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RESILIENCE OF ORGANISATION CAPITAL ON FIRMS' PERFORMANCE AMID CRISIS

LI XIAN LIU[1*], **ZHIYUE SUN**[2]

1. James Cook University, Australia.
2. Curtin University, Australia.

* Corresponding Author: Li Xian Liu, College of Business, Law & Governance, James Cook University, 1 James Cook Drive, Douglas, 4811, Townsville, Queensland, Australia.
☎ +61 (7) 4781 4037 ✉ li.liu1@jcu.edu.au

Abstract

Drawing on the concept of organisation capital as an intangible asset perspective, we examine the relationship between organisation capital and Australia firms' performance and its moderating effects during the last two crisis periods, i.e., Global Financial Crisis (GFC) and COVID-19. We find that higher investment in organisation capital will result in lower drops in firm's performance. Long-term investment in organisation capital would help to improve firm's performance and mitigate the Changes in ROA in crisis. A resilience picture through organisation capital is pictured.

Keywords: organisation capital, crisis resilience, drops in firm performance, firm-specific crisis severity

1. Introduction

The recent COVID-19 crisis has instigated economic disruptions that affected nearly every aspect of life more than that during the 2008/09 Global Financial Crisis (GFC), posing a direct threat to business in different societies by both public and private organisations. Operating in a more volatile and dynamic environment more than ever, survival and growth become a central goal for most businesses. It raises questions such as: What practices should business organisations possess to survive this adverse environmental condition? Can we plan-ahead to preserve performance and weather the next crisis? The last two crises (GFC, COVID-19) and their severe economic and social consequences provide a unique setting to examine the organisation capital and their impact on businesses' resilience, sustainability, and competitiveness through difficult times.

Much research has been conducted to explain what we know about the crisis-organisation interaction and how to develop organisational resilience to respond to adversity but also to mitigate it before it arises (Williams, Gruber, Sutcliffe, Shepherd, & Zhao, 2017). The term resilience was first used by Holling's (1973) work on ecological systems and then used in different contexts (such as physical systems, socioecological systems, psychology, and disaster management) to outline the ability of a system to return to a steady state after disruption (Delilah Roque, Pijawka, & Wutich, 2020). Aside from the environmental and physical dimensions that resiliency theory focuses on, studies of organisational resilience have also been developed. Organisational resilience is defined as the ability to absorb strain and preserve, to survive, adapt and grow (or improve) functioning in the presence of turbulent changes that may threaten organisation survival (Cumming et al., 2005; Fiksel, 2006; Lengnick-Hall, Beck, & Lengnick-Hall, 2011; Ponis & Koronis, 2012; Sutcliffe & Vogus, 2003), which has been a newer tradition in management theory that incorporates insights from both coping and contingency theories (Koronis & Ponis, 2018). Myer and Moore (2006) (p. 143) indicate that there is a

"reciprocal effect of crises on individuals and organisations. If these relationships are supportive, the impact of the crisis can be reduced; if they are obstructive, the impact has the potential to be severe". Therefore, organisational resilience is the ability to absorb crisis, trauma or radical change and maintain or exceed the previous performance levels (Horne III, 1997).

The 1990s organisational resilience studies focused on the individual resilience of employees (Doe, 1994; Egeland, Carlson, & Sroufe, 1993), and the collective actions of employees that constitute the organisational response to change (Home III & Orr, 1997). Concepts of resilience at the organisational level expands in the 2000s (Caralli, 2006; Gunderson, 2000; Myer & Moore, 2006; Riolli & Savicki, 2003; Sundström & Hollnagel, 2017). Facing with the environment of uncertainty and unpredictability, contributions to corporate resilience and growth include increased buffering capacity (Gunderson, 2000); strong relational assets such as financial reserves (Gittell, Cameron, Lim, & Rivas, 2006); increased preparedness (Koronis & Ponis, 2018), good governance and balanced growth (Carmeli & Markman, 2011), and investment in intangible capital (Haskel & Westlake, 2017).

Organisation capital as one of the prominent components of the intangible assets of the economy has documented the strong complementarity between organisation and knowledge capital in improving firm (and national) innovation, growth, and competitiveness (Bresnahan, Brynjolfsson, & Hitt, 2002; Brynjolfsson, Hitt, & Yang, 2002). Lev, Radhakrishnan, and Zhang (2009) also show that organisation capital is a persistent creator of value and growth for business enterprises. They also suggest that the contribution made by organisation capital is generally manifested in sustained growth in sales, earnings, and market value. Uddin, Hasan and Abadi (2022) also find that firms' intangibles such as internally generated organisation capital could provide resilience to pandemic shocks from infectious diseases. However, the impact of organisation capital on performance and its resilience benefit during crisis periods still remain under-developed. Considering this gap in the literature, in this study we investigate whether organisation capital can act as a resilience driver to enhance the survival and recovery of organisations from the emerged crisis such as COVID-19 with the use of an Australian sample. Our contributions can be summarised as follows. First, we contribute to the literature gap by providing further evidence on the organisational resilience benefits provided by organisation capital. Second, to the best of our knowledge, there has been no study focusing on the benefits of organisation capital to Australian firms during a crisis environment. Australia provides an intriguing case study in relation to the global economic crisis. It has been claimed to have withstood the global financial crisis remarkably well, given the source of numerous laudatory statements by government officials (Hill, 2012). For example, in 2008, the Governor of the Reserve Bank of Australia commented, that "there would be very few countries, if any, which would not envy Australia's fiscal position." This statement is supported by the following Australian economic growth after the global financial crisis. In the March quarter of 2009, the Australian economy grew by 0.4 per cent. In contrast, all the G7 economies contracted in the March quarter and as a group by 2.1 per cent. Out of 33 advanced economies, only two managed to grow in the March quarter (Gruen, 2009). In addition, Australia has a diverse economy with significant sectors like mining, agriculture, manufacturing, services, and finance. It is an entrepreneurial nation, with small and medium businesses playing a significant role in Australian growth and job creation (Bloch & Bhattacharya, 2016). Therefore, studying its experiences can provide valuable lessons for policymakers and researchers globally in managing and mitigating the impact of economic crises.

