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Labor Unions and Leverage: Evidence from Firm-Level Union Data

Katsushi Suzuki

School of Business Administration
Hitotsubashi University

Nakako Zushi

School of Business Administration
Hitotsubashi University

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Katsushi Suzuki
School of Business Administration
Hitotsubashi University
ksuzuki@hub.hit-u.ac.jp

Nakako Zushi
School of Business Administration
Hitotsubashi University
id17f002@g.hit-u.ac.jp

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Abstract
This paper investigates the effect of labor unions on firm leverage by using firm-level labor union data from Japan. We find that as union coverage increases, leverage decreases. This relation is robust when the firm falls into deficit. In addition, we find that firms with higher union coverage have a higher interest coverage ratio than non-unionized firms. Our results imply that firms with significant employee influence enhanced by labor unions make decisions to ensure the firm's stability to prevent wage demands stemming from employees' unemployment risk.

JEL classification: G30, G32, J21
Keywords: Leverage, Capital structure, Labor union, Unemployment cost

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ABSTRACT

This paper investigates the effect of labor unions on firm leverage by using firm-level labor union data from Japan. We find that as union coverage increases, leverage decreases. This relation is robust when the firm falls into deficit. In addition, we find that firms with higher union coverage have a higher interest coverage ratio than non-unionized firms. Our results imply that firms with significant employee influence enhanced by labor unions make decisions to ensure the firm's stability to prevent wage demands stemming from employees' unemployment risk.

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A growing stream of literature investigates the relation between labor unions and firm leverage by using country- and industry-level union coverage (Simintzi et al. 2015; Bronars and Deere 1991; Myers and Saretto 2016). [1] However, the results are controversial, and two competing hypotheses are discussed: (i) the *unemployment cost hypothesis*, in which labor unions negatively affect leverage, and (ii) the *bargaining power hypothesis*, in which labor unions positively affect leverage. A potential reason for this controversy is that the U.S. literature uses a firm-level proxy that is converted from country- or industry-level union coverage as the proxy for the influence of labor unions within the firm. In an analysis using this firm-level proxy, it is difficult to identify whether country or industry characteristics or the influence of labor unions within the firm have an effect. In contrast, the number of union members who belong to firm-level labor unions of each listed firm in Japan is available. The disclosure rule requires listed firms to report the information about labor unions, for example, the existence or absence of a labor union in the firm, the number of union members, and so on, in their annual security reports. Using this firm-level data for the number of union members allows us to identify the influence of labor unions within each listed firm. The purpose of this paper is to investigate the *unemployment cost hypothesis* and the *bargaining power hypothesis* regarding the relation between labor unions and the firm's leverage using firm-level union coverage data.

The *unemployment cost hypothesis* is a hypothesis in which a manager selects financial policies to make the firm's financial situation stable or have it appear stable. Employees will bear significant costs if they are unemployed (Diamond 1982; Mortensen and Pissarides 1994).[2] Therefore, employees demand a premium on their wages and benefits to compensate for the potential risk of unemployment (Topel 1984). Thus, to avoid such demands and therefore reduce the costs stemming from employees' unemployment risk, an incentive to select this financial policy that prevents the firm from falling into financial trouble or makes the firm appear far from financial trouble arises in the firm. When a firm has a labor union, the labor union strengthens these demands through collective bargaining representing the employees. Prior literature regarding this hypothesis shows that firms with a strong labor union influence tend to smooth earnings (Hamm et al. 2018) and reduce dividends to hedge their cash flow volatility (He et al. 2016; Haw et al. 2018). In terms of leverage, Simintzi et al. (2015) use country-level data and find results that support the *unemployment cost hypothesis*. Debt financing increases employees' risk of unemployment when the firm is in financial trouble. The union demands of preliminary

[1] Matsa (2010) conducts firm-level analysis. However, their sample consists of cross-sectional data in 1977, 1987 and 1999, and thus, their sample is limited to 1,676 firm-years.

[2] Unemployed employees seek jobs for re-employment. However, their job opportunities are limited since their human assets are firm-specific (Lazear 2009) and both the workers and the firms have only incomplete information in terms of workers' productivity (Harris and Holmstrom 1982).

compensation for employees' unemployment risk increase as leverage increases. Then, such firms have an incentive to lower their leverage to reduce the unemployment risk of their employees and thus avoid the union demands stemming from such risk. Under this hypothesis, we predict that firms with a strong labor union influence decrease their leverage.

