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What factors impact debt levels in the health sector? Evidence for a bank system-oriented country.

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Tables

Table 1: Dependent Variables

Variable	Proxy	References
Debt (DEB)	$\frac{Total\ Debt}{Total\ Assets}$	Acaravci (2015); Matias and Serrasqueiro (2017); Munawar (2020); Neves *et al.* (2020); Rajan and Zingales (1995); Santos *et al.* (2014)
Medium and long-term debt (DEBMLT)	$\frac{Non-current\ liability}{Total\ Assets}$	Jorge and Armada (2001); Neves *et al.* (2020); Öhman and Yazdanfar (2017)
Short-term debt (DEBST)	$\frac{Current\ liability}{Total\ Assets}$	Neves *et al.* (2020); Öhman e Yazdanfar (2017); Proenca *et al.*, (2014)

Table 2: Independent variables

Variable	Proxy	References
Size	ln (*Total Assets*)	Acaravci (2015); Farhangdoust, and Molavi, H. (2020); Neves *et al.* (2020); Neves *et al.* (2021); Neves *et al.* (2022a); Rajan e Zingales (1995); Santos *et al.* (2014); Serrasqueiro (2008); Vieira *et al.* (2019).
Tangibility (Tang)	$\frac{Tangible\ Fixed\ Assets}{Total\ Assets}$	Dasilas and Papasyriopoulos (2015); Esperança *et al.* (2003); Matias and Serrasqueiro (2017); Mugoša (2015); Neves *et al.* (2020); Neves *et al.* (2021); Serrasqueiro (2011); Serrasqueiro *et al.* (2016).
Social Expenses (SE)	Ln (Personnel expenses + post-employment benefits)	Baghai *et al.* (2021) Cancela *et al.* (2020); Michaels *et al.* (2019); Neves *et al.* (2022c); Neves *et al.* (2022d); Seo et *al.* (2019).
Profitability: Return on Equity ratio (ROE)	$\frac{Net\ income\ for\ the\ period}{Equity\ capital}$	Jouida (2018), Neves *et al.* (2022); Proença and Neves (2022).
Current Ratio (CR)	$\frac{Current\ Assets}{Current\ liability}$	Chakrabarti and Chakrabarti (2019); Chaklader and Chawla (2016); Danso *et al.*, 2020); Ersoy (2022); Ibrahim and Lau (2019); Neves *et al.* (2022e); Pathak and Chandani (2021).
Gross Domestic Product growth rate (GDP)	GDP growth rate, compared to the previous year	Ersoy (2022); Mirza *et al.* (2017); Panda and Nanda (2020); Pathak and Chandani (2021); Tekin (2019); Yildirim *et al.*, (2018).
Covid – 19 (COVID)	Dummy variable where 1 represents the year with covid, and 0 the opposite	Acharya and Steffen, (2020); Halling *et al.* (2020); Li *et al.* (2020).

Table 3: Descriptive Statistics

Variables	Mean	SD	Minimum	Maximum
DEB (ln)	3.786159	1.245791	-2.302585	4.19268
DEBMLT (ln)	-2.096741	1.668649	-9.189898	4.359481
DEBST (ln)	-2.635162	1.783969	-15.3005	1.171065
SIZE	6.448106	3.356217	-4.461936	13.3696
TANG	0.3035127	0.2924426	0	0.9991703
SE	0.55265	3.910338	0	165.3437
ROE	33.47689	66.32008	-198.774	287.251
CR	6.48515	16.52937	-0.551	177.411
GDP	9.823692	0.0875644	9.680719	9.944677
COVID	0.1522346	0.3593318	0	1

Note: This table presents descriptive statistics for the dependent and independent variables used in the study. Check Tables 1 and 2 for the description of the variables.

Table 4: Estimation results of models 1, 2 and 3 for global period (2011-2020)

Dependent variables									
Ind. Variables	**DEB (1)**			**DEBMLT (2)**			**DEBST (3)**		
	Coeff.	**Z**	**P**	**Coeff.**	**Z**	**P**	**Coeff.**	**Z**	**P**
Lagged DEBT	0.4509905 (0.0454789)	9.92	0.000***	0.4421122 (0.0284038)	15.57	0.000***	0.30816313 (0.0309103)	9.97	0.000***
SIZE	0.951517 (0.0307346)	3.10	0.002***	0.125982 (0.0636335)	1.98	0.048**	-0.0179272 (0.0827575)	-0.22	0.829
TANG	0.5491457 (0.1382207)	3.97	0.000***	1.13796 (0.2646242)	4.30	0.000***	-0.7903152 (0.2219191)	-3.56	0.000***
SE	0.1574231 (0.0367889)	4.28	0.000***	0.2413189 (0.0631727)	3.82	0.000***	-0.3721172 (0.2067366)	-1.80	0.072*
ROE	-0.0002119 (0.0002132)	-0.99	0.320	-0.0007751 (0.0003745)	-2.07	0.038**	0.0009816 (0.0003868)	2.54	0.011**
CR	-0.0185519 (0.0020414)	-9.09	0.000***	0.0033853 (0.0026334)	1.29	0.199	-0.891352 (0.1189724)	-7.49	0.000***
GDP	-0.1189037 (0.1299854)	-0.91	0.360	0.006073 (0.3301025)	0.02	0.985	-0.946301 (0.2708403)	-3.49	0.000***
COVID	0.0231401 (0.0265578)	0.87	0.384	0.0787005 (0.0420102)	1.87	0.061	-0.5678999 (0.0587512)	-9.67	0.000***
Wald		548.79 (8)	0.0000		352.97 (8)	0.0000		785.25 (8)	0.0000
Sargan		52.18208 (43)	0.1591		58.50867 (43)	0.0576		51.14223 (43)	0.1844
m1		-4.7698	0.0000		-4.2932	0.0000		-2.3523	0.0187
m2		-1.5242	0.1275		1.3998	0.1616		0.54144	0.5882