This paper is designed as follows. Section 2 discusses the data sample and methodology. Section 3 presents our key empirical results. Section 4 concludes.

2. Data, variable description, and method

2.1 Data and sample

Our sample consists of 18,995 firm-level yearly observations listed on Australian Stock Exchange over the period from 2000 to 2023, covering 1,389 firms. Data were retrieved from Compustat Global via Wharton Research Data Services (WRDS) platform and LSEG Refinitiv Workspace. All financial firms are excluded. We winsorise all continuous variables at the top and bottom 1%.

2.2 Measurement of key variables

Firm performance

Changes in ROA (or Δ_{ROA}) and revenue growth (or REVG) have been used as dependent variable following the study of post-shock studies such as the 2008/09 global financial crisis (Buyl, Boone, & Wade, 2019). We assess Changes in ROA based on yearly ROA and is therefore operationalised as a company's performance (ROA) in the current financial year (i.e. time t) minus its performance in the previous financial year (i.e. time t-1). Revenue growth is computed as the percentage change in sales revenue from the previous year to the current year (i.e. from time t-1 to time t). As ROA is considered an accounting measure (or an ex-post approach to capture firm performance) which may fail to capture the future prospects of firms, we also include changes in Tobin's q (or $\Delta_{Tobin's\ q}$) from time t-1 to time t as an alternative dependent variable to take into account investors' future expectations and thus being considered as an ex-ante approach to reflect firm performance. Tobin's q is computed based on the following equation:

$$Tobin's\ q = \frac{Total\ Assets - Book\ Value\ of\ Equity + Market\ Value\ of\ Equity}{Total\ Assets} \quad (1)$$

Organisation capital

Lev and Radhakrishnan (2005); (Lev et al., 2009) use selling, general, and administrative (SG&A) expenditures as a direct measure of organisation capital (or OC). The empirical validation of organisation capital performed by Eisfeldt and Papanikolaou (2013) is supported by their analysis that Tobin's Q, executive compensation, and labour expense per employee are all monotonically increasing in organisation capital, consistent with higher organisation capital firms depending on more skilled employees and generating more output relative to their recorded assets.

So, a firm's level of organisation capital in each year is constructed as the accumulation of the depreciated value of its organisation capital in the previous year and the contemporary deflated values of SG&A expenses.

It is computed following Lev and Radhakrishnan (2009) and Eisfeldt and Papanikolaou (2013):

$$OC_{i,t} = OC_{i,t-1}(1 - \delta_0) + \frac{SGA_{i,t}}{cpi_t} \quad (2)$$

Where:

- $OC_{i,t}$ (and δ_0) denote the firm-specific stock of organisation capital at time t (and depreciation rate of OC).

- SGA is SG&A (selling, general, and administrative expenses).
- cpi_t is the consumer price index at time t.

The initial stock of organisation capital is estimated as the initial SG&A expense divided by the sum of the growth rate and the depreciation rate:

$$OC_{i,t0} = \frac{SGA_{i,t0}}{g+\delta_0} \quad (3)$$

Where:

- t_0 is initial year for the firm in the sample.

A 20% depreciation rate (δ_0), a growth rate (g) equals to 10% are chosen following Eisfeldt and Papanikolaou (2013)'s and Allen's (2022) studies. Zero or missing values of SG&A have been removed from the sample. Organisation capital is further scaled by total assets to make it comparable across firms.

Firm-specific crisis severity

Following Osiyevskyy, Shirokova, and Ritala (2020), the firm-specific crisis severity is estimated as the changes in two-year revenue between the crisis years (2020, 2021) and the pre-crisis years (2019, 2018) as below. The same method is applied to the 2008/09 global financial crisis.

$$Firm-specific\ crisis\ severity = 1 - \frac{Revenue_{2020}+Revenue_{2021}}{Revenue_{2019}+Revenue_{2018}} \quad (4)$$

The positive values on this variable suggest that during the crisis years, the firm suffered a drop in revenue (i.e. $\frac{Revenue_{2020}+Revenue_{2021}}{Revenue_{2019}+Revenue_{2018}} < 1$). The negative values on this variable suggest that the firm was growing despite the overall economic downturn (i.e. ($\llbracket . \frac{Revenue_{2020}+Revenue_{2021}}{Revenue_{2019}+Revenue_{2018}} > 1$). If there is no change in revenue, the crisis severity variable equals zero (i.e. ($\llbracket \frac{Revenue_{2020}+Revenue_{2021}}{Revenue_{2019}+Revenue_{2018}} = 1$).

