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Organizational capital and credit ratings

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ABSTRACT

This study uses pooled OLS to examine the effect of organizational capital on credit ratings using a large sample of US firm data from 1989 to 2017. The main finding reveals that firms with higher organizational capital receive higher credit ratings. This finding is robust to numerous robustness tests, alternative estimation techniques, and attempts to mitigate omitted variable and endogeneity concerns. Further, the positive effect of organizational capital on credit ratings is more prominent when firms are more financially constrained. Overall, our findings reveal the importance of organizational capital in the credit ratings of a firm.

1. Introduction

Existing research on credit ratings primarily emphasizes the significance of financial factors for firms. However, it is crucial to recognize the impact of non-financial factors, such as organizational capital, on a firm's credit ratings. This study aims to address the following inquiry: Do firms in the United States with higher organizational capital have higher credit ratings, even after considering common determinants of credit ratings? This question is vital as it introduces an additional non-financial factor that may influence credit ratings. Firms experiencing even a minor upgrade in credit ratings enjoy advantages such as reduced debt costs, fewer debt issuances, and increased capital investment compared to firms that receive downgrades (Tang, 2009). Consequently, the findings of this study hold economic significance since even a slight upgrade in credit ratings can benefit firms.

Organizational capital (OC hereafter) refers to a firm's intangible assets contributing to its overall performance and competitive advantage. It encompasses various elements such as the firm's knowledge, processes, culture, relationships, and reputation. Existing research shows that OC plays a significant role in shaping a firm's success and can substantially impact its performance. Particularly, the existing research documents that firms with higher OC are associated with higher average returns (Eisfeldt and Papanikolaou, 2013), greater productivity (Chen and Inklaar, 2016), lower implied cost of capital (Attig and El Ghoul, 2018), superior acquisition deals performance (Li et al., 2018), higher cash holdings (Marwick et al., 2020), increased tax efficiency and firm value (Hasan et al., 2021), greater corporate innovation activities (Cui et al., 2021; Francis et al., 2021), higher dividend payouts (Hasan and Uddin, 2022), and more readable annual reports (Panta and Panta, 2023).

Existing literature documents that rating agencies consider factors such as Fitch's market share (Becker and Milbourn, 2011), corporate social responsibility disclosures (Attig et al., 2013), corporate innovation (Hsu et al., 2015), managerial ability (Cornaggia et al., 2017), financial reporting quality (Akins, 2018; Alissa et al., 2013; Bonsall et al., 2017), corporate governance quality (Ashbaugh-Skaife et al., 2006; Habib and Ranasinghe, 2022), and social capital (Hossain et al., 2023). That being said, we predict that

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organizational capital may have important implications for a firm's credit rating, though no prior study has explored this relationship. Therefore, this research aims to explore the effects of organizational capital and fill the void in credit ratings and organizational capital literature.

Different types of assets, particularly intangible ones, offer varied values to a firm (Hall, 1992; Itami and Roehl, 1991; Wang and Barney, 2006). This paper prioritizes organizational capital, a mix of formal and informal, explicit, and implicit knowledge, including culture, structure, and learning (Attig and Cleary, 2014; Eisfeldt and Papanikolaou, 2013; Prescott and Visscher, 1980), due to its durability and distinct importance in a firm's production function (Bretscher, 2022; Crouzet and Eberly, 2023; Eisfeldt and Papanikolaou, 2013; Lev et al., 2009). Organizational capital significantly adds to a firm's financial value by enabling beneficial stakeholder activities, increasing sales margins, and reducing costs (Dierickx and Cool, 1989; Eisfeldt and Papanikolaou, 2013; Hasan et al., 2021; Peteraf, 1993; Peters and Waterman, 2006). More than 40% of all cash flow from intangible assets is attributed to organizational capital, which also enhances operational, investment, and innovation performance (Atkeson and Kehoe, 2005; Attig et al., 2013; Enache and Srivastava, 2017; Hasan et al., 2018; Leung et al., 2018; Lev et al., 2009).

Similarly, the resource-based view also substantiates our proposed positive correlation between organizational capital and credit ratings. This theory attributes varying performance levels across firms to disparities in their resources and capabilities, encompassing both tangible and intangible assets like organizational capital (Amit and Schoemaker, 1993; Barney, 1991). These unique and valuable resources, difficult to replicate, lay the groundwork for a firm's competitive edge, leading to positive returns (Peteraf, 1993). This perspective is supported by numerous empirical studies indicating direct, positive effects of resources (Miller and Shamsie, 1996; Pennings et al., 1998). Thus, resources not only form the backbone of firm strategies but are pivotal for their execution, too (Barney, 1991; Schoenecker and Cooper, 1998). Considering the resource-based view and the influence of organizational capital on firms (Bhandari and Golden, 2021; Frost, 2007; Habib and Ranasinghe, 2022; Hasan and Taylor, 2023; Larkin, 2013), we propose a positive link between organizational capital and a firm's credit rating.