Regression is performed using an unbalanced panel data consisting of 514 companies. Standard Error values are in parentheses; It should also be noted that: i) *, **, and *** indicate significance levels at 10%, 5% and 1% respectively; ii) The Sargan test with a p-value greater than 5% shows that the instruments are valid, with the test values in parentheses representing the degrees of freedom; iii) The Wald test presents a p-value less than 5% which means that the joint significance and the coefficients are significant asymptotically distributed as $\chi 2$ under a null hypothesis without significance, with the degrees of freedom in parentheses; iv) The m1 test has a normal distribution N (0.1) and tests the null hypothesis of absence of first-order autocorrelation against the alternative hypothesis of existence of first-order autocorrelation; v) The m2 test has a normal distribution N (0.1) and with a p-value greater than 5% accepts the null hypothesis of absence of second-order autocorrelation.
Check Tables 1 and 2 for description of variables.

Table 5: Estimation results of models 1, 2 and 3 for Troika period (2011-2014)

Dependent variables									
Ind. Variable	**DEB (1)**			**DEBMLT (2)**			**DEBST (3)**		
	Coeff.	**Z**	**P**	**Coeff.**	**Z**	**P**	**Coeff.**	**Z**	**P**
Lagged DEBT	0.3722956 (0.1356004)	2.75	0.006***	0.8042351 (0.3220455)	2.50	0.013**	0.2003219 (0.2155723)	0.93	0.353
SIZE	0.3309082 (0.1720553)	1.92	0.054*	0.6690858 (0.6113308)	1.09	0.274	0.0938181 (0.2114)	0.44	0.657
TANG	-0.0562928 (0.0530766)	-1.06	0.289	2.561534 (1.905723)	1.34	0.179	0.8645602 (1.121655)	0.77	0.441
SE	0.3837641 (0.1125777)	3.41	0.001***	1.870024 (0.706456)	2.65	0.008***	-0.838796 (0.6481747)	-1.29	0.196
ROE	-0.0003494 (0.0002956)	-1.18	0.237	0.0013451 (0.0024657)	0.55	0.585	-0.0008521 (0.0014168)	-0.60	0.548
CR	-0.0199001 (0.0064522)	-3.08	0.002***	-0.0236752 (0.0072482)	-3.27	0.001***	-1.487989 (0.3091173)	-4.81	0.000***
GDP	-0.0164629 (0.0063762)	-2.58	0.010**	-3.131499 (3.34324)	-0.94	0.349	0.047619 (0.0246699)	1.93	0.054*
Wald		33.43 (7)	0.000		35.60 (7)	0.0000		36.63 (7)	0.0000
Sargan		5.13947 (4)	0.2733		1.212102 (4)	0.8761		3.37393 (4)	0.4973
m1		-0.75314	0.4514		-1.5259	0.1270		-1.2594	0.2079
m2		-	-		-	-		-	-

Regression is performed using an unbalanced panel data consisting of 514 companies. Standard Error values are in parentheses; It should also be noted that: i) *, **, and *** indicate significance levels at 10%, 5% and 1% respectively; ii) The Sargan test with a p-value greater than 5% shows that the instruments are valid, with the test values in parentheses representing the degrees of freedom; iii) The Wald test presents a p-value less than 5% which means that the joint significance and the coefficients are significant asymptotically distributed as $\chi 2$ under a null hypothesis without significance, with the degrees of freedom in parentheses; iv) The m1 test has a normal distribution N (0.1) and tests the null hypothesis of absence of first-order autocorrelation against the alternative hypothesis of existence of first-order autocorrelation; v) The m2 test has a normal distribution N (0.1) and with a p-value greater than 5% accepts the null hypothesis of absence of second-order autocorrelation.
Check Tables 1 and 2 for description of variables.

Appendix

Table 6: Estimation results of models 1, 2 and 3 for period before Covid (2011-2019)

Dependent variables									
Ind. Variables	**DEB (1)**			**DEBMLT (2)**			**DEBST (3)**		
	Coeff.	**Z**	**P**	**Coeff.**	**Z**	**P**	**Coeff.**	**Z**	**P**
Lagged DEBT	0.1111972 (0.0208972)	5.32	0.000***	0.4621647 (0.0302755)	15.27	0.000***	0.032456 (0.0061956)	5.24	0.000***
SIZE	-15.15704 (3.199973)	-4.74	0.000***	-0.0330849 (0.0183401)	-1.80	0.071*	-0.0359026 (0.0070677)	-5.08	0.000***
TANG	2.250799 (1.442617)	1.56	0.119	0.0227874 (0.0124289)	1.83	0.067*	-0.0032013 (0.2219191)	-1.00	0.318
SE	1.480858 (1.680039)	0.88	0.378	-0.0045624 (0.0132587)	-0.34	0.731	0.0116405 (0.0057724)	2.02	0.044*
ROE	0.0023747 (0.0043356)	0.55	0.584	-0.000118 (0.0000322)	-0.37	0.713	8.49e-07 (0.0070677)	-5.08	0.000***
CR	-0.0583777 (0.0123365)	-4.73	0.000***	0.0000459 (0.0001078)	0.43	0.670	-7.77e-06 (0.0000322)	-0.24	0.809
GDP	-14.34287 (11.76561)	-1.22	0.223	-0.0945302 (0.0684115)	-1.38	0.167	-0.1510628 (0.0388151)	-3.89	0.000***
Wald		93.86 (7)	0.0000		277.64 (7)	0.0000		136.67 (7)	0.0000
Sargan		39.17699 (34)	0.2487		39.37313 (34)	0.2419		50.66844 (34)	0.0329
m1		-1.8593	0.0630		-3.7928	0.0001		-2.7366	0.0062
m2		-1.4135	0.1575		-0.20878	0.8346		0.09765	0.9222