To account for the possible factors that might affect the independent variables and the outcome variables, a set of relevant control variables are added. Table 1 presents the summary description of variable definitions.

Table 1: Variable Description

Variable	Definition
Dependent Variable	
Changes in ROA, Δ_{ROA}	Return on Asset (ROA) changes between time *t* and time *t-1*
Changes in Tobin's q, $\Delta_{Tobin's\ q}$	Tobin's q changes between time *t* and time *t-1*; Tobin's q is computed as (Total assets – book value of equity + market value of equity) / total assets
Revenue Growth, REVG	Revenue at time *t* relative to time *t-1*
Independent Variables	
Organisation Capital	It is measured as the stock of organisation capital scaled by total assets
Firm-specific Crisis Severity	Changes in two-year revenue between the crisis years (2020, 2021) and the pre-crisis years (2019, 2018)
GFC Crisis	A dummy variable that equals one if the year is 2008 or 2009, otherwise zero
Covid Crisis	A dummy variable that equals one if the year is 2020 or 2021, otherwise zero
GFC + Covid Crisis	A dummy variable that equals one if the year is 2008, 2009, 2020 or 2021, otherwise zero
Control Variables	
Firm Size	Natural logarithm of 1 plus the book value of assets.
Firm Age	Age is the age of the firm, which is calculated as the natural logarithm of 1 plus the number of years to 2023 that the company was first incorporated. Older firms might be more likely to acquire resources that help them manage negative events (e.g., human capital) (DesJardine et al., 2019)
Research & Development	Research and development expenditures to total assets
Capital Expenditure	Capital expenditures to book value of total assets
Leverage	Total long-term debt relative to total assets
Independent Board	Percentage of independent board members as reported by the company.
Chairman Duality	Does the CEO simultaneously chair the board or has the chairman of the board been the CEO of the company?
Average Board Tenure	Average number of years each board member has been on the board.

2.3 Modelling methods

Multinomial logistic regression analysis was performed to examine whether firm-specific characteristics, organisation capital and Changes in ROA can help distinguish the normal years and crisis years between 2000 and 2023. The equation can be formalised as below:

$$P(Y = j) = \frac{e^{W_j}}{1+\sum_{j=1}^{4} e^{W_j}} \quad (5)$$

Where:

- $W_j = \beta_{j0} + \beta_{j1}X_1 + \beta_{j2}X_2 \ldots + \beta_{jn}X_n$
- P(Y=j) represents the crisis years j (j=1 if is 2008, j=2 if it is 2009, j=3 if it is 2020, j=4 if it is 2021) is chosen against the normal or non-crisis years. The ranking of the crisis years does not imply an ordinal relationship or infer any economic ranking. Each crisis year is treated as a separate category.

A longitudinal panel data research design has been adopted to control endogeneity and unobserved heterogeneity. The Hausman test failed to reject the null hypothesis, indicating that the random-effect estimator was consistent and therefore appropriate. To account for heteroscedasticity and intragroup correlations, we clustered standard errors within the panel.

To test the impact of organisation capital on firm performance and whether organisation capital provides resilience benefits during the crisis periods, we construct the following equations as below:

$$\Delta_{ROA_{it}}/\Delta_{Tobin's\ q_{it}} = \alpha + \beta \times Independent\ variables_{it} + \gamma \times Control\ variables_{it} + \theta \times Corporate\ governance\ variables_{it} + \delta \times Interaction\ terms_{it} + \mu_j + \varepsilon_{it} \quad (6)$$

$$REVG_{it} = \alpha + \beta \times Independent\ variables_{it} + \gamma \times Control\ variables_{it} + \theta \times Corporate\ governance\ variables_{it} + \delta \times Interaction\ terms_{it} + \mu_j + \varepsilon_{it} \quad (7)$$

The dependent variables in Eq. (6) are Change in ROA and Change in Tobin's q, whereas the dependent variable in Eq. (7) is revenue growth. In Eq.(6), we include the following independent variables for our analyses: organisation capital, Global Financial Crisis (hereafter GFC) which is a dummy variable equals 1 if the year is 2008 or 2009, Covid dummy which is a dummy variable that equals 1 if the year is 2020 or 2021, and lastly Crisis dummy which is dummy variable that equals one if the year is 2008, 2009, 2020 or 2021 (i.e. GFC + Covid). In Eq. (7), we use firm-specific crisis severity and Crisis dummy as independent variables. We also include the interaction terms between organisation capital and different dummy variables (i.e. GFC, Covid, Crisis) in Eq. (6) and interaction term between organisation capital and firm-specific crisis severity in Eq.(7). We also include the following control variables in our analyses: firm size, firm age, R&D expenditures scaled by total assets, capital expenditure scaled by total assets, firm leverage and corporate governance variables such

as independent board members, chairman duality and average auditor tenure. i is the firm index, t is the year index and μ_j is the industry fixed effect. Variable definitions are listed in Table 1. In order to address heteroskedasticity and autocorrelation and potential endogeneity, Eqs. (6) and (7) are estimated based on the Cross-sectional Time-series Generalised Least Squares (GLS) method as our data structure is panel data.