Following prior literature (Baghai et al., 2014; Hossain et al., 2023), we test our hypothesis using long-term domestic issuer ratings from Standard & Poor. Using a large sample of US firms from 1989 to 2017, we find a positive relationship between credit ratings and organizational capital, consistent with our hypothesis. We divide this sample into high and low OC firms and conduct univariate tests. This study finds an average credit rating of 13.02 for high OC firms and 12.37 for low OC firms, indicating a significant difference at a 1% significance level. The results continue to hold in a multivariate setting where we control for various firm-level determinants as in prior research (Cornaggia et al., 2017; Hossain et al., 2023), including the year and industry effects. After controlling for the common determinants of credit ratings, we find that the relationship between credit ratings and organizational capital is statistically robust and economically meaningful. We also find that organizational capital moderates the negative effects of the lower readability of annual reports, leverage, financial constraints, and crisis on credit ratings.

The findings imply that depending on the method of OC measurement, a one standard deviation increase in OC is associated with a 0.94% increase in credit ratings relative to the mean. Similarly, a one standard deviation change in organizational capital is associated with a 0.034 standard deviation change in credit ratings.[1] This research makes a significant contribution to existing literature. First, it provides evidence of the importance of organizational capital in firms' credit ratings. Second, it expands the literature on credit ratings by focusing on intangible forms of wealth, such as OC. Finally, we extend the traditional bond ratings literature by incorporating OC designed to control agency conflicts between bondholders and management/shareholders.

The remainder of the paper is organized as follows. Section 2 describes the data and methodology and defines the variables. Section 3 discusses the empirical findings. Section 4 concludes the research's findings.

2. Data and methodology

2.1. Data sources and sample

Our initial sample is comprised of all Compustat firms with long-term domestic issuer credit ratings from S&P from 1973 to 2017. We use the Compustat Capital IQ database to obtain S&P's long-term domestic issuer ratings (SPLTICRM). We create the primary variable of interest, organizational capital, and firm-level control variables using Compustat annual file. Our final sample consists of 25,051 firm-year observations, excluding firms in utility and financial industries and missing control variables, for publicly traded US firms from 1989 to 2017.

2.2. Measuring credit ratings

Following prior studies on credit ratings (Bonsall et al., 2017; Cassell et al., 2019), we convert the S&P credit rating categories to numerical values which range from 1 (D) to 21 (AAA) where AAA (D) represents the highest (lowest) credit ratings and a firm's creditworthiness in addition to its ability to repay individual obligations. Generally, BBB- (12) or higher ratings are considered investment-grade ratings, whereas BB+ (11) or lower are non-investment-grade ratings (Hossain et al., 2023).

[1] The economic impact of OC on credit ratings is comparable to existing research. For instance, Cornaggia et al. (2017) find that a one standard deviation increase in managerial ability is associated with a 0.038 standard deviation increase in ratings. Similarly, Becker and Milbourn (2011) find that one standard deviation change in Fitch's market share is associated with a 0.0478 standard deviation increase in credit ratings.

2.3. Measuring organizational capital

Based on previous research (Eisfeldt and Papanikolaou, 2013; Gao et al., 2021), we calculate a firm's OC by considering capitalized SG&A expenses, encompassing the non-production costs involved in operating the firm. To gage OC using the perpetual inventory method, we determined the initial value of the firm i's OC stock using the following approach:

$$\mathrm{OC}_{i,0} = \frac{SG\&A_{i,1}}{g + \delta_{OC}}$$

Where OC represents the firm's organizational capital, SG&A denotes selling and administrative expenses, g stands for the average annual growth rate of SG&A at the company level, and δ represents the depreciation rate of R&D expenses. Consistent with previous studies (Eisfeldt and Papanikolaou, 2013), we set a value of 15% for δ. To construct OC iteratively, we compute the deflated value of SG&A using the following equation:

$$\mathrm{OC}_{i,t} = (1 - \delta_{OC})OC_{i,t} + \frac{SG\&A_{i,t}}{CPI_t}$$

Where, SG&A represents a firm's selling and administrative expenses, where *i* and *t* indicate the specific firm and year, respectively. CPI denotes the consumer price index at the end of the fiscal year *t,* and δ_{OC} denotes the depreciation rate of OC stocks, which is set at 15% based on Gao et al. (2021). If the proportion of SG&A expenses allocated to investing in OC remains consistent across firms, it will not impact the ranking of firms in terms of OC, as noted by Li et al. (2018). To address this concern, we follow previous research and measure organizational capital as OC deciles *(Rank_OC)*. However, due to variations in accounting practices regarding the composition of SG&A expenses across industries, there may be measurement errors in firm-level OC, as highlighted by Li et al. (2018). To mitigate this issue, we construct industry-adjusted OC *(IndAdj_OC)* by adopting methods from prior literature (Gao et al., 2021; Li et al., 2018). Additionally, our fourth measure of OC *(Adj_OC)* is calculated using net SG&A and represents the difference between R&D and advertising expenses.