Regression is performed using an unbalanced panel data consisting of 514 companies. Standard Error values are in parentheses; It should also be noted that: i) *, **, and *** indicate significance levels at 10%, 5% and 1% respectively; ii) The Sargan test with a p-value greater than 5% shows that the instruments are valid, with the test values in parentheses representing the degrees of freedom; iii) The Wald test presents a p-value less than 5% which means that the joint significance and the coefficients are significant asymptotically distributed as $\chi 2$ under a null hypothesis without significance, with the degrees of freedom in parentheses; iv) The m1 test has a normal distribution N (0.1) and tests the null hypothesis of absence of first-order autocorrelation against the alternative hypothesis of existence of first-order autocorrelation; v) The m2 test has a normal distribution N (0.1) and with a p-value greater than 5% accepts the null hypothesis of absence of second-order autocorrelation.
Check Tables 1 and 2 for description of variables.

Table 7: Estimation results of models 1, 2 and 3 for global period (2011-2020) with quadratic size

Dependent variables									
Ind. Variables	**DEB (1)**			**DEBMLT (2)**			**DEBST (3)**		
	Coeff.	**Z**	**P**	**Coeff.**	**Z**	**P**	**Coeff.**	**Z**	**P**
Lagged DEBT	0.1191953 (0.0211097)	5.65	0.000***	0.4521815 (0.0285315)	15.85	0.000***	0.0280449 (0.0051082)	5.49	0.000***
SIZE	-11.73327 (5.998651)	-1.96	0.050*	-0.0805578 (0.0382972)	-2.10	0.035**	0.0395183 (0.0141009)	2.80	0.005***
SIZE²	-0.0569771 (0.357279)	-0.16	0.873	0.0030169 (0.0023865)	1.26	0.206	-0.0052314 (0.0009571)	-5.47	0.000***
TANG	3.575989 (1.005062)	3.56	0.000***	0.0306229 (0.0094621)	3.24	0.001***	-0.0037687 (0.0019935)	-1.89	0.059*
SE	0.8048584 (1.228513)	0.66	0.512	-0.0030671 (0.0096567)	-0.32	0.751	0.0088774 (0.0034913)	2.54	0.011**
ROE	0.0025079 (0.0037557)	0.67	0.504	4.07e-07 (0.0000225)	0.02	0.986	-3.33e-06 (0.0000134)	-0.25	0.804
CR	-0.0704793 (0.0211923)	-3.33	0.001***	0.000083 (0.5841928)	0.56	0.573	-0.0000216 (0.0000464)	-0.47	0.641
GDP	-21.36731 (10.33404)	-2.07	0.039**	-0.0392088 (0.0600586)	-0.65	0.514	-0.1462691 (0.0284938)	-5.13	0.000***
COVID	0.8571793 (1.558339)	0.55	0.582	-0.004053 (0.0123236)	-0.33	0.742	-0.0113108 (0.0047235)	-2.39	0.017**
Wald		119.46 (9)	0.0000		312.85 (9)	0.0000		281.00 (9)	0.0000
Sargan		50.48322 (43)	0.2018		50.48322 (43)	0.2018		51.14223 (43)	0.1844
m1		-3.9596	0.0001		-3.9596	0.0001		-2.3523	0.0187
m2		0.53324	0.5939		0.53324	0.5939		0.54144	0.5882

Regression is performed using an unbalanced panel data consisting of 514 companies. Standard Error values are in parentheses; It should also be noted that: i) *, **, and *** indicate significance levels at 10%, 5% and 1% respectively; ii) The Sargan test with a p-value greater than 5% shows that the instruments are valid, with the test values in parentheses representing the degrees of freedom; iii) The Wald test presents a p-value less than 5% which means that the joint significance and the coefficients are significant asymptotically distributed as $\chi 2$ under a null hypothesis without significance, with the degrees of freedom in parentheses; iv) The m1 test has a normal distribution N (0.1) and tests the null hypothesis of absence of first-order autocorrelation against the alternative hypothesis of existence of first-order autocorrelation; v) The m2 test has a normal distribution N (0.1) and with a p-value greater than 5% accepts the null hypothesis of absence of second-order autocorrelation.
Check Tables 1 and 2 for description of variables.

Table 8: VIF

Variables	VIF
SIZE	16.24
TANG	9.89
SE	6.63
ROE	1.03
CR	1.09
GDP	1.11
COVID	1.09
Mean	5.30

What factors impact debt levels in the health sector? Evidence for a bank system-oriented country

Abstract

Purpose: The main goal of this study is to examine the determinants of the level of indebtedness in the health sector in Portugal, taking into account the effects of the COVID-19 pandemic. At the same time, an attempt is made to understand whether the effect of a pandemic crisis is similar to that of a financial crisis.

Design/methodology/approach: To achieve this aim, two subperiods were analyzed: a global period between 2011 and 2020 that includes the pandemic crisis, and the period between 2011 and 2014, designated as the financial assistance period by the "Troika" in Portugal. For a sample of 514 companies belonging to the NACE code: 86100 – Activities of the health sector with hospitalization, the panel data methodology was applied, specifically, the generalized method of moments (GMM)-system proposed by Arellano and Bover (1995) and Blundell and Bond (1998).

Findings: The results of the study are in line with the Pecking-order explanatory theory, demonstrating that companies in this sector follow a financing hierarchy, preferentially resorting to internally generated funds and external debt. Additionally, the results reveal that the capital structure of companies has changed due to the COVID-19 pandemic. As for the period of financial assistance, there are no major differences in evidence when the total debt ratio is considered. The results suggest different impacts when it comes to a bear market period caused by a health crisis or a period of growing economic slowdowns.