The *bargaining power hypothesis* is a hypothesis in which a manager strategically selects financial policies that make the firm's financial flexibility lower or appear low. Under circumstances in which any concession to union demands risks firm survival, collective bargaining would be advantageous for the firm. Therefore, managers may have an incentive to manipulate their financial policies to reduce their financial flexibility or make it appear low in order to claim that there is no room for concession to the union demands, resulting in an increase in the managers' bargaining power. Prior literature concerning this hypothesis shows that firms with a strong influence of labor unions tend to reduce their cash holdings (Klasa et al. 2009; Tong and Huang 2018), use income-decreasing accounting methods (DeAngelo and DeAngelo 1991; D'Souza et al. 2000), manipulate dividends based on the profitability of the firm (Chino 2016), miss consensus analyst forecasts (Bova 2013) and delay good news disclosure and promote bad news disclosure (Chung et al. 2016). Regarding leverage, Bronars and Deere (1991), and Myers and Saretto (2016) use industry-level data and find results that support the *bargaining power hypothesis*. Debt financing often accompanies the risk of bankruptcy and increases the unemployment risk of employees due to financial trouble or bankruptcy. Firms can utilize this risk to make labor unions withdraw their wage and benefits demands in collective bargaining.[3] Therefore, managers increase their leverage to increase their bargaining power against labor unions. Under this hypothesis, we predict that firms with a strong influence of labor unions increase their leverage.

We find that firms with higher union coverage are likely to lower their leverage. This relation is robust when the firm faces a deficit. Additionally, the results from the analysis of the interest coverage ratio confirm that firms with higher union coverage tend to have higher interest coverage ratios. These results are consistent with the *unemployment cost hypothesis* and imply that firms make decisions that ensure the firm's financial stability in terms of leverage to mitigate unions' wage demands stemming from employees' unemployment risk.

This paper proceeds as follows. We explain our data and sample selection process in section 2, discuss the results from the empirical analyses in section 3 and conclude in section 4.

[3] Myers and Saretto (2016) find that labor unions in firms with high leverage during collective bargaining are unlikely to strike.

I. DATA AND VARIABLES

Labor union data are obtained from the annual security reports of each firm from April 2004 to March 2017. These data include information on the existence or absence of a labor union, the number of union members, the number of employees, the average tenure of the firm's employees and the average age of the firm's employees. Accounting data and stock price data are obtained from Quick Astra Manager. Our initial sample collected in this way includes 39,362 firm-years. We exclude 291 firm-years that do not cover the twelve months of the fiscal year, 643 firm-years for financial institutions or firms for which the industry is not specified, 157 firm-years for firms with negative equity, 8,609 firm-years without labor union data and 5,281 firm-years without other necessary data. As a result, the final sample consists of 24,381 firm-years.

Motivated by Myers and Saretto (2016), we use the following equation to investigate the influence of labor unions on leverage:

$$Leverage_{i,t+1} = \beta_0 + \beta_1 UNION_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 \Delta Employee/Asset_{i,t} + \beta_4 ROA_{i,t} + \beta_5 Cash/Asset_{i,t} + \beta_6 / Asset_{i,t} + \beta_7 Dividend/Asset_{i,t} + \beta_8 \, ln(Sales)_{i,t} + \beta_9 MTB_{i,t} + \beta_{10} Altman\ Z\text{-}score_{i,t} + \varepsilon_{i,t}. \quad (1)$$

Our main dependent variable is the debt ratio at the time t+1($Leverage_{t+1}$). Our main independent variables in this paper are the number of union members divided by the number of employees for each firm (*UNION COVERAGE*) and a dummy variable to which we assign a value of 1 if the firm has a labor union and 0 otherwise (*UNION dummy*). Control variables are as follows. First, we include *Leverage* at time t. Layoffs and pension funds are associated with strikes, and we include the change in the ratio of the number of employees to assets from time t-1 to time t (Δ*Employee/Asset*). According to DeAngelo and DeAngelo (1991), firms manipulate their earnings downwards and cut dividends so that labor unions must concede that the firm is in poor financial health. Thus, we include operating income divided by assets (*ROA*) and dividends divided by assets (*Dividend/Asset*). According to Klasa, Maxwell and Ortiz-Molina (2009), cash holdings are associated with the possibility of striking. Therefore, we include cash divided by asset (*Cash/Asset*). Because inventory reduces the cost of strikes, we include inventory divided by assets (*Inventory/Asset*). We include the natural log of sales (*ln(Sales)*) as a measure of firm size, the market-to-book ratio (*MTB*) as a measure of investment opportunities and the modified Altman's Z-score (*Altman Z-score*) as a measure of the possibility of bankruptcy. Continuous variables are winsorized at the 1% and 99% levels.