2.4. Empirical model

Following prior research (Baghai et al., 2014; Cornaggia et al., 2017; Hossain et al., 2023), we use the following pooled Ordinary Least Squares (OLS) regression model to test the relationship between credit ratings and organizational capital:

$$\text{Credit Ratingi, t} = \alpha 0 + \beta 1\text{OCi, t} + \beta 2\text{X}^{'}\text{i, t} + \text{Year Dummiest} + \text{Industry Dummiesj} + \varepsilon\text{i, t} \quad (1)$$

Where *i* refers to the firm, *t* is the fiscal year, and *j* is the industry. The dependent variable is *Credit Rating,* which is the rating of a firm converted into a numerical form for firm *i* in fiscal year *t, OC* is the organizational capital, and industry dummies are based on 2-digit SIC codes. X_i' *is* a vector of control variables, and the control variables are as in prior literature (Ashbaugh-Skaife et al., 2006; Cornaggia et al., 2017; Hossain et al., 2023). We cluster the standard errors by firm to adjust for the correlations of the error terms among firms. Variable definitions are provided in the Appendix.

3. Results

3.1. Summary statistics and correlations

Table 1 presents summary statistics. The mean (median) of credit rating is 12.496 (12.00) with a standard deviation of 3.7112,

Table 1
Summary statistics.

Variables	*N*	*Mean*	*SD*	*p25*	*Median*	*p75*
Credit Rating	25,051	12.496	3.712	10.000	12.000	15.000
OC	25,051	0.983	1.052	0.282	0.679	1.331
Firm Size	25,051	8.033	1.451	6.993	7.939	9.077
Debt Ratio	25,051	0.351	0.197	0.213	0.321	0.456
ROA	25,051	0.129	0.092	0.088	0.128	0.172
Loss	25,051	0.232	0.422	0.000	0.000	0.000
Tangibility	25,051	0.347	0.239	0.147	0.293	0.520
Interest Coverage	25,051	13.936	48.249	2.981	5.965	11.603
Subordinated Debt	25,051	0.189	0.392	0.000	0.000	0.000
CF Volatility	25,051	0.042	0.035	0.021	0.033	0.052
KZ Index	25,051	0.771	1.174	0.174	0.820	1.443
Excess Cash	25,051	0.344	0.475	0.000	0.000	1.000
Dividend	25,051	0.626	0.484	0.000	1.000	1.000
Dis Accrual	25,051	−0.010	0.080	−0.038	−0.005	0.028

Note: This table reports descriptive statistics of the variables used in the regression models. Variable definitions are in the Appendix.

which are in line with prior research (Hossain et al., 2023). The mean OC (the primary measure) is 0.983 with a standard deviation of 1.05, which is again consistent with existing research (Li et al., 2018).

3.2. Correlation and univariate tests

Panel A in Table 2 presents the correlations matrix. The bold values are significant at <0.10 level. The correlation between credit ratings and organizational capital is positive (0.03) and significant (p-value < 0.01), which is a very primitive confirmation of our hypothesis. As the Pearson correlation coefficients demonstrate, our control variables had no extreme correlations. The average variance inflation factors (VIFs) in our model is 1.59, and none of the variables have VIFs greater than two, which is well within the acceptable value of <10.

A noticeable difference in average credit ratings emerges when we divide the sample into high and low OC groups. This difference is visually illustrated in Fig. 1. Univariate test results, as presented in Panel B of Table 2, confirm this observation. The average credit ratings for high OC firms is 0.65 higher than for low OC firms, and the difference is statistically significant (p-value < 0.01). These findings indicate a positive relationship between credit ratings and organizational capital.

3.3. Multivariate results

After finding preliminary support for our research hypothesis using univariate tests, we start our analysis by examining whether firms with high organizational capital are rated higher. Table 3 presents the results of this analysis using the model specified in Eq. [1], using all measures of organizational capital. Consistent with our hypothesis, multivariate regression analysis shows that firms with high OC are indeed rated higher. The dependent variable is a firm's credit rating. The coefficient of OC in Column 1 is 0.118, with a t-statistic of 2.641. The coefficient for OC continues to be significant when we use alternative measures of OC in columns 2–4. We control for the information environment and agency problem in all estimates. The coefficients of the control variables are generally consistent with those reported in prior studies that employ credit ratings as the dependent variable.