3. Empirical results and discussion

3.1 Descriptive statistics

Descriptive statistics are summarised in Table 2. The mean value of the changes in ROA, changes in Tobin's q and revenue growth are 0.707, 0.273 and 1.482 respectively. The mean value of organisation capital as a proportion of total assets is close to 26.4%. Descriptive statistics of the long-term leverage indicate that Australia has relatively lower long-term leverage ratios. The average research and development expense to total assets is 15.8% across all industries.

Table 2: Descriptive Statistics

	Observation	Mean	S.D.	P25	Median	P75
Changes in ROA, Δ_{ROA}	17,183	0.707	6.174	-0.689	-0.138	0.538
Changes in Tobin's q, $\Delta_{Tobin's\ q}$	15,173	0.273	1.139	-0.277	-0.007	0.368
Revenue Growth, REVG	13,164	1.482	7.283	-0.239	0.067	0.428
Firm-specific crisis severity	11,782	-2.561	12.55	-0.726	-0.110	0.371
Organisation Capital	18,781	0.264	0.749	0.008	0.033	0.159
Research & Development	4,176	0.158	0.260	0.011	0.054	0.190
Firm Size	18,995	3.239	2.059	1.801	2.828	4.334
Firm Age	18,995	2.251	0.937	1.609	2.398	2.944
Capital Expenditure	17,000	0.099	0.141	0.010	0.039	0.132
Leverage	18,780	0.069	0.143	0	0	0.068
Independent Board	2,612	62.69	21.16	50	66.67	80
Chairman Duality	2,686	0.106	0.307	0	0	0
Average Board Tenure	2,653	6.044	3.035	4.031	5.55	7.438

Note: This table reports the cross-sectional distribution (number of observations, mean, median, standard deviation, and 25th, 75th percentiles) of Australian listed firms from 2000 to 2023. Financial companies are excluded.

3.2 Multinomial logistic regression analysis

Table 3 presents the multinomial logistic regression analysis results which show the impact of variables during GFC and COVID-19 crisis periods, with the non-crisis period serving as the base or reference category. The dependent variable is the year of crisis, identified as the year of 2008, 2009, 2020 and 2021. The interpretation of the multinomial logistic regression is that for a unit change in the predictor variable, a positive coefficient implies an increase in the log-odds of being in a crisis year relative to normal periods. As presented in Table 3, we find that changes in Tobin's Q, organisation capital and firm size are statistically significant during crisis periods. Both organisation capital and firm size increased during GFC relative to normal periods but decreased during COVID-19 period. Firms' changes in Tobin's Q are found to be lower during GFC relative to normal periods but higher during COVID-19 period. This could be due to the reduction in interest rate by the Reserve Bank of Australia during the early pandemic period (Vallence & Wallis, 2021) or other factors such as digital

transformation which have helped Australian firms to survive. The opposite signs of coefficients for GFC and COVID-19 periods underscore the nature of the crises. Despite the insignificance of other variables, the significant coefficients of organisation capital in different crisis periods suggest that it could act as a differentiating feature.

Table 3: Multinomial Logistic Regression Results

This table reports the multinomial logistic regression results based on Eq.(5). The dependent variable is the year of crisis, identified as the years of 2008, 2009, 2020, and 2021. The reference category is non-crisis periods, which is stated as normal in the table. A positive beta coefficient means an increased probability in the crisis period relative to the non-crisis period. A negative beta coefficient means a decreased probability in the crisis period relative to the non-crisis period.

	2008/Normal	2009/Normal	2020/Normal	2021/Normal
Changes in ROA, Δ_{ROA}	0.0343	0.0182	0.0038	-0.0138
	(0.409)	(0.349)	(0.134)	(-0.394)
Changes in Tobin's, $\Delta_{Tobin's\ q}$	-4.7558***	-1.8084*	0.6610***	0.7527***
	(-2.905)	(-1.652)	(2.925)	(3.509)
Revenue Growth	0.0073	-0.0252	-0.0290	-0.0321
	(0.058)	(-0.213)	(-0.408)	(-0.481)
Firm-specific Crisis Severity	0.0823	-0.0307*	-0.0101	-0.0217
	(0.162)	(-1.747)	(-0.495)	(-1.380)
Organisation Capital	7.1047***	4.6496***	-15.5397***	-23.7825***
	(4.076)	(2.961)	(-2.673)	(-3.095)
Firm Size	0.8819***	0.5025**	-0.1302	-0.0651
	(2.906)	(2.270)	(-1.395)	(-0.666)
Firm Age	-0.1559	0.0198	0.0276	0.1743
	(-0.290)	(0.044)	(0.095)	(0.606)
Research & Development	-4.0446	-2.8960	-0.3756	-0.5617
	(-0.487)	(-0.470)	(-0.287)	(-0.432)
Capital Expenditure	-2.6650	3.9311	0.7372	-3.3313
	(-0.301)	(0.896)	(0.318)	(-0.946)
Leverage	0.4801	-1.8043	1.5137*	0.9506
	(0.200)	(-0.885)	(1.744)	(1.003)
Independent Board	-0.0172	-0.0055	0.0191**	0.0127
	(-1.086)	(-0.381)	(2.149)	(1.498)
Chairman Duality	0.7323	0.0656	-0.0544	0.0892
	(0.818)	(0.079)	(-0.106)	(0.183)
Average Board Tenure	0.0560	-0.0118	-0.0813	-0.1001*
	(0.443)	(-0.112)	(-1.496)	(-1.857)
Constant	-10.1428***	-6.8565***	-2.1395*	-2.0004*
	(-3.411)	(-3.260)	(-1.901)	(-1.820)
Observations	710	710	710	710