Panel A of Table 1 shows the summary statistics. The mean (median) of *Leverage* is 0.202 (0.163) for the full sample. The mean of the *UNION dummy* is 0.490, implying that approximately half of the sample firms

have labor unions. The mean (median) of *UNION COVERAGE* is 0.377 (0.000). This result implies that unionized firms have large labor unions.

Panel B of Table 1 shows the comparison of variables between the subsamples of unionized firms and nonunionized firms. The mean (median) of *TENURE*, the average tenure of the firm's employees, is 15.725 years (16.100 years) among unionized firms, whereas it is 9.323 years (9.000 years) among non-unionized firms. The mean (median) difference of *TENURE* between unionized firms and non-unionized firms is 6.401 years (7.100 years), indicating that the average tenure of employees is significantly longer among unionized firms than among non-unionized firms. This result is consistent with our prediction. The mean (median) of *Leverage* is 0.203 (0.175) among unionized firms, whereas it is 0.201 (0.149) among non-unionized firms. The mean (median) difference of *Leverage* is 0.001 (0.026), indicating that unionized firms have a higher leverage than non-unionized firms, although the mean difference of *Leverage* is not significant, whereas the mean difference is significant. This result is consistent with the *bargaining power hypothesis*.

Insert Table 1

II. RESULTS

A. Baseline regression results

To investigate the *unemployment cost hypothesis* and the *bargaining power hypothesis*, we conduct the regression as defined in equation (1) in which the dependent variable is *Leverage* at time t+1. This paper predicts that labor unions negatively affect the firm's leverage. However, it can be considered that the level of leverage induces employees to unionize or belong to a labor union. It is possible that labor unions and leverage are simultaneously determined. To address this possibility, this paper employs the two-stage instrumental variable regression. Hernández (1995) finds that because part-time workers have shorter tenures, they are less likely to have an incentive to unionize than full-time workers. Motivated by this prior study, this paper uses the average tenure of the firm's employees (*TENURE*) as an instrumental variable.[4] We predict that firms whose employees have a longer average tenure are likely to be unionized.

[4] Following Scoville (1971), who reports that as a worker ages, the demands of unionization increase, we conduct the same regression presented here by using the average age of the firm's employees as an instrumental variable and find results similar to our baseline results.

Table 2 shows the results from the two-stage instrumental variable regression. Column (1) presents the first-stage result that estimates *UNION COVERAGE* by *ln(TENURE)* and the control variables as defined in equation (1). The coefficient of *ln(TENURE)* is significantly positive. This result is consistent with our prediction that as the average length of the firm's employees' tenure increases, the union coverage increases. Column (2) presents the second-stage result that estimates *Leverage* at time t+1 by the instrumented *UNION COVERAGE* and the control variables as defined in equation (1). Our instrumental variable specification passes the Langrange-Multiplier test for underidentification using a rank test procedure from Kleibergen and Paap (2006), and the Cragg-Donald and the Kleibergen-Paap Wald test for weak identification. The coefficient of *UNION COVERAGE* is negative and significant at the 1% level. This result indicates that the influence of labor unions is associated with a lower leverage level, supporting the *unemployment cost hypothesis*. According to the value of the coefficient, when *UNION COVERAGE* increases by one standard deviation (0.413, as presented in Panel A of Table 1), *Leverage* at time t+1 decreases by 0.189% points ($-0.458 \times 0.413 = -0.189$). Columns (3) and (4) present the results of a similar regression replacing the labor union measure with the *UNION dummy*. The coefficient of the *UNION dummy* in Column (4) is negative and significant at the 1% level. This result indicates that leverage is 0.313% points lower among unionized firms than among non-unionized firms. This result supports the *unemployment cost hypothesis* in the same way as the result of *UNION COVERAGE*. In summary, these results are economically significant.