The economic impact of our empirical results is significant. A one standard deviation increase in OC is associated with a 0.124 (0.118 × 1.052) increase in credit ratings. This change is equivalent to a 0.032 (0.118/3.712) standard deviation increase in ratings, comparable to the impact of one standard deviation change in managerial ability. For instance, Cornaggia et al. (2017) find that a one standard deviation increase in managerial ability is associated with a 0.038 standard deviation increase in ratings. Similarly, Becker and Milbourn (2011) find that a one standard deviation change in a competitor's market share is associated with a 0.048 standard deviation increase in ratings. According to Baghai et al. (2014), a one-unit downgrade in credit ratings corresponds to a decrease of approximately 74 basis points in debt spread. Assuming a linear relationship between ratings and basis points, a one standard deviation increase in organizational capital (OC) would decrease 9.19 basis points (0.118 × 1.05 × 74) in debt spread. This decrease implies potential savings of approximately $4.00 million for an average firm with high OC (mean leverage of 0.351 x average total assets of $12,397.76 million x 0.0009).

Existing research finds governance and institutional ownership as important determinants of credit rating. Therefore, we conduct further tests including these variables and replicate our main results in Table 3. Table 4, Panels A and B present results controlling for the entrenchment index *(Eindex)* and institutional ownership ratio *(Inst. Ownership)*, respectively. The effects of OC continue to remain significant and positive when we control for governance and institutional ownership in our model despite a significant loss in sample size.

3.4. Robustness tests

We conduct several robustness tests to validate our main findings.

Table 2
Univariate test results.

Panel A: Correlation matrix								
Variables	(1)	(2)	(3)	(4)	(5)	(6)		
(1) Credit Rating	1.00							
(2) OC	**0.03**	1.00						
(3) Firm Size	**0.58**	**−0.17**	1.00					
(4) Debt Ratio	**−0.48**	**−0.09**	**−0.29**	1.00				
(5) ROA	**0.36**	**0.13**	**0.10**	**−0.17**	1.00			
(6) Loss	**−0.43**	−0.01	**−0.22**	**0.32**	**−0.45**	1.00		
Panel B: Univariate test results								
Variables	*High OC Firms (N = 4322)*			*Low OC Firms (N = 12,414)*			*Difference*	
	Mean	*Median*	*Std.Dev*	*Mean*	*Median*	*Std.Dev*	*Mean*	*P-value*
Credit Rating	13.02	13.00	4.04	12.37	12.00	3.62	0.65	0.00

Panel A in this table reports the Pearson correlations (for brevity, most variables excluded in the table), and Panel B reports univariate test results. Bolded figures indicate $p < 0.01$. All other variables are defined in Appendix.

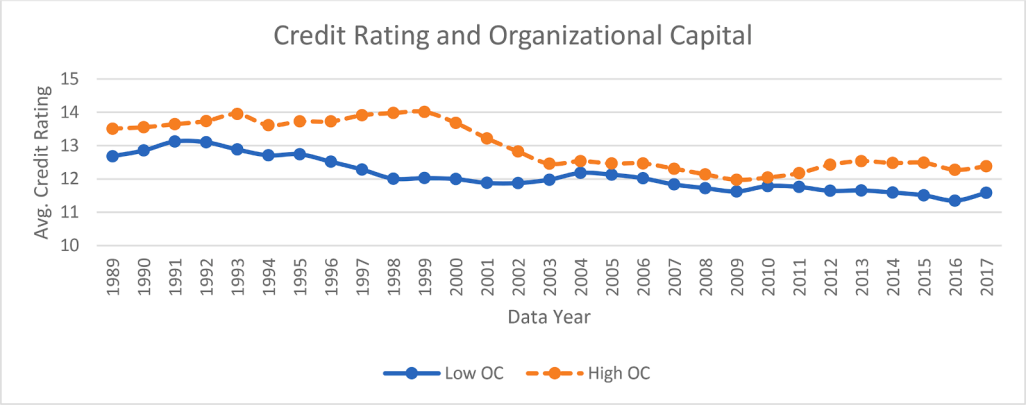

Fig. 1. Graphical representation: credit ratings and organizational capital. This figure graphically shows average credit ratings for a high (the dotted line) and low (undotted line) organizational capital firm on a year-by-year basis.

Table 3
Organizational capital is associated with higher credit ratings.