Originality/value: As far as we know, this is the first study that analyses the debt levels in the context of the health sector in a country with a financial system based on the bank sector, using short- and long-term debt ratios, taking into account the particularities of two different moments considered to be bear market that may eventually be useful for comparison with other bear market moments in other macroeconomic environments.

Keywords: Debt, Covid-19, Financial Crisis, GMM system, Health sector.

¿Qué factores impactan los niveles de deuda en el sector salud? Evidencia de un país orientado al sistema bancario

Resumen

Propósito: El objetivo principal de este estudio es examinar los determinantes del nivel de endeudamiento en el sector de la salud en Portugal, teniendo en cuenta los efectos de la pandemia de COVID-19. Al mismo tiempo, se intenta comprender si el efecto de una crisis pandémica es similar al de una crisis financiera.

Diseño/metodología/enfoque: Para lograr este objetivo, se analizaron dos subperíodos: un período global entre 2011 y 2020 que incluye la crisis pandémica y el período entre 2011 y 2014, designado como el período de asistencia financiera por la "Troika" en Portugal. Para una muestra de 514 empresas pertenecientes al código NACE: 86100 - Actividades del sector de la salud con hospitalización, se aplicó la metodología de datos de panel, específicamente, el método generalizado de momentos (GMM)-sistema propuesto por Arellano y Bover (1995) y Blundell y Bond (1998).

Hallazgos: Los resultados del estudio están en línea con la teoría explicativa del "Pecking-order", demostrando que las empresas en este sector siguen una jerarquía de financiamiento, recurriendo preferentemente a fondos generados internamente y deuda externa. Además, los resultados revelan que la estructura de capital de las empresas ha cambiado debido a la pandemia de COVID-19. En cuanto al período de asistencia financiera, no hay diferencias significativas en la evidencia cuando se considera la proporción total de deuda. Los resultados sugieren impactos diferentes cuando se trata de un período de mercado bajista causado por una crisis de salud o un período de crecimiento económico más lento.

Originalidad/valor: Hasta donde sabemos, este es el primer estudio que analiza los niveles de deuda en el contexto del sector de la salud en un país con un sistema financiero basado en el sector bancario, utilizando ratios de deuda a corto y largo plazo, teniendo en cuenta las particularidades de dos momentos diferentes considerados como momentos de mercado bajista que eventualmente pueden ser útiles para comparar con otros momentos de mercado bajista en otros entornos macroeconómicos.

Palabras clave: Deuda, Covid-19, Crisis Financiera, Sistema GMM, Sector de la Salud.

Que fatores afetam os níveis de dívida no setor da saúde? Evidência num país orientado à banca

Resumo

Objetivo: O principal objetivo deste estudo é examinar os determinantes do nível de endividamento no setor de saúde em Portugal, levando em consideração os efeitos da pandemia de COVID-19. Ao mesmo tempo, tenta-se compreender se o efeito de uma crise pandêmica é semelhante ao de uma crise financeira.

Design/metodologia/abordagem: Para atingir esse objetivo, foram analisados dois subperíodos: um período global entre 2011 e 2020, que inclui a crise pandêmica, e o período entre 2011 e 2014, designado como o período de assistência financeira pela "Troika" em Portugal. Para uma amostra de 514 empresas pertencentes ao código NACE: 86100 - Atividades do setor de saúde com hospitalização, foi aplicada a metodologia de dados em painel, especificamente o método generalizado de momentos (GMM)-sistema proposto por Arellano e Bover (1995) e Blundell e Bond (1998).

Resultados: Os resultados do estudo estão de acordo com a teoria explicativa da ordem de preferência ("Pecking-order"), demonstrando que as empresas neste setor seguem uma hierarquia de financiamento, recorrendo preferencialmente a fundos gerados internamente e dívida externa. Além disso, os resultados revelam que a estrutura de capital das empresas mudou devido à pandemia de COVID-19. No que diz respeito ao período de assistência financeira, não há diferenças significativas na evidência quando se considera a proporção total de dívida. Os resultados sugerem impactos diferentes quando se trata de um período de mercado em baixa causado por uma crise de saúde ou um período de desaceleração econômica.

Originalidade/valor: Até onde sabemos, este é o primeiro estudo que analisa os níveis de dívida no contexto do setor de saúde em um país com um sistema financeiro baseado no setor bancário, utilizando índices de dívida de curto e longo prazo, levando em consideração as particularidades de dois momentos diferentes considerados como momentos de mercado em baixa que eventualmente podem ser úteis para comparação com outros momentos de mercado em baixa em outros ambientes macroeconômicos.

Palavras-chave: Dívida, Covid-19, Crise Financeira, Sistema GMM, Setor de Saúde.

1- Introduction

The theory of capital structure and its association with corporate performance and value has been an important issue in corporate finance literature since the Modigliani and Miller (1963) propositions. Currently, it is exalted that the capital structure of a company is a combination of debt and equity that make up the sources of corporate assets (Boateng *et al.*, 2022; Pouraghajan and Malekian, 2012).

In global crisis periods, the combination between borrowed capital and equity capital can be significantly changed, which is why we focused our study on this research topic (Coyne, 2011; Reddy *et al.*, 2022; Vo *et al.*, 2022).

In the middle of the 21st century, a pandemic crisis began, COVID-19, which influenced society and economies worldwide. On March 2, 2020, Portugal registered the first case associated with the Covid-19 outbreak. On March 11, the WHO (World Health Organization, 2020) declared the disease an international pandemic (WHO, 2020). This pandemic forced governments, globally, to announce confinement measures that triggered several repercussions on the world's economies (Vo *et al.*, 2022). Regarding the health sector, the covid-19 crisis showed an inability of hospitals to respond to the increase in the number of cases and the wear and tear of health professionals, also providing an opportunity to create online consultations and monitor patients from a distance (e.g., Yadaw *et al.*, 2020). During this period, and due to this overload on the health system, with increased expenses due to higher staffing costs, supply needs, and expensive intensive care units, investors were very concerned about the sustainability of this sector (Colenda *et al.*, 2020). However, the health sector was the first sector to receive additional government financial resources (Šimović *et al.*, 2021). In Portugal, the pandemic has substantially increased the need for financial resources in hospitals, since one hospitalized patient with covid is equivalent to the treatment of three patients with other pathologies (Seringa *et al.*, 2021). In Portugal, the national health system is public and profit is not its main objective, however, it is crucial to ensure financial sustainability and debt growth can expose this sustainability (Matos *et al.*, 2021).