The coefficients of Δ*Employee/Asset* are significantly negative, showing that the increasing possibility of a strike decreases the firm's leverage. The coefficients of *ROA* are significantly negative, suggesting that firms make the decision to decrease their leverage while signaling their low profitability. The coefficients of *Cash/Asset* are significantly negative, implying that such circumstances that increase the possibility of strikes decrease the firm's leverage. These results are consistent with the *unemployment cost hypothesis*. The coefficient of *Inventory/Asset* is significantly positive, which implies that inventory is one of the determinants that increase the firm's leverage because it reduces the cost of strikes for the firm. Finally, the coefficient of *ln(Sales)* is significantly positive, which means that larger firms have a higher level of leverage. *Dividend/Asset*, *MTB* and *Altman Z-score* are not significant.

Insert Table 2

B. Deficit firms

Table 3 shows the results of the analysis on whether the negative relation between labor unions and leverage is affected by the firm's financial deficit. We conduct the same two-stage instrumental variable regression as shown in Table 2 by introducing a dummy variable that indicates whether the firm is in deficit or not (*Deficit dummy*). *Deficit dummy* is a dummy variable to which we assign a value of 1 if the firm is in deficit and 0 otherwise. A firm is deemed to be in deficit when the firm belongs to the top tertile group of a deficit measure, calculated as the ratio of the sum of dividends, capital expenditure, the change in working capital from t-1 to t and the current portion of long-term debt at t-1 minus the amount of operating cash flow minus interest and discount expenses, and corporate, inhabitant, and enterprise taxes to assets. The dependent variable is the debt ratio at the time t+1 ($Leverage_{t+1}$). The independent variables are the union coverage (*UNION COVERAGE*), the deficit dummy (*Deficit dummy*) and an interaction term of such variables (*UNION COVERAGE×Deficit dummy*). We use the log of average tenure of the firm's employees and its interaction term with the deficit dummy (*ln(TENURE)×Deficit dummy*). Control variables are the same as in Table 2. If the *unemployment cost hypothesis* is dominant, the *UNION COVERAGE×Deficit dummy* will be significantly negative.

Column (3) shows the second-stage results. Consistent with our prediction, the coefficient of the *UNION COVERAGE×Deficit dummy* is negative and significant at the 1% level. According to the value of the coefficient, when *UNION COVERAGE* increases by one standard deviation (0.413), deficit firms decrease *Leverage* at time t+1 by 0.183% points ($-0.449 \times 0.413 - 0.017 \times 0.413 + 0.009 = -0.183$), whereas non-deficit firms decrease it by 0.185% points ($-0.449 \times 0.413 = -0.185$). The coefficient of the *UNION dummy×Deficit dummy*, which is indicated in Column (6), is also negative and significant at the 1% level. Firms with labor unions decrease *Leverage* at the time of t+1 by 0.308% points ($-0.303 \times 0.413 - 0.015 \times 0.413 + 0.010 = -0.308$) when they fall into deficit, whereas they decrease it by 0.303% points when they are not in deficit. These results indicate that firms decrease their leverage to reduce the risk of bankruptcy when they have a labor union and when the labor union has a strong influence, supporting the results presented in Table 2.

Insert Table 3

C. Interest coverage ratio

Following Agrawal and Matsa (2013), we investigate the interest coverage ratio, which indicates the firm's ability to pay for the outstanding debt and thus can be another indicator that workers are concerned about the possibility of financial distress. The interest coverage ratio is denoted as *ICR*. We deem the value of *ICR* as 0 when the operating income is negative. In contrast with the negative influence of labor unions on leverage, we expect that labor unions positively affect the firm's interest coverage ratio. Panel A of Table 4 shows that the mean (median) of *ICR* is 94.733 (12.111). According to Panel B, the mean (median) of *ICR* is 89.338 (12.888) among unionized firms, whereas it is 99.917 (11.164) among non-unionized firms. The mean (median) difference of *ICR* between unionized firms and non-unionized firms is -10.579 (1.723), indicating mixed results.

Panel C shows the results from the similar regression as in Table 2 in terms of the interest coverage ratio. The dependent variable is the log of *ICR* at time t+1 ($ln(1+ICR)_{t+1}$). The coefficient of *UNION COVERAGE* in Column (2) is positive and significant at the 1% level. This result means that if *UNION COVERAGE* increases by one standard deviation (0.413), *ICR* at time t+1 increases by 2.114% ($5.118 \times 0.413 = 2.114$). The coefficient of the *UNION dummy* shown in Column (4) is also positive and significant at the 1% level. This result indicates that unionized firms are likely to have 3.525% higher *ICR* at time t+1 than non-unionized firms. These results are economically significant. In summary, these results imply that firms increase their ability to pay for the outstanding debt to fall into financial distress when they have a labor union and when the labor unions have a strong influence, supporting the results presented in Table 2.