Variables	(1)	(2)	(3)	(4)
	Dependent variable = Credit Rating			
OC	0.118***			
	(2.641)			
Rank_OC		0.120***		
		(4.742)		
IndAdj_OC			0.121***	
			(2.706)	
Adj_OC				0.134***
				(2.652)
Firm Size	1.236***	1.248***	1.236***	1.239***
	(34.737)	(35.078)	(34.757)	(34.645)
Debt Ratio	−2.474***	−2.431***	−2.476***	−2.469***
	(−10.455)	(−10.248)	(−10.469)	(−10.423)
ROA	6.315***	6.173***	6.312***	6.318***
	(13.097)	(12.989)	(13.077)	(13.081)
Loss	−1.081***	−1.099***	−1.081***	−1.077***
	(−15.996)	(−16.227)	(−15.978)	(−15.867)
Tangibility	−0.338	−0.221	−0.338	−0.348
	(−1.505)	(−0.974)	(−1.506)	(−1.557)
Interest Coverage	0.003***	0.003***	0.003***	0.003***
	(3.904)	(3.848)	(3.903)	(3.933)
Subordinated Debt	−0.539***	−0.517***	−0.539***	−0.542***
	(−6.944)	(−6.642)	(−6.949)	(−6.982)
CF Volatility	−8.392***	−8.292***	−8.398***	−8.324***
	(−8.682)	(−8.590)	(−8.676)	(−8.607)
KZ Index	−0.340***	−0.345***	−0.340***	−0.342***
	(−8.145)	(−8.269)	(−8.140)	(−8.174)
Excess Cash	−0.235***	−0.237***	−0.235***	−0.227***
	(−3.940)	(−3.976)	(−3.949)	(−3.821)
Dividend	1.083***	1.072***	1.084***	1.079***
	(14.025)	(13.905)	(14.034)	(13.966)
Dis Accrual	−1.251***	−1.212***	−1.255***	−1.259***
	(−4.371)	(−4.259)	(−4.386)	(−4.398)
Observations	25,051	25,051	25,051	25,051
R-squared	0.695	0.696	0.695	0.695
Year/Industry Dummies	Yes	Yes	Yes	Yes

Note: This table reports the OLS regression results for the association between credit ratings and organizational capital. Robust standard errors clustered at the firm level. Industry dummies are based on the two-digit Standard Industrial Classification (SIC) codes. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively. Variables are defined in the Appendix.

3.4.1. Oster test for omitted variable bias

We have a particular concern regarding our analysis, which involves the possibility of excluding certain variables from our model that could potentially impact a company's credit rating. To assess the presence of omitted variable bias in our baseline model, as presented in Table 4, Column 1, we conduct a formal test following the methodology outlined by Oster (2019). The Oster test results

Table 4
Additional tests.

Panel A: Organizational Capital and credit ratings controlling for governance				
Variables	(1)	(2)	(3)	(4)
	Dependent variable = Credit Rating			
OC	0.109**			
	(2.011)			
Rank_OC		0.140***		
		(3.640)		
IndAdj_OC			0.115**	
			(2.142)	
Adj_OC				0.118*
				(1.951)
Eindex	0.030	0.027	0.030	0.029
	(0.734)	(0.665)	(0.726)	(0.715)
Observations	12,389	12,389	12,389	12,389
R-squared	0.680	0.682	0.680	0.680
Control	Yes	Yes	Yes	Yes
Year/Industry Dummies	Yes	Yes	Yes	Yes
Panel B: Organizational capital and credit ratings controlling for inst. ownership				
Variables	(1)	(2)	(3)	(4)
OC	0.169***			
	(3.019)			
Rank_OC		0.130***		
		(4.499)		
IndAdj_OC			0.170***	
			(3.083)	
Adj_OC				0.197***
				(3.063)
Inst. Ownership	0.170	0.163	0.169	0.170
	(1.147)	(1.100)	(1.142)	(1.145)
Observations	20,388	20,388	20,388	20,388
R-squared	0.700	0.701	0.700	0.700
Control	Yes	Yes	Yes	Yes
Year/Industry Dummies	Yes	Yes	Yes	Yes

Note: This table reports the OLS regression results for the association between credit ratings and organizational capital using additional control variables. Robust standard errors clustered at the firm level. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively. Variables are defined in the Appendix.

indicate no omitted variable bias in our baseline analysis.