Notes:
Z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Likelihood ratio chi-square = 129.83 with a p-value < 0.0001
Pseudo R^2 = 0.1152

3.3 GLS analysis results

Table 4 presents the relationship between organisational capital and firm performance, and the interaction effects between organisation capital and different crisis dummy variables on firm performance based on Eq.(6). Panel A of Table 4 considers changes in ROA as a proxy for firm performance. Models (1) to (10) report a positive relationship between organisational capital and changes in ROA. This implies that higher investment in organisational capital results in further increases in the current ROA compared to the previous year's ROA.

Out of the three crisis dummy variables, we find that Covid dummy variable has a significant and negative impact on firms' changes in ROA, with and without the inclusion of control variables in the models (the negative coefficient of Crisis dummy variable is likely caused by the significance of Covid dummy, rather than GFC dummy which becomes insignificant in later models). This result appears intuitive, as firms experienced losses during the recent pandemic.

Our most important finding is highlighted by the significance of the interaction terms between organisation capital and GFC/Covid/Crisis dummies. In models (8) to (10), we find significant and negative coefficients for interaction term between organisation capital and each dummy variable. This result implies that organisation capital potentially exacerbate the decline in ROA during crisis periods. However, this could be due to the absence of strong governance mechanisms and firms' organisation capital may not be effectively utilised. As shown in models (12) and (13), after including the corporate governance variables, we observe significant and positive coefficients for the interaction terms between organisation capital and Covid/Crisis dummies, which indicates that higher organisation capital can either mitigate the decline in ROA compared to previous year, or potentially reverse the negative impact and lead to improved firm performance during crisis time. We plot the interaction effects on changes in ROA from model (13) with separate regression lines for further visualisation of the implication (Please refer to Figure 1). As shown in Figure 1, during crisis period, organisation capital can provide firm resilience by improving their ROA. Drawing on the results presented in models (8) to (10), we postulate that organisation capital can offer firm resilience or buffering effect during crisis periods if companies have effective governance structure in place.

Table 4: GLS Model Estimates of Organisation Capital, Crisis Period, and Other Firm-Specific Features on firm performance

This table presents the relationship between organisation capital and firm performance from 2000 to 2023 based on Eqs. (6) and (7). In panel A, we use changes in ROA to capture firm performance. In Panel B, Tobin's q is used as an alternative proxy to capture firm performance. We also include the interaction terms between organisation capital and different crisis dummy variables (i.e. GFC if the year is 2008, 2009; Covid if the year is 2020, 2021 and lastly Crisis if the year is 2008, 2009, 2020, 2021).

Panel A. GLS Estimates of Organisation Capital, Crisis Periods and Changes in ROA

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Organisation Capital	0.4640***	0.4621***	0.4574***	0.4620***	0.4872***	0.5079***	0.5140***	0.6027***	0.5552***	0.4257***	1.1687	-0.2249	0.1809
	(13.356)	(13.209)	(13.117)	(13.288)	(7.412)	(7.711)	(7.843)	(8.834)	(7.674)	(6.803)	(1.319)	(-0.647)	(0.234)
GFC Dummy		0.1196***			-0.0587			0.0637			-0.1409		
		(2.594)			(-0.994)			(0.988)			(-0.561)		
Covid Dummy			-0.2297***			-0.1466***			-0.1103**			-0.2502***	
			(-7.331)			(-3.348)			(-2.276)			(-3.030)	
Crisis Dummy				-0.0861***			-0.1296***			-0.0403			-0.3246***
				(-3.309)			(-3.482)			(-1.152)			(-3.906)
Organisation Capital × GFC Dummy								-0.5675***			0.1812		
								(-3.621)			(0.095)		
Organisation Capital × Covid Dummy									-0.4244***			11.7206***	
									(-2.723)			(28.243)	
Organisation Capital × Crisis Year Dummy										-0.4329***			6.1647***
										(-4.159)			(4.872)