Although the issue of debt in companies has been widely studied, this topic remains open, lacking studies on the effects of a crisis whose origin is not manipulation of results or bank failures, but arising from problems with public health. This article studies the determinants of debt for a large number of Portuguese hospitals, including the effects of Covid in this sector.

In this sense, three debt ratios of companies were studied using some traditional determinants considering Covid-19 and Troikas[1] period.

The study covers the period between 2011 and 2020, including the year in which the greatest consequences of the Covid-19 pandemic occurred. In addition, this work also studied the period from 2011 to 2014, which became known as the period of the Troika in Portugal to help to balance public accounts and increase competitiveness in Portugal, as a necessary condition for the cash loan of 78 billion euros that these three entities granted to the Portuguese State.

The article is organized as follows: Section 2 presents the literature review and hypothesis. Section 3 highlights the research design. Section 4 presents a discussion of the result. Finally, the conclusions are presented in section 6.

[1] The Troika is made up by International Monetary Fund, the European Commission, and the European Central Bank

2. Literature Review and Hypotheses

2.1 Company-specific characteristics

2.1.1. Companies' Size

The company's size is a crucial factor in corporate performance because this company-specific characteristic shows the company's reputation value and can be used to evaluate firm growth (Serrasqueiro and Nunes, 2008; Neves *et al.*, 2020; Neves *et al.*, 2022a).

The literature grants different signs and significance between size and debt levels (López-Gracia and Sogorb-Mira, 2008; Neves *et al.*, 2022b, Neves *et al.*, 2023). Since Kraus and Litzenberger (1973), with their Trade-off theory, several authors showed a positive relationship between company size and debt, given that larger companies have less information asymmetry and, consequently, incur lower risks of bankruptcy (Serrasqueiro, 2008). The positive relationship is based on the argument that debt helps solve free cash flow problems, in large companies (Santos *et al.*, 2014). A larger company provides more information (Santos *et al.*, 2014), is more diversified, and consequently benefits from lower spreads (Rajan and Zingales, 1995). Matias and Serrasqueiro (2017) also conclude that there is a positive relationship between company size and the three debt ratios (global debt ratio, long-term, and short-term debt ratio).

On the other hand, Acaravci (2015) identified a negative relationship between company size and debt, supported by the Pecking-order Theory. That means a greater accumulation of profits and thus a greater preference for self-financing. Neves *et al.* (2020), and Proença *et al.* (2014) recognize a negative relationship between short-term debt and size, and a positive relationship between medium and long-term debt.

Based on the literature, we propose the first hypothesis with no predicted signal:

H1: Company size influences the company's debt levels.

2.1.2. Tangibility

Companies with more fixed assets are usually more mature and with transparency of information and may have more debt, namely long-term (Datta, et al., 2019). Tangible fixed assets serve as collaterals which makes them valuable from the perspective of the creditor (Santos *et al.*, 2014). Consequently, the risk of default and the associated financial costs decrease, which makes companies more likely to resort to external funding sources (Dasilas and Papasyriopoulos, 2015). The positive relationship is under the Trade-Off theory and follows Rajan and Zingales (1995). Jorge and Armada (2001) and Öhman and Yazdanfar (2017) suggest a positive relationship between medium and long-

term debt and a negative relationship with short-term debt as tangible assets are not needed as collateral for short-term loans (Ortiz-Molina and Penas, 2008).

However, Neves *et al.* (2020) found this positive relationship between short-term debt and tangibility because the banks require more valuable collaterals from riskier companies (Esperança *et al.*, 2003).

Degryse *et al.* (2012) also find a positive relationship between tangibility and debt, since these assets are given as collateral to creditors, mitigating agency problems, asymmetric information, costs of bankruptcy, credit risk, and moral hazard (Frank and Goyal, 2009). On the other hand, Matias and Serrasqueiro (2017), Serrasqueiro (2011), and Serrasqueiro *et al.* (2016) showed a negative relationship between tangibility and debt, justifying that companies with more tangible assets use more internal funds instead of debt, giving greater financial flexibility. Following the literature our hypothesis is with no predicted signal:

H2: Tangibility influences the company's debt levels.

2.1.3. Social expenses

Social spending is on the one hand associated with higher costs, however, it also serves as a lever for employee motivation and performance. (Cancela et al., 2020). Literature has studied the relationship between social expenses and debt but the results are inconclusive.

On the one hand, the negative relationship between debt and social expenses is argued by Michaels *et al.* (2019), and Seo *et al.* (2019). The authors admit that this relationship is related to the fact that social spending directly affects the company's earnings. Following the authors, if this pre-tax expense is not compensated by the contribution margin, then the expense of social expenses will affect the company's operating profit. Therefore, this expenditure can act as a substitute for the corporate debt tax shield, especially when the level of corporate debt is relatively low. The negative relationship is in line with the Trade-off theory. Moreover, companies with more debt may not have funds available to pay higher wages (Seo *et al.*, 2019).

On the other hand, Berk *et al.*, (2010) show a positive relationship, according to the Pecking-order theory. The author states that the greater the increase in employee costs and if revenue growth does not follow, the company loses the financial capacity to generate internal funds and needs to resort to external debt to meet its responsibilities.

Also, companies with more debt can pay their employees more if they need to hire employees in a very competitive job market (Baghai *et al.*, 2021).