3.4.2. Propensity scores matching

To address concerns of a potential influence from the linear functional form in our OLS estimate and omitted factors, we employ propensity score matching (PSM) to create a matched sample of control firms resembling the treated firms. PSM does not assume a specific functional relationship, unlike OLS. Prior studies (Fang et al., 2014; Hossain et al., 2023) have used PSM to address dissimilarities between treated and control samples. Untabulated univariate tests reveal significantly higher credit ratings for firms with higher OC. Panel A of Table 5 presents the OLS regression results using the PSM sample, supporting the main findings in Table 3.

3.4.3. Entropy balancing

One concern regarding propensity score matching (PSM) is the potential for inadequate covariate balance between treatment and control groups. In contrast, the entropy balancing method proposed by Hainmueller (2012) does not rely on a model and instead uses an algorithm to assign weights to control sample observations. Following recent research (McMullin andand Schonberger, 2020; Shroff et al., 2017), we employ the entropy balancing technique in our analysis. The results in Panel B of Table 5 mirror our main findings in Table 3. The positive and significant coefficients for each measure of organizational capital (OC) confirm that our hypothesis remains valid even after reweighting the control sample (firms with lower OC) using entropy balancing.

3.4.4. Instrumental variable

We further employ 2SLS regression to address simultaneity and omitted variable bias. We use the ratio of research and development expenditure to total assets (R&D Expense) as the instrument variable. We expect this variable to be positively and significantly associated with OC as firms' spending on research and development is also a form of spending on organizational capital. It is, however, unlikely that R&D expenses will affect directly other than through OC. Column 1 in Panel C in Table 5 reveals the coefficient on R&D Expense is positive and significant in the first-stage regression. Both an under-identification test (Kleibergen-Paap rk LM Statistic = 47.61, P-value < 0.001) and week identification (Cragg-Donald Wald F statistic 867.36, Stock and Yogo (2005) critical values = 16.38) test results indicate that our instrument is valid. Column 2 reports results for instrumented OC, and the estimated coefficient is much higher and significant. Thus, our test results are robust in addressing endogeneity concerns in our estimation.

Table 5
Robustness tests.

Panel A: Multivariate analysis using the PSM-matched control sample				
Variables	*(1)*	*(2)*	*(3)*	*(4)*
	Dependent variable = Credit Rating			
OC	0.080***			
	(3.646)			
Rank_OC		0.096***		
		(4.566)		
IndAdj_OC			0.071***	
			(3.330)	
Adj_OC				0.073***
				(2.950)
Observations	7727	4422	8605	7774
R-squared	0.716	0.702	0.734	0.702
Control	Yes	Yes	Yes	Yes
Year/Industry Dummies	Yes	Yes	Yes	Yes
Panel B: Multivariate analysis using the balanced entropy technique				
Variables	*(1)*	*(2)*	*(3)*	*(4)*
HighOC_Dum	0.271**			
	(2.400)			
HighrankOC_Dum		0.502***		
		(5.258)		
HighIndadjOC_Dum			0.348***	
			(3.904)	
HighAltOC_Dum				0.260**
				(2.434)
Observations	25,051	25,051	25,051	25,051
R-squared	0.721	0.713	0.718	0.716
Control	Yes	Yes	Yes	Yes
Year/Industry Dummies	Yes	Yes	Yes	Yes
Panel C: Multivariate analysis using instrumental variable				
Variables	(1)	(2)		
	Dependent variable = OC	*Dependent variable = Credit Rating*		
OC-Instrumented		0.414*		
		(1.754)		
R&D Expense	6.257***			
	(8.529)			
Observations	25,051	25,051		
R-squared	0.414	0.690		
Control	Yes	Yes		
Year/Industry Dummies	Yes	Yes		
Panel D: Multivariate analysis using alternative estimation techniques – Logistic Regression				
Variables	(1)	(2)	(3)	(4)
	Dependent variable = Credit Rating			
OC	0.153**			
	(2.417)			
Rank_OC		0.116***		
		(3.200)		
IndAdj_OC			0.157**	
			(2.489)	
Adj_OC				0.216***
				(3.087)
Observations	25,034	25,034	25,034	25,034
Pseudo R2	0.551	0.552	0.551	0.552
Control	Yes	Yes	Yes	Yes
Year/Industry Dummies	Yes	Yes	Yes	Yes

Note: This table reports robustness test results for the association between credit ratings and organizational capital. Robust standard errors clustered at the firm level. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively. Variables are defined in the Appendix.

3.4.5. Alternative estimation technique

There may be concerns that our estimation techniques may drive our test results. Following prior research (Hossain et al., 2023), we employ ordered logistic regression and replicate our main results in Table 3. These results continue to hold when we use an ordered logit model. We report these results in Columns (1) to (4) in Panel D in Table 5. The coefficient of each measure of OC is significant and positive, supporting our main findings in Table 3.