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Control Variables													
Firm Size					-0.0129	-0.0145	-0.0133	-0.0161	-0.0150	-0.0333***	-0.0025	-0.0028	0.0026
					(-1.258)	(-1.379)	(-1.276)	(-1.575)	(-1.399)	(-4.407)	(-0.064)	(-0.083)	(0.078)
Firm Age					0.0537**	0.0647**	0.0663**	0.0608**	0.0589**	0.0256	-0.0394	-0.0011	-0.0104
					(2.118)	(2.542)	(2.576)	(2.427)	(2.284)	(1.462)	(-0.373)	(-0.012)	(-0.110)
Research & Development					1.1859***	1.2420***	1.2386***	1.2049***	1.2942***	0.6209***	1.5614***	1.5135***	1.7820***
					(11.211)	(11.725)	(11.680)	(11.393)	(11.961)	(7.696)	(4.453)	(4.760)	(5.515)
Capital Expenditure					3.1383***	3.3072***	3.3311***	3.0135***	3.1973***	2.2481***	2.9866	2.3952	1.9286
					(6.968)	(7.382)	(7.453)	(6.739)	(7.019)	(6.195)	(1.542)	(1.343)	(1.076)
Leverage					-0.0999	-0.0810	-0.0469	-0.1121	-0.0300	-0.1301	-0.4182	-0.3323	-0.4228
					(-0.672)	(-0.531)	(-0.308)	(-0.775)	(-0.195)	(-1.077)	(-1.170)	(-1.066)	(-1.286)
Independent Board											0.0006	0.0001	0.0005
											(0.267)	(0.073)	(0.288)
Chairman Duality											-0.2373	-0.1982	-0.2756*
											(-1.528)	(-1.445)	(-1.897)
Average Board Tenure											0.0229	0.0108	0.0142
											(1.444)	(0.789)	(0.969)
Constant	0.4643***	0.4601***	0.4625***	0.4709***	-0.0183	-0.0980	-0.0329	-0.0281	-0.0929	0.3093	-0.0171	0.0190	-0.0868
	(7.467)	(7.452)	(7.370)	(7.524)	(-0.082)	(-0.531)	(-0.143)	(-0.117)	(-0.529)	(1.607)	(-0.026)	(0.034)	(-0.154)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,079	17,079	17,079	17,079	3,641	3,641	3,641	3,641	3,641	3,641	759	759	759
Firms	1,305	1,305	1,305	1,305	427	427	427	427	427	427	99	99	99

Note: t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

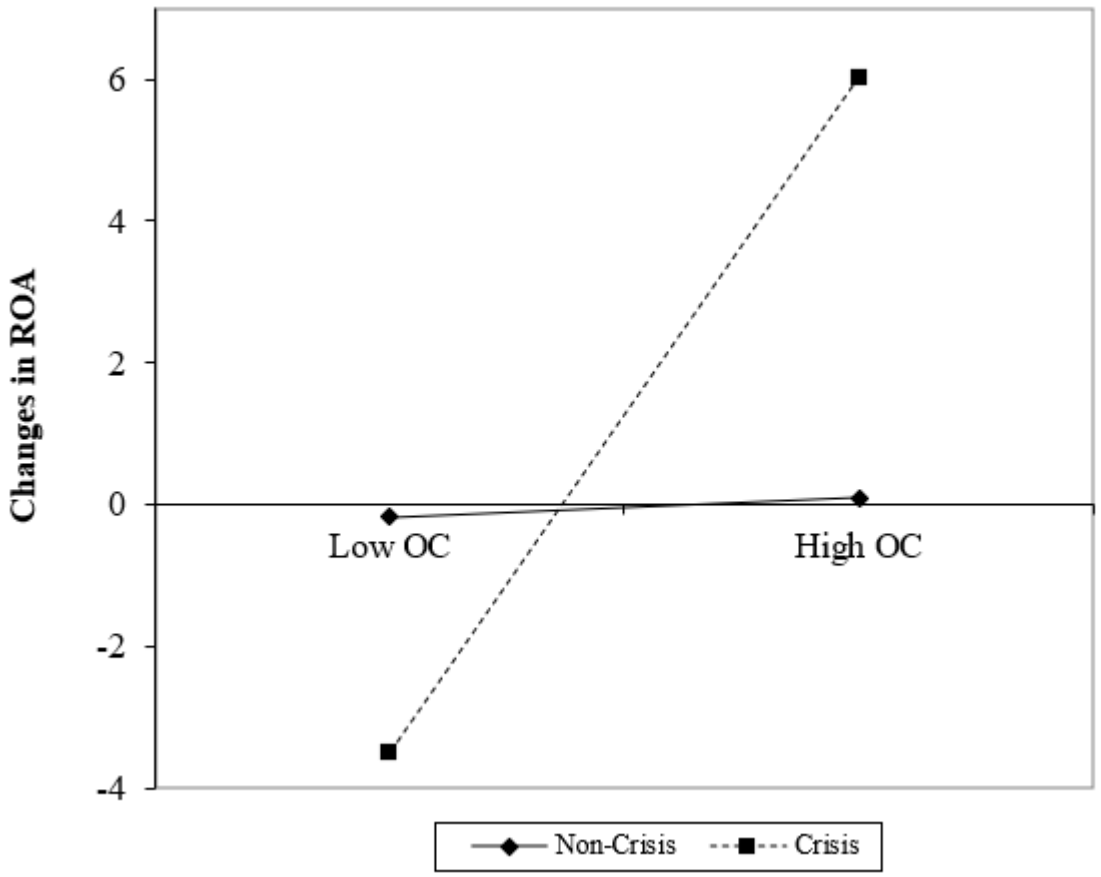
Panel B. GLS Estimates of Organisation Capital, Crisis Periods and Changes in Tobin's q