Other studies show that the relationship can vary depending on the unemployment rate (Akyol and Verwijmeren, 2013). Thus, the hypothesis proposed with no predicted signal:

H3: Social expenses influence the company's debt levels.

2.1.4. Profitability

A positive relationship between profitability and indebtedness is supported by the Trade-off theory, in the sense that the increase in debt increases the tax benefits associated with issuing foreign debt and reduces the burden of interest incurred; companies able to generate more profits, lessen the problems associated with bankruptcy costs (Jensen and Meckling, 1976).

According to the agency theory by Jensen and Meckling (1976), debt serves as a control mechanism, since shareholders limit the abusive use of resources by managers. However, the same authors state that indebtedness gives rise to a new conflict of interest between shareholders and creditors, insofar as the greater recourse to debt increases the risk for the creditor, who in case of default assumes the costs (Myers, 2001). Neves and Branco (2020) emphasize that when creditors perceive that they are exposed to greater risk, they demand higher remuneration rates and/or financing contracts that allow them to reduce the risk. In this way, it is expected that short-term indebtedness, given that it requires greater monitoring and a greater frequency of renegotiation of contracts, may be the solution for reducing agency conflicts between shareholders and creditors. Moreover, Deesomsak *et al.* (2009), Delcoure (2007), Nunkoo and Boateng (2010), found a positive effect between profitability and debt levels, as the more profitable companies have lower financing costs in the event of financial difficulty, leading to greater indebtedness.

On the other hand, companies with higher profitability prefer to finance their needs using accumulated funds, before issuing debt, following the pecking order theory (Handriani and Robiyanto, 2018). The origin is to reduce information asymmetry and reduce transaction costs, making companies prefer internal sources of financing to take advantage of future investment opportunities. (Yildirim *et al.*, 2018). Abel (2018); Gebauer *et al.* (2018), and Panda and Nanda (2018) also found a negative relationship between profitability and debt, justifying this result with the Pecking-order theory. Tekin (2019) states that companies with higher profits generate more funds internally, using less debt. Therefore, our hypothesis is with no predicted signal.

H4: Profitability influences the company's debt levels.

2.1.5. Current ratio

The current ratio is the balance between resources and short-term responsibilities, in which a company can easily transform certain assets into liquid financial resources (Öhman and Yazdanfar, 2017). Thus, a negative relationship between liquidity and debt is expected, since companies with higher liquidity ratios prefer internal funding sources to finance their activity, rather than external debt. (Neves *et al.*, 2020).

Mateev *et al.* (2013) and Serrasqueiro *et al.* (2016) established that the increase in corporate liquidity, allows the company to ensure the ability to generate more internal funds. Consequently, companies avoid using external debt, not only because of the higher cost but also because of the greater associated risk (Lipson and Mortal, 2009). The negative relationship is supported by the arguments of the pecking-order theory (Neves *et al.*, 2020). Moreover, companies with greater liquidity will have less debt to protect the interests of investors (Danso *et al.*, 2020). Chaklader and Chawla (2016), Chakrabarti and Chakrabarti (2019), Ibrahim and Lau (2019) and Pathak and Chandani (2021) also found a negative relationship.

However, Dakua (2019) establish that there is also a positive relationship. The authors argue that although current assets are greater than current liabilities, the company expresses interest in increasing its debt, due to the lack of receipts from customers (long average receipt period) in the perspective to maintain a good relationship with suppliers. Degryse *et al.* (2012), and Vo (2017), based on the Trade-off theory, concluded that companies with high levels of liquidity have a good financial capacity to support more debt and manage better the problems of free cash flow, which are considered as the benefits of debt. Serrasqueiro *et al.* (2016) point out a positive relationship between liquidity and long-term debt, concluding that companies with greater liquidity will be those that are better able to pay off the debt in the long term. Considering the literature, the following hypothesis is proposed (with no predicted signal):

H5: Current ratio influences the company's debt levels.

2.2. Macroeconomic Determinants

2.2.1. Gross Domestic Product

Gross domestic product (GDP) is used to measure growth over a given period country. Several empirical studies argue for a negative relationship between debt and GDP (Panda and Nanda, 2020; Riaz *et al.*, 2014; Tekin, 2019; Yildirim *et al.*, 2018). A growing economy translates into GDP growth, which leads companies to be able to increase their

internal profits and, thus, give preference to self-financing rather than the need to resort to external debt. The negative relationship is in line with the Pecking-order theory.

However, in the literature, the existence of different relationships is also verified. For example, De Jong *et al.* (2008), Frank and Goyal (2009), Mirza *et al.* (2017), Pathak and Chandani (2021), found a positive relationship between debt and GDP. In the case of economic prosperity, as the GDP increases, the companies where they carry out their activity have greater access to external financing to meet their needs. Based on the presented arguments, we formulated the following hypothesis (with no predicted signal):

H6: GDP influences the company's debt levels.

2.2.2. Covid-19 pandemic

The coronavirus disease 2019 (COVID-19) posed challenges to organizations that were forced to adjust their activity (Reis and Soares, 2022). One of the reorganizations that companies made was related to the use of debt. The literature shows that companies increased their debt during the COVID-19 crisis (Acharya and Steffen, 2020; Halling *et al.*, 2020; Li *et al.*, 2020) since in periods of greater uncertainty and crisis, organizations are more cautious and intend to have cash reserves to face uncertainty (Boileau and Moyen, 2016; Duong *et al.*, 2020).

However, analyzing other periods of crisis, the literature shows a different impact on the debt. Economic crises reduce the activity of companies, as a result of the loss of purchasing power, and lead to less funding for organizations by banks to face uncertainty (Coyne, 2011). Proença *et al.* (2014) show that economic crises have a negative relationship with the indebtedness of companies since companies will have more difficulties in paying their debts due to the reduction of cashflows to these payments.