3.5. Additional analysis

3.5.1. Does OC moderate the effect of experiencing financial constraints?

Existing literature suggests that financially constrained firms are more likely to receive lower credit ratings compared to their financially unconstrained counterparts. (Campello, 2006; Chava and Jarrow, 2004). We expect that firms with higher OC moderate the effects of financial constraints on credit ratings. To test this hypothesis, we divide our sample into financially constrained and unconstrained groups using SA Index (e.g., Chen et al., 2020). Following Hadlock and Pierce (2010), we calculate SA Index as follows:

$$\text{SA Index} = -0.737 \times \text{Sizei}, t + 0.043 \times \text{Sizei}, \text{t2} - -0.040 \times \text{Agei t} \quad (2)$$

Where size is the natural log of inflation-adjusted total assets adjusted by CPI of 2017, and Age is the number of years a firm has been listed in the CRSP database.

We investigate the impact of financial distress on the relationship between credit ratings and organizational capital. We divide the firms into quartiles based on their SA Index, with higher values indicating a greater likelihood of financial distress. We then conducted an OLS regression analysis to test the relationship between credit ratings, organizational capital, and financial distress. Table 6 reports the results. The test results show that the relationship between organizational capital and credit ratings was stronger for financially constrained firms than unconstrained ones. This suggests that organizational capital can help to mitigate the negative impact of financial distress on credit ratings.

3.6. Organizational capital and credit ratings: channel analysis

Prior studies document lower readability (Bonsall and Miller, 2017), higher information asymmetry (Ashbaugh-Skaife et al., 2006; Mei and Subramanyam, 2008), higher leverage, financial constraints (Chien et al., 2023) and crisis (Hossain et al., 2023) are associated with less favorable credit ratings. In Table 7, the test results demonstrate the moderating effects of readability, leverage, financial distress, and crisis on the relationship between organizational capital (OC) and credit ratings. The negative coefficient for Readability in Column (1) implies that as the readability of annual reports decreases, the credit rating decreases. However, the positive and significant coefficient for Readability*OC (Coef. = 0.088, p-value < 0.01) indicates that the negative impact of readability on credit ratings may be moderated when considering a firm's organizational capital. Moving to Column (2), the moderating effect of leverage is examined. A positive and significant coefficient for Highlev*OC (Coef. = 0.065, p-value < 0.05) implies that organizational capital mitigates the negative impact of high leverage, leading to higher credit ratings for firms. Column (3) focuses on the measure of financial constraints, represented by the SA Index. The coefficient for SA Index*OC is positive and significant (Coef. = 0.146, p-value < 0.01). This suggests that organizational capital moderates the adverse effects of financial constraints, and rating agencies take into account the positive impact of OC when assigning higher credit ratings. Lastly, the positive coefficient for Crisis*OC (Coef. = 0.138, p-value < 0.01) in Column (4) indicates that OC moderates the impact of a crisis, resulting in higher credit ratings for firms. These results demonstrate that organizational capital contributes to higher credit ratings through various channels, including enhanced readability of financial reports, mitigating the negative effects of high leverage and financial constraints, and moderating the impact of crises.

Table 6
Organizational capital and rating relationship and the role of financial distress.

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
	High SA Index				*Low SA Index*			
	Dependent variable = Credit Rating							
OC	0.115**				−0.029			
	(2.100)				(−0.512)			
Rank_OC		0.054*				0.073*		
		(1.812)				(1.885)		
IndAdj_OC			0.119**				−0.025	
			(2.161)				(−0.445)	
Adj_OC				0.137**				−0.006
				(2.221)				(−0.102)
SA Index (High-Low)								
χ^2	16.23***	0.79	16.05***	12.96***				
P-value	(0.000)	(0.375)	(0.000)	(0.000)				
Observations	12,523	12,523	12,523	12,523	12,524	12,524	12,524	12,524
R-squared	0.641	0.641	0.641	0.641	0.695	0.696	0.695	0.695
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the OLS regression results for the association between credit ratings and organizational capital using subsamples of financially constrained and unconstrained firms. Robust standard errors clustered at the firm level. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively. Variables are defined in the Appendix.

Table 7
Organizational capital and credit ratings - channel analysis.