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Organisation Capital	0.3924***	0.3930***	0.4225***	0.3884***	0.2035***	0.1890***	0.1777***	0.1907***	0.1980***	0.2161***	0.2011*	0.1923*	0.3537***
	(24.477)	(23.580)	(26.284)	(24.062)	(7.633)	(6.520)	(6.114)	(6.616)	(6.567)	(6.782)	(1.790)	(1.709)	(3.133)
GFC Dummy		-0.2202***			-0.1966***			-0.2082***			-0.1028**		
		(-17.530)			(-9.402)			(-8.757)			(-2.435)		
Covid Dummy			0.1378***			0.1266***			0.1327***			0.1511***	
			(14.987)			(7.202)			(7.054)			(4.695)	
Crisis Dummy				-0.0239***			-0.0148			0.0019			0.1145***
				(-2.931)			(-1.015)			(0.122)			(4.359)
Organisation Capital × GFC Dummy								0.0700			-0.2355		
								(0.830)			(-1.035)		
Organisation Capital × Covid Dummy									-0.0336			2.3992*	
									(-0.234)			(1.759)	
Organisation Capital × Crisis Year Dummy										-0.1669**			-0.8099***
										(-2.195)			(-4.320)
Control Variables													
Firm Size					-0.0245***	-0.0255***	-0.0264***	-0.0247***	-0.0249***	-0.0263***	-0.0137*	-0.0112	-0.0189*
					(-7.042)	(-7.229)	(-7.426)	(-7.107)	(-6.884)	(-7.319)	(-1.928)	(-1.175)	(-1.910)
Firm Age					-0.0043	0.0009	0.0063	-0.0055	0.0009	0.0076	0.0086	-0.0378**	-0.0154
					(-0.461)	(0.104)	(0.686)	(-0.582)	(0.102)	(0.808)	(0.588)	(-2.127)	(-0.824)
Research & Development					0.4868***	0.4766***	0.4812***	0.4829***	0.4793***	0.4837***	0.0963	0.1321	0.1007
					(7.862)	(7.928)	(7.869)	(7.824)	(7.818)	(7.834)	(0.801)	(0.811)	(0.607)

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Capital Expenditure					-0.0777	-0.0669	-0.1132	-0.0637	-0.0752	-0.1320	-0.0593	0.0617	-0.0628
					(-0.550)	(-0.477)	(-0.801)	(-0.454)	(-0.532)	(-0.928)	(-0.338)	(0.275)	(-0.264)
Leverage					-0.0914**	-0.1038***	-0.0760**	-0.0907**	-0.1032**	-0.0808**	-0.0934*	-0.2244***	-0.1477**
					(-2.347)	(-2.598)	(-1.996)	(-2.331)	(-2.560)	(-2.097)	(-1.740)	(-3.072)	(-2.107)
Independent Board											-0.0004	-0.0013**	-0.0007
											(-0.837)	(-2.411)	(-1.245)
Chairman Duality											0.0064	-0.0327	-0.0227
											(0.248)	(-0.878)	(-0.611)
Average Board Tenure											-0.0028	0.0023	0.0008
											(-1.023)	(0.608)	(0.210)
Constant	0.1131***	0.1306***	0.0978***	0.1189***	0.2314***	0.2092***	0.2144***	0.2343***	0.2088***	0.2130***	0.1940***	0.3336***	0.3054***
	(7.024)	(7.783)	(5.846)	(7.312)	(3.788)	(3.847)	(3.857)	(3.840)	(3.832)	(3.841)	(2.851)	(4.437)	(3.825)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,994	14,994	14,994	14,994	3,222	3,222	3,222	3,222	3,222	3,222	730	730	730
Firms	1,187	1,187	1,187	1,187	390	390	390	390	390	390	96	96	96

Note: t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Two-way interaction effects between organisation capital (OC) and crisis periods on Changes in ROA



We further repeat our GLS analyses by considering Tobin's q as a dependent variable to capture forward-looking firm performance. Our results are presented in Panel B of Table 4. In Panel B, we find that the relationship between organisation capital and changes in Tobin's q is positive and significant in most models, which is consistent with the relationship in Panel A of Table 4. We notice that Tobin's q decreased during GFC but increased during the recent COVID pandemic periods. As aforementioned, this could be affected by the reduction in interest rates or other factors such as digital transformation which have helped Australian firms to survive. In addition, after controlling other control and corporate governance variables, we find a positive significant effect of the interaction terms between organisation capital and Covid dummy on the changes in Tobin's q in the model (12), which reflects the positive impact of organisation capital on firm resilience during Covid period. In model (13), we find a negative and significant effect of organization capital on changes in Tobin's q during crisis periods (i.e. GFC and Covid periods together) with the inclusion of corporate governance variables. This contrasts with the positive buffering effect of organisation capital we have observed in previous analyses. A possible explanation could be the nature of different crises and measurement differences. ROA is an accounting-based measure, while Tobin's q is a market-based measure. In addition, GFC and COVID-19 are different types of crises. The GFC mainly affected the credit and financial markets, but COVID-19 affected almost every business sector. Hence, the aggregation of GFC and COVID-19 periods (i.e. Crisis dummy) could produce a different combined effect on changes in Tobin's q.