Concerning the hospitals, there was an increase in expenses due to higher staffing costs, supply needs, and expensive intensive care units, which can lead to more debt (Colenda *et al.*, 2020).

The scarcity of studies leads us to pose the following hypothesis with no predicted signal:

H7: Covid-19 influences the company's debt levels.

3. Research Design

3.1 Sample

This study comprises 514 Portuguese companies in the health sector from 2011 to 2020. The companies, belonging to NACE code: 86100 – Activities of the health sector with hospitalization.

We have collected accounting data from SABI - Bureau van Dijk; GDP was collected from the Instituto Nacional de Estatística (INE) database. Our models were tested by using the STATA 16 software.

3.2 Variables

3.2.1 Dependent Variables

Table 1 presents the dependent variables used as measures of corporate performance

[Insert Table 1 here]

3.2.2 Independent Variables

Table 2 grants the explanatory variables used in the literature review.

[Insert Table 2 here]

3.3 Models and estimation Method

Following Neves (2018), the methodology used to test the hypotheses was the Generalized Method of Moments (GMM)-system, also known as GMM Dynamic Estimator, developed by Arellano and Bover (1995) and Blundell and Bond (1998) who argue that this method cancels out unobservable effects, despite the existence of omitted variables, enhancing the reliability of the results. In particular, the GMM system[2] uses instrumental variables with lagged values of the dependent variable, as well as lagged values of independent variables that could potentially suffer from endogeneity. The main benefit of this method is to correct somewhat endogeneity problems. According to Arellano and Bond (1991), the use of panel data analysis has other advantages, such as the greater amount of information available, the control of endogeneity, greater control of possible collinearity between independent variables, and minimization of the problem of the neglect of explanatory variables. The GMM Dynamic Estimator makes it possible to observe the impact/effect of independent variables on the decision on the capital structure of companies, as well as the level of significance of these relationships.

To validate the models, the Wald test was used, which checks whether the coefficients of the variables are jointly different from zero. The second test proposed was the Sargan

[2] Specifically, we have used Stata 16 software with the command "xtdpdsys".

test, which verifies the independence of the variables with the error term, thus realizing whether the instruments are valid. Finally, we perform autocorrelation tests of first and second-order errors (m1 and m2).

The models to be tested are the following:

Total period:

Model 1

$$DEB_{it} = \beta_1(DEB)_{it-1} + \beta_2(Size)_{it} + \beta_3(Tang)_{it} + \beta_4(SE)_{it} + \beta_5(ROE)_{it} + \beta_6(CR)_{it} + \beta_7(GDP)_{it} + \beta_8(COVID)_{it} + \mu_{it} + v_i$$

Model 2:

$$DEBMLT_{it} = \beta_1(DEBMTL)_{it-1} + \beta_2(Size)_{it} + \beta_3(Tang)_{it} + \beta_4(SE)_{it} + \beta_5(ROE)_{it} + \beta_6(CR)_{it} + \beta_7(GDP)_{it} + \beta_8(COVID)_{it} + \mu_{it} + v_i$$

Model 3:

$$DEBST_{it} = \beta_1(DEBST)_{it-1} + \beta_2(Size)_{it} + \beta_3(Tang)_{it} + \beta_4(SE)_{it} + \beta_5(ROE)_{it} + \beta_6(CR)_{it} + \beta_7(GDP)_{it} + \beta_8(COVID)_{it} + \mu_{it} + v_i$$

DEB_{it}, $DEBMLT_{it}$ and $DEBST_{it}$ are the dependent variables that correspond to the three ratios of total debt, medium and long term and short term, respectively. The independent variables are: $Size_{it}$ – Companies size; WC_{it} – Working capital; $Tang_{it}$ – Tangibility of assets; SE_{it} – Social expenses; ROE_{it} - Return on Equity ratio; CR_{it} - Current Ratio; GDP_{it} – GDP variation; $COVID_{it}$ – Dummy variable (in Covid year); μ_{it} – error random component; v_i – error individual effect; i – Companies and t – Years.

The error term has two components: v_i, an individual unobservable effect (organization-specific and time-invariant), possibly correlated with covariates, and u_{it}, unobservables that are not correlated with the model's explanatory variables.

The 3 models for the Troika period are the same, they just do not include the dummy variable covid.

4. Results and Discussion

4.1 Descriptive Statistics

Table 3 aims to summarize descriptive statistics for variables

[Insert Table 3 here]

Table 2 shows that both the dependent and independent variables have positive values. The average of the companies' total indebtedness is around 44% (as the variable is logarithmized, taking the inverse yields e^3.786159=44%), which indicates that Portuguese companies in the health sector constitute borrowed capital as a weight in their capital structure.

Regarding the independent variables, it should be noted that ROE is the variable with the highest average. Suggesting that there may be some imbalance in debt management as a financial leverage effect.

To assess multicollinearity, VIFs were calculated, and on average, the value is less than 10, which leads to the conclusion that there is no multicollinearity (Table 8 in Appendix).

4.2 Results

Table 4 points out the results of estimation models for the global period.

[Insert Table 4 here]

From the reading of table 4, it is highlighted that for the three debt ratios, the previous year's indebtedness positively conditions the current year's indebtedness.

Regarding the impact of Covid-19 on indebtedness, it appears that in 2020, the year of the most harmful consequences of the pandemic, medium, and long-term indebtedness increased, which is not surprising given the large influx of patients in hospitals and the continuous need for expensive new equipment. This outcome corroborates our hypothesis 7 according to Acharya and Steffen (2020). This result is also consistent with the objective for tangibility and company size since more investments lead to more debt both total and long term. These results corroborate hypotheses 1 and 2 in agreement with Degryse *et al.* (2012) and Matias and Serrasqueiro (2017), respectively.