Variables	*(1)*	*(2)*	*(3)*	*(4)*
	Dependent variable = Credit Rating			
OC	0.084***	0.080***	0.094***	0.114***
	(3.390)	(3.392)	(3.168)	(5.926)
Readability	−0.575***			
	(−13.881)			
*Readability * OC*	0.088***			
	(2.970)			
Lev		−0.642***		
		(−13.315)		
*Lev * OC*		0.065**		
		(2.219)		
SA Index			−0.762***	
			(−19.528)	
*SA Index * OC*			0.146***	
			(5.132)	
Crisis				−2.913***
				(−11.554)
*Crisis * OC*				0.138***
				(3.335)
Observations	18,910	24,918	25,047	25,051
R-squared	0.705	0.698	0.700	0.695
Control	Yes	Yes	Yes	Yes
Year/Industry Dummies	Yes	Yes	Yes	Yes

Note: This table reports cross-sectional regression results for the relationship between organizational capital and credit ratings. Readability is an indicator variable that equals one if the bog index is less than the average bog index and zero otherwise. The Bog index measures readability, as in Bonsall et al. (2017), and a higher score means lower readability. Lev is an indicator variable that equals 1 when leverage is higher than average leverage and zero otherwise. SA Index is an indicator variable that equals one if SA Index is higher than the average SA Index and zero otherwise. Crisis which equals one for the years 2008 and 2009 and zero otherwise. Control variables are the same as in Table 3. Robust standard errors clustered at the firm level. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively. Variables are defined in the Appendix.

4. Conclusion

This study examines the association between organizational capital and credit rating. Based on the view that organizational capital moderates the negative effects of informational asymmetry, leverage, financial constraints, and crisis, we argue that rating agencies consider firms' organizational capital on credit rating. We find evidence supporting this prediction. Our cross-sectional analysis shows that the positive association is more pronounced for firms with less readable annual reports, higher leverage, financial constraints, and during crisis periods. Generally, these results suggest that information on organizational capital provides an important signal to rating agencies to assess firms' creditworthiness and their potential to service debts. We contribute to the literature by suggesting valuable information communicated via firms' organizational capital captured in credit rating, documenting the effects of a hitherto unexplored determinant of credit ratings, and further supporting existing literature (e.g., Cornaggia et al., 2017; Hossain et al., 2023) that non-financial factors are important determinants of credit rating. Our findings are significant in both theoretical and practical aspects. Theoretically, we provide new insights into credit rating determinants, emphasizing the role of organizational capital as an important determinant of firms' creditworthiness. From a practical viewpoint, understanding the impact of organizational capital on credit ratings can help firms strategize to enhance their creditworthiness, making it easier to obtain financing and reduce borrowing costs. However, this research has some limitations. The focus on publicly traded US firms could restrict the generalizability of our findings to other contexts, such as private firms or firms operating in different economic environments.

Declaration of Competing Interest

None.

Data availability

The authors do not have permission to share data.

Appendix: Variable definitions

(*continued on next page*)

(*continued*)

Variables		**Definition**
Variables		**Definition**
Credit Rating	=	S&P's long-term issuer credit rating is converted into numerical values with an AAA rating given a score of 21 and a C rating score of 1. Each incremental step is equivalent to 1.
OC	=	Organization capital scaled by total assets, constructed by capitalizing SG&A expenses using the perpetual inventory method following Eisfeldt and Papanikolaou (2013).
OC_Rank	=	The annual decile rank of a firm's organization capital based on the Compustat universe.
IndAdj_OC	=	The organization capital minus the (2-digit SIC) industry median OC, scaled by total assets.
IndAj_OC_Rank	=	*Adj*_OC is calculated using net SG&A, which is the net of R&D and advertising expenses.
Firm Size	=	The natural logarithm of total assets (AT).
Leverage	=	Total debt (DLC + DLTT) scaled by total assets (AT).
ROA	=	Operating income (OIBDP) scaled by total assets (AT).
Loss	=	One, if net income before extraordinary items is negative, zero otherwise.
Tangibility	=	Property, plant, and equipment scaled by total assets (AT).
Interest Coverage	=	Operating income (OIBDP) scaled by interest expense (XINT).
Subord. Debt	=	Indicator variable that equals one if the firm has subordinated debt or zero otherwise.
CFVol	=	The standard deviation of the six most recent observations of cash flow from operations, with a minimum requirement of three observations.
KZ Index	=	Following Kaplan and Zingales (1997), financial constraints (KZ Index) is calculated as follows: −1.002*(cash flow over lagged total assets) - 39.368*(dividend over lagged total assets) −1.315*(cash over lagged total assets) +3.139*leverage +0.283*Tobin's Q.
Excess Cash	=	This is an indicator variable that equals one if a firm's cash holding (CHE/AT) for a given year is higher than the median level of that firm's 2SIC industry for that year.
Dis Accrual	=	Discretionary accruals is the difference between the total accruals and the fitted normal accruals, defined as $DA_{it} = (TA_{it}/ Assets_{i,t-1}) - NA_{it}$ as in Cohen and Zarowin (2010).

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