Insert Table 4

III. CONCLUSIONS

The interest of this paper is to investigate the relationship between employees and the decision on the level of leverage through the existence and influence of labor unions. According to the empirical results, we find that firms decrease their leverage when they have a labor union and when the labor union has a strong influence. This result is robust among deficit firms. Additionally, a similar result is confirmed when we investigate the interest coverage ratio. These results imply that labor unions have a significant influence on the firm's financial

policy and support the *unemployment cost hypothesis* in which firms with strong labor unions bear higher potential bankruptcy costs and thus take actions to reduce bankruptcy risks.

Prior literature studies the influence of labor unions on the decision regarding leverage by using country- and industry-level measures of labor unions and finds two competing evidence: the first supports the *unemployment cost hypothesis* (Simintzi et al. 2015), and the other supports the *bargaining power hypothesis* (Bronars and Deere 1991; Myers and Saretto 2016). This paper investigates using firm-level union coverage and contributes to such arguments by providing strong evidence that supports the *unemployment cost hypothesis*.

Appendix 1 Variable definitions

Variables	Definition
UNION COVERAGE	The number of union members divided by the number of employees for each firm.
UNION dummy	A dummy variable to which we assign a value of 1 if the firm has a labor union and 0 otherwise.
TENURE	The average tenure of the firm's employees.
Leverage	Debt divided by assets
ICR	Interest coverage ratio. We deem the value of *ICR* as 0 when the operating income is negative
Δ*Employee/Asset*	The change in the ratio of the number of employees to assets from time t-1 to time t
ROA	Operating income divided by assets
Cash/Asset	Cash and securities divided by assets
Inventory/Asset	Inventory divided by assets
Dividend/Asset	Dividends divided by assets
Sales	Sales
MTB	Market value of equity and total liability divided by assets
Altman Z-score	The modified Altman's Z-score, calculated by following equation: $$Altman\ Z\text{-}score = 3.3 \times (EBIT \div Asset_{t-1}) + 1.0 \times (Sales \div Asset_{t-1}) + 1.4 \times (Retained\ earnings \div Asset_{t-1}) + 1.2 \times (Working\ capital \div Asset_{t-1})$$
Deficit dummy	A dummy variable to which we assign a value of 1 if the firm is in deficit and 0 otherwise. A firm is deemed to be in deficit when the firm is belongs to the top tertile group of a deficit measure, calculated as follows: $$Deficit = \big(Dividend + Capital\ expenditure + \Delta Working\ capital + Current\ portion\ of\ long\text{-}term\ debt_{t-1} - (Operating\ cash\ flow - Interest\ and\ discount\ expense - Corporate, inhabitant, and\ enterprise\ taxes)\big) \div Asset$$

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Table 1 Summary statistics

This table explains the variables used in the analyses. Panel A shows the summary statistics, and Panel B shows the mean (median) difference test between the subsample of unionized firms and that of non-unionized firms. *UNION COVERAGE* is the ratio of the number of union members to the number of employees in the firm. The *UNION dummy* is a dummy variable that takes a value of 1 when the firm has a labor union and 0 otherwise. *TENURE* is the average tenure of employees. *Leverage* is a ratio of debt to assets. Δ*Employee/Asset* is the change in the number of employees divided by assets from time t-1 to time t. *ROA* is operating income divided by assets. *Cash/Asset* is cash and marketable securities divided by assets. *Inventory/Asset* is inventory divided by assets. *Dividend/Asset* is the amount of dividends paid divided by assets. *Sales* is sales. *MTB* is the market value of equity and total liability divided by assets. *Altman Z-score* is the modified Altman's Z-score. Continuous variables are winsorized at the 1% and 99% levels.

Panel A: Summary statistics. (N=24,381)

Variables	Mean	Standard deviation	25th percentile	Median	75th percentile
UNION COVERAGE	0.377	0.413	0.000	0.000	0.799
UNION dummy	0.490	0.500	0.000	0.000	1.000
TENURE	12.460	5.497	8.000	13.400	16.800
Leverage	0.202	0.182	0.038	0.163	0.322
Δ*Employee/Asset*	-0.000	0.003	-0.001	-0.000	0.001
ROA	0.048	0.061	0.021	0.043	0.076
Cash/Asset	0.189	0.138	0.088	0.153	0.253
Inventory/Asset	0.118	0.107	0.040	0.098	0.161
Dividend/Asset	0.009	0.009	0.004	0.007	0.012
Sales	123,819	338,801	12,577	32,267	89,932
MTB	1.127	0.644	0.806	0.958	1.202
Altman Z-score	2.052	0.974	1.455	2.013	2.601

Panel B: Mean (median) difference test based on the existence or absence of labor unions.