But if Covid-19 led to more long-term debt, short-term debt did not. This result was because the Portuguese government immediately helped these institutions financially. It should be noted that much more beds, staff, and clinical consumables were needed. It was also necessary for the intervention and help of the armed forces and large improvised tents to accommodate and assist patients with serious respiratory crises. The Portuguese Government financed most of these expenses, in a very short period, both in public and private hospitals.

It is also noted that social spending led to more total and long-term debt to motivate workers who worked longer hours than usual. This result allows for corroborating

hypothesis 3 according to Baghai *et al.* (2021) with the argument of the pecking-order theory. The positive relationship with indebtedness can also be explained by a company's concerns with its employees and with the economy itself since better wages presuppose greater purchasing power and more equity and social justice. Here, too, in the short term, this was not noticed because there was direct and immediate intervention by the Portuguese government.

We also emphasize the negative sign for the three debt-to-liquidity ratios. This result corroborates our hypothesis 5 according to Neves *et al.* (2020) supported by the pecking-order theory once again.

The negative relationship between ROE and medium and long-term debt corroborates hypothesis 4 and the assumptions of the Pecking-order theory. The positive relationship with short-term debt can be explained by the ease of use and/or amortization of short-term debt (Dasilas and Papasyriopoulos, 2015), as well as the reduced risk for the creditor associated with this category of contracts, thus reducing agency costs problems.

[Insert Table 5 here]

Regarding the comparative analysis of the two periods, we can see that the total indebtedness levels of the previous year positively influence those of the current year, suggesting that the health sector is permanently indebted regardless of the periods considered. It should be noted, however, that in the period of the troika's intervention in Portugal, the higher the GDP, the lower the need for indebtedness. Perhaps this result is justified by the weak economic growth of this period of financial assistance and the limitations imposed by the Troika on the banks to the indebtedness without collateral. Social spending is seen as an added burden on the costs of these companies, leading to higher levels of indebtedness. Staff working in hospitals, namely doctors and nurses, have been demanding better working conditions and wages for several years and this has led to higher levels of debt, on an ongoing basis.

For both periods, the larger hospitals, the greater the total debt, given the need for more material and human investments. The results also emphasize that the higher the liquidity levels, the less the need to resort to credit, which may suggest some financial imbalance in these institutions that use short-term liquidity to assume other types of commitments.

Finally, concerning the variable of total indebtedness, it is noted that the ROE has no meaning in any of the periods, which may suggest that the levels of return on equity are

not met when contracting debt. Probability levels in this sector are probably not enough to curb total indebtedness.

Regarding long-term indebtedness, the same sign and significance obtained in the total indebtedness variables stand out for the variables of the previous year's indebtedness and social spending. Also in the Troika period, it is noted that the mismanagement of current assets could be a problem given the negative sign of liquidity with long-term debt levels. Also noteworthy is the fact that in the Troika period, the number of significant variables is smaller when both the dependent variable of medium and long-term debt and short-term debt are used.

In the appendix, in Table 6, we conducted new estimations for the period 2011 to 2019 to assess the impact of the year 2020, by comparing it to Table 4. Thus, it is concluded that the size of organizations during the COVID period had a positive influence on the total debt, in contrast to what was observed in the period from 2011 to 2020. This conclusion also applies to medium and long-term debt since, before COVID-19, a larger size implied less medium and long-term debt, while during the COVID-19 period, it implied more debt due to increased infrastructure, medical equipment, and associated liabilities. Regarding short-term debt, before COVID-19, higher social expenditures led to more debt, whereas during COVID-19, it resulted in less debt, suggesting a greater concern for employee well-being before the pandemic.

We also conducted a robustness analysis, considering the squared size variable. Based on the results presented in Table 7 in the appendix, it was concluded that a non-linear relationship is observed only between size and short-term debt. This implies that beyond a certain size, debt starts to decrease, as larger organizations rely more on self-financing than short-term debt.

5. Conclusions

This paper aimed to study some of the internal and external determinants of the indebtedness of Portuguese companies in the health sector. For this purpose, a global period from 2011 to 2020 was considered, which includes the covid- 19 pandemic and the designated period of financial intervention by the Troika, between 2011 and 2014.

For a sample of 514 companies, the panel data methodology was used and the results generally show that there are no significant differences in the two samples when the total

debt ratio is used. The degradation of the Portuguese economy and the arrival of the Troika in the spring of 2011 had no major impact on the determinants of total debt.

The effect of the pandemic crisis raises major challenges for the manager, the growing need for new expensive equipment given the large influx to emergencies and intensive care help to explain the positive relationship between long-term debt and the binary variable Covid. In the short term, however, the negative sign shown by the results is related to rapid state intervention in the sector to prevent more deaths. These findings are linked to the fact that more investments in tangible assets and larger companies lead to more total and long-term debt.

The results also underline that the higher the liquidity levels, the less the need to resort to credit, which may suggest some financial imbalance in these institutions that use short-term liquidity to assume other types of commitments.

Our results suggest that the impact of a health crisis is not the same as another crisis caused by weak macroeconomic fundamentals.

Theoretical implications

This work sought to increase the literature on the subject, in a sector of high public interest but still little explored. Academics can find support here for future research that will help to better understand the effects of health crises and other market crises on the indebtedness of this type of company.

Practical implications:

Managers can understand the impact of their internal decisions on debt levels;

Managers, investors, and civil society realize that the impact of a health crisis on the debt levels of companies in the health sector is different from the impact that internal and external variables have when facing another type of bear market caused by a severe slowdown of the economy.

The main limitations of this study are related to the impossibility of obtaining complete data for all the variables under study, as well as the scarce literature in this sector, for countries with characteristics similar to those of Portugal, a banking-oriented country.

For future research, it would be interesting to divide the health sector into the public sector and the private sector, to analyze to what extent the capital structure decisions differ in this sector of particular interest around the world.

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