3.4 Effects of organisation capital in crisis environment

Following Osiyevskyy et al. (2020)'s study, we examine the two-way interactive effect between organisation capital and firm-specific crisis severity to understand how the interactive effects affect revenue growth during crisis periods.

Model (1) in Table 5 reports a negative standalone relationship between organisation capital and revenue growth. A higher investment in organisation capital potentially restricts funds available for other investment opportunities and thus reduces a firm's revenue growth. This remains consistent when we include Crisis dummy and control variables in models (2) and (3). Models (2) and (3) further show that firms' revenue growth decreases during the crisis periods (i.e. GFC and COVID-19 pandemic). Model (4) indicates that higher firm-specific crisis severity (as it becomes more positive) is associated with a reduction in revenue growth. We further examine whether organisation capital can act as a moderator to influence the relationship between firm-specific crisis severity and revenue growth in models (5) and (6).

The result from model (6) shows that the two-way interaction effect is negative at 10% level, indicating that organisation capital negatively moderates the association between firm-specific crisis severity and revenue growth during the crisis period. The negative relationship between organisation capital and revenue growth becomes more pronounced in firms that are more severely affected by the crisis. This shows that the magnitude of crisis or shock could potentially diminish the resilience provided by organisation capital.

Table 5: Interactive Effects of Organisation Capital, Firm-specific Crisis Severity on Revenue Growth in Crisis Environment

Following Osiyevskyy et al. (2020)'s study, this table presents the impact of organisation capital and firm-specific crisis severity on firm's revenue growth during crisis period. Firm-specific crisis severity is computed based on Eq. (4). Model (6) also presents the moderating effect of organisation capital (i.e. the interactive effect) on the relationship between firm-specific crisis severity and revenue growth.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Organisation Capital	-0.1255***	-0.1313***	-0.1980***	-0.2314***	-0.1754***	-0.2103**
	(-4.959)	(-5.081)	(-4.023)	(-3.619)	(-3.037)	(-2.103)
Crisis Dummy		-0.0900***	-0.1094***	-0.0505*	-0.0610**	-0.0155
		(-3.857)	(-3.492)	(-1.955)	(-2.382)	(-0.657)
Firm-specific Crisis Severity				-0.0528***	-0.0586***	-0.2553***
				(-10.061)	(-10.667)	(-11.523)
Organisation Capital × Firm-specific Crisis Severity					-0.0151	-0.9470*
					(-0.395)	(-1.732)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control variables						
Firm Size			-0.0008	-0.0069	-0.0158**	-0.0092
			(-0.066)	(-0.836)	(-2.240)	(-1.132)
Firm Age			-0.2061***	-0.1082***	-0.0955***	-0.0179
			(-6.377)	(-4.900)	(-4.993)	(-0.959)
Research & Development			-0.0434	-0.3187***	-0.4044***	-0.2012
			(-0.290)	(-2.643)	(-3.405)	(-1.278)
Capital Expenditure			-0.2049	-0.4472*	-0.5878**	-0.2595
			(-0.582)	(-1.664)	(-2.213)	(-1.111)
Leverage			-0.3009**	-0.2597***	-0.2264**	-0.1013
			(-2.288)	(-2.719)	(-2.350)	(-1.566)
Independent Board						0.0002
						(0.296)
Chairman Duality						0.0604
						(1.199)
Average Board Tenure						-0.0036
						(-1.216)
Constant	0.3235***	0.3474***	0.8272***	0.5500**	0.5775**	0.1433
	(3.872)	(4.175)	(3.645)	(2.320)	(2.473)	(1.402)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,982	12,982	3,422	2,994	2,994	722
Firms	1,087	1,087	404	371	371	93

Note: t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4. Conclusion

Through this Australian based study, we find a very important characteristic of organisation capital. Firms that choose to invest in organisation capital and other investments would turn out to be more productive and profitable than others. Organisation capital would help to improve changes in ROA during crisis periods if there is strong corporate governance. When interacting organisation capital and crisis, it becomes evident that their interaction could preserve firm's performance and mitigate the adverse effects during disruptive events (times), providing resilience to crisis better than the other otherwise. Despite the immediate or short-term negative impact of organisation capital on revenue growth, organisation capital could still provide the foundation for long-term resilience and post-crisis recovery, which is not captured in the current model.

As the next potential crisis will continue to impact people and businesses around the world, businesses will need to continue to prepare and respond. For countries like Australia which is filled with SMEs, it is important for them to plan the long-term investment in organisation capital to safeguard their future from the next crisis.

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