediction of the theory of compromise (Miller and Orr, 1966), which postulates that size is a factor of substitution that opposes information asymmetry. This means that large companies have less liquidity and may easily increase their liquidities from consumer markets compared to small businesses that struggle with information asymmetry. Because this knowledge asymmetry results in financial constraints that lead to more expensive external funding. Additionally, García-Teruel and Martínez-Solano (2008) found a negative correlation between PME size and treasury levels.

At 1% level the variable (LEV) (-0.014) exhibits a negative and statistically significant effect on the level of cash detention. The negative sign of the regression coefficient indicates that there is an inverse relationship between the impact of leverage and the company's cash flow; as the impact of leverage increases, the company's cash flow decreases. Furthermore, the effect of levier is reduced by 0.014 when the stock is increased by 1%.

This result is comparable to empirical studies that support the prediction of the theory of compromise (Miller and Orr, 1966), which suggests that debt is viewed as a replacement for liquidity. This means that businesses with access to the debt market can use loans as a replacement for liquidity (Baskin 1987; John, 1993). In fact, Ferreira and Vilela (2004) and Ozkan and Ozkan (2004) support this negative relationship, which states that the effect of leverage can be used as a substitute for liquidities.

As a result, businesses that experience the effect of leverage retain fewer liquidities to avoid the costs associated with liquidity retention. Additionally, Jani *et al.* (2004) support this viewpoint as well. They explain this relationship by pointing out that Indonesian manufacturing companies have good access to funding sources and do not need to hold large amounts of liquid assets.

Investors will find this result useful since a business is ineffective if it has a large amount of liquid assets on its balance sheet. Therefore, debt serves as a substitute for firms' liquidity retention and indicates easier access to external financing when the cost of maintaining high levels of liquidity is relatively high.

The variable (GROWTH) has a negative (-0.055) and statistically significant effect at the 1% level on the level of cash retention. This is explained by the fact that businesses worry about having strong growth prospects and securing their funding because they face issues with either the absence of external funds or the existence of funds but at exorbitant costs. In such a scenario, these businesses will have to forgo new initiatives and focus on building up adequate levels of cash.

However, they will be required to fund high financing costs. This is where the negative relationship between growth opportunities and the level of cash retention occurs. Therefore, this result is consistent with the research conducted by Qin *et al.* (2020).

The variable (ROA) has a negative (-0.709) and statistically significant effect at the 1% level on liquidity retention. This may be explained by the fact that businesses prioritise using their unpublished profits to pay back their debt, which results in a reduction in liquid assets. As a result, there is a negative correlation between rentability and the level of liquidity retention. This is consistent with several empirical studies, such as Lee and Song (2007) and Clarkson *et al.* (2020).

The variable (FCF) is positive (0.009) and not significant; the positive coefficient of cash flow is consistent with the notion that businesses with higher cash flows are likely to hold larger cash reserves due to their preference for internal funding over external funding. Insofar as cash flow is also a measure of business growth opportunities, a positive coefficient may suggest that companies with higher cash flow also have larger cash reserves to prevent having to forgo worthwhile investment opportunities during unfavorable times.

Furthermore, this result is consistent with the prediction of the hierarchical order theory (Myers and Majluf, 1984), which proposes a positive relationship between the level of liquidity retention and the cash flow since businesses with high cash flow retain a large portion of liquid assets (Ferreira and Vilela, 2004). Accordingly, Deloof (2003) confirms that the liquid reserves used by the company to fund new investments are those that have already been saved in the form of liquid reserves so that they may be readily released in an emergency.

This is when more cash flow will result in more significant liquid reserves. Furthermore, it was added that the act of conserving more cash flow may be viewed as a preventative measure against future cash flow problems. According to the same line of reasoning, Garcia-Teruel and Martinez-Solano (2008) concluded that businesses with significant cash flow will maintain high levels of cash.

The variable (HF3) has a positive but non-significant effect (0.005). This result is consistent with the study by Opler *et al.* (1999), which demonstrated that managers and control actioners are more likely to hold too many liquidities in order to maximize the company's value because liquid assets lower the risk of incurring expenses like agency costs.

This is where there is a positive correlation between the amount of property and the level of cash retention. Thus, Kuan *et al.* (2012) examined this relationship and found that excessive control rights had a favorable impact on the amount of cash held by businesses with high cash holdings. Furthermore, it has been demonstrated by Jebran *et al.* (2019) that Chinese businesses are also distinguished by a high concentration of property, which grants them access to control law actioners and allows them to retain additional liquidity. Therefore, there is a favorable correlation between the main owners of control and the retention of liquidities.

The variable (TR) has a positive and non-significant effect (0.039), which is consistent with the findings of Anjum and Malik's (2013) study, which found a positive correlation between the level of liquidity retention and the working capital. Given this, the ratio of client creations rotation, or "TR," is defined as a metric for managing an organization's working capital. Since an increase in working capital has resulted in a higher level of liquidity, highly liquid companies have tended to have higher levels of liquidity than less liquid companies.

Robustness Test:

We proceed with a robustness test to ensure the validity of our previously discovered results. To achieve this, we combined the DID approach with the propensity score matching (PSM) technique, which was developed by Heckman *et al.* (1998) after being founded by Rosenbaum and Rubin (1983) and combining the propensity score with a double difference analysis (DID).

A complementarity principle underlies the combination of DID analysis and the appearance on score of propension procedure. Using these two techniques enables a better correction of the selection bias. Furthermore, the calculation of the treatment effect obtained will provide an even more reliable assessment of the relationship (Bénabou *et al.*, 2004; Imbens and Wooldridge, 2009).

Additionally, for the robustness test, we choose the PSM approach with an extra variable dependent on the level of an organization's cash holdings, called "Cash-holdings 2." The results of the estimate using PSM of three regressions, namely the basic model and the two models with the effects of goodwill moderators and goodwill depreciation, are thus shown in Table 11 below.

Table 11. PSM Results of three regressions estimated using the PSM method

	Cash-holdings 2		
VARIABLES	BASELINE	GW	GWIM
TREATED*PERIOD	0.00542***	0.0277**	0.0915**
	(0.00126)	(0.0109)	(0.0375)
SIZE	-0.00954	-0.0276*	-0.0200

	(0.0170)	(0.0158)	(0.0179)
LEV	-0.0187***	-0.00738	0.0198**
	(0.00685)	(0.00626)	(0.0077)
GROWTH	-0.0678***	-0.0670***	-0.0596***
	(0.0207)	(0.0232)	(0.0226)
ROA	-0.0821***	-0.1654***	-0.2798**
	(0.00842)	(0.0627)	(0.1089)
HF3	0.00939	0.00885	0.00548**
	(0.0277)	(0.0302)	(0.00305)
FCF	0.0135	-0.0492	-0.0464
	(0.0632)	(0.0623)	(0.0615)
TR	0.0161	-0.0939	-0.236***
	(0.0379)	(0.260)	(0.00928)
TREATED	0.0489***	0.0399***	0.0406***
	(0.00569)	(0.00501)	(0.00513)
PERIOD	0.0324***	0.0465***	-0.0104
	(0.0125)	(0.0163)	(0.0246)
GW*TREATED*PERIOD		-0.291***	
		(0.101)	
GW		-0.227*	
		(0.131)	
GWIM*TREATED*PERIOD			-0.01638***
			(0.00418)
GWIM			-0.534**
			(0.248)
CONSTANT	0.105	0.232*	0.283*
	(0.140)	(0.132)	(0.164)
OBSERVATIONS	200	200	200
IND	YES	YES	YES
YEAR	YES	YES	YES

Note: Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: STATA software output.

Therefore, based on the findings in this Table, it can be said that:

The results shown in the first line of each column correspond to the coefficients of interaction (TREATED*PERIOD) of the main effect that describes the impact of the pandemic on the level of liquidity retention of businesses without accounting for moderators, the presence of a moderator effect on goodwill, and the presence of a moderator effect on goodwill depreciation.

These results are all positive and significant at the 5% level, unless the main effect (BASELINE) is positive and significant at This demonstrates that the level of liquidity retention has significantly increased since the pandemic's onset, allowing the first hypothesis, H1, to be validated.

Additionally, the interaction coefficient of the goodwill moderator effect

(GW*TREATED*PERIOD) is negative (-0.291) and significant at the 1% level. This supports and validates the second hypothesis, H2, which holds that goodwill contributed to the pandemic's beneficial effect on the level of cash retention.

Additionally, the effect moderator of goodwill depreciation's coefficient of interaction (GWIM*TREATED*PERIOD) is negative (-0.016) and significant at the 1% level. This indicates that the devaluation of goodwill has also contributed to the positive effect of the pandemic on the level of treasurer retention and has validated the third hypothesis, H3.

Regarding the control variables, the results show that the level of cash retention is significantly and negatively correlated with the ratio of end-of-business (LEV), the ratio of the rate of growth of business numbers (GROWTH), and the rentability of assets (ROA). However, no correlation was found between the size of the business (SIZE), the concentration of the property (HF3), the rotation ratio of the debtors' accounts (TR), the cash flow (FCF), and the level of liquidity retention of Tunisian businesses.

As a result, our conclusions are solid since the results are consistent with the initial results determined using the DID method.

6. General Conclusion

Because they translate their success into the economic well-being of a nation and its local communities, businesses have a fundamental role in the economy. Indeed, businesses can help create jobs, improve people's quality of life, supply a wide range of goods and services, revitalize the population, assist the government in running smoothly, and ensure that taxes are maintained to improve the nation's infrastructure. In this way, businesses become the engine of a nation's economic stability, growth, and health.

Additionally, an organization's operations are mostly dependent on its finances. In other words, liquid money is essential to every business's operation since it enables the payment of various expenses. These include salaries, employers, taxes, supplier invoices, and so forth. On the other hand, his absence may cause problems.

Therefore, it is necessary to regularly monitor the level of the company's finances to have an equilibrium that ensures the growth and prosperity of the business by providing a worldwide view.

Therefore, liquidity reserves give businesses the assurance that they will be protected against a potential negative event that would force them to obtain funding from outside sources in order to guard against the risk of liquidity shortages or failures and to be able to finance their investments without fear of loss and without taking into account the cost of external financing or their ability to access it. Furthermore, maintaining a reasonable level of liquidity is crucial for every business to ensure smooth operation

during unfavorable times.

On the basis of this reasoning, and in an effort to better manage our subject, we have devoted the first part to introducing the key concepts of our study, such as the concepts of goodwill and its devaluation, crisis and a historical overview of the major crises, and treasury, its use, and the factors influencing its decision.

The second section focused on the theoretical framework and research hypotheses, emphasizing the various relationships, such as the relationship between the crisis and the level of cash detention, as well as the influence of goodwill and its depreciation on the relationship between the crisis and the level of cash detention.

The final section enabled us to empirically test our research hypotheses on a sample of forty companies listed on the Tunisian Stock Exchange's Market Index over the period 2016-2020.

We have chosen a methodological approach using panel data with the assistance of the DID method to achieve our goal of this research. First and foremost, we used the level of cash holdings of Tunisian companies listed on stock exchanges during the first semesters of 2016-2020 as our research focus and the industries affected by the pandemic as our benchmark. After that, we separated the sectors into heavily and weakly affected areas. Finally, we used two moderators' goodwill and goodwill depreciation to assess the moderator's effect on the relationship between the COVID-19 crisis and the level of Treasury detention.

Our empirical results show a number of intriguing implications. First and foremost, we have found a positive and significant correlation between the COVID-19 crisis and the level of cash holdings of businesses in heavily affected sectors. This highlights the idea of preventing liquidity holdings and validates that businesses choose to increase their liquidity holdings to avoid systemic risks related to the pandemic.

Second, we have seen that the presence of two moderators' goodwill and the devaluation of goodwill allows for a significant positive relationship between the COVID-19 crisis and the level of cash detention. To put it another way, businesses with goodwill and goodwill depreciation increased less their level of liquidity retention. This is related to the fact that businesses that exhibit goodwill and goodwill depreciation pose significant financial risks and are subject to bank financing restrictions.

Furthermore, the presence of goodwill frequently reflects operational risks. Furthermore, the occurrence of a decline in goodwill is a direct result of the performance deterioration following mergers and acquisitions.

This warns all parties involved, including those who are responsible for the systemic risk increase. As a result, they will be more cautious when providing loans to businesses who experienced financial difficulties during the COVID-19 pandemic.

Additionally, the study's estimation results have demonstrated the value of the treasurer's role in helping Tunisian businesses prepare for failure risks during difficult times, such as the COVID-19 pandemic. Specifically, the role of goodwill moderator and goodwill depreciation, which limits businesses' ability to finance themselves and prevents them from increasing their level of cash holdings during this time.

Therefore, through investments in mergers and acquisitions, this study may help business leaders decide whether to alleviate pressure on levels of cash retention throughout the pandemic. It will thus pay more attention to the kinds of investments made during unfavorable times while keeping the reserve under control to reduce the risk of a potential breach.

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