Variables	Unionized firms			Non-unionized firms			Mean difference (t-stat.)	Median difference (z-stat.)
	Mean	Median	Standard deviation	Mean	Median	Standard deviation		
TENURE	15.725	16.100	3.798	9.323	9.000	5.031	6.401 (111.793)	7.100 (92.070)
Leverage	0.203	0.175	0.169	0.201	0.149	0.193	0.001 (0.574)	0.026 (7.070)
Obs.	11,947			12,434				

Table 2 The influence of labor unions on leverage

This table shows the results from the two-stage instrumental variable regression regarding the influence of labor unions on firm leverage. The dependent variable is leverage at time t+1 ($Leverage_{t+1}$). The independent variable is union coverage (*UNION COVERAGE*) and the dummy variable indicates whether a firm has a labor union (*UNION dummy*). As the instrumental variable, we employ the log of employees' average tenure (*ln(TENURE)*). Control variables consist of *Leverage*, the change in the number of employees from time t-1 to time t (Δ*Employee/Asset*), operating income divided by assets (*ROA*), cash and securities (*Cash/Asset*), inventory (*Inventory/Asset*) and the modified Altman's Z-score (*Altman Z-score*). Continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses are robust t-statistics for the first-stage (z-statistics for the second-stage). *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

Variables	First-stage	Second-stage	First-stage	Second-stage
	UNION COVERAGE	$Leverage_{t+1}$	*UNION dummy*	$Leverage_{t+1}$
	(1)	(2)	(3)	(4)
UNION COVERAGE		-0.458**		
		(-2.554)		
UNION dummy				-0.313***
				(-2.611)
ln(TENURE)	0.024***		0.035***	
	(5.417)		(6.039)	
Leverage	-0.050***	0.599***	-0.052***	0.606***
	(-5.095)	(35.864)	(-4.555)	(40.394)
Δ*Employee/Asset*	-0.581***	-0.410*	0.039	-0.131
	(-2.815)	(-1.649)	(0.148)	(-0.642)
ROA	-0.010	-0.123***	-0.013	-0.123***
	(-0.579)	(-5.559)	(-0.694)	(-5.698)
Cash/Asset	0.037***	-0.035***	0.020*	-0.045***
	(3.867)	(-2.665)	(1.836)	(-4.014)
Inventory/Asset	0.024**	0.042**	0.006	0.033**
	(2.103)	(2.347)	(0.490)	(1.965)
Dividend/Asset	-0.099	0.209	-0.274*	0.169
	(-0.679)	(1.396)	(-1.679)	(1.160)
ln(Sales)	0.012***	0.022***	0.005	0.018***
	(4.125)	(5.348)	(1.515)	(5.306)
MTB	0.002*	0.003	0.000	0.002
	(1.756)	(1.482)	(0.302)	(1.086)
Altman Z-score	-0.007***	0.001	-0.003	0.004
	(-3.539)	(0.413)	(-1.163)	(1.558)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	24,381	24,381	24,381	24,381
Kleibergen-Paap rk LM statistic		28.868***		33.136***
Cragg-Donald Wald F statistic		88.634		150.893
Kleibergen-Paap rk Wald F statistic		29.346		36.474

Table 3 Deficit firms

This table shows the results from the two-stage instrumental variable regression examining whether the baseline results are affected by the firm's financial deficit. The dependent variable is leverage at time t+1 ($Leverage_{t+1}$). The independent variable is union coverage (*UNION COVERAGE*) and its interaction term with a dummy variable of deficit (*UNION COVERAGE×Deficit dummy*), a dummy variable of the existence of a labor union (*UNION dummy*) and its interaction term with the dummy variable for deficit (*UNION COVERAGE×Deficit dummy*), and the dummy variable for deficit (*Deficit dummy*). As the instrumental variable, we employ the log of the average tenure of employees (*ln(TENURE)*) and its interaction term with the dummy variable of deficit (*ln(TENURE)×Deficit dummy*). Control variables are the same as introduced in Table 2. Continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses are robust t-statistics for the first-stage (z-statistics for the second-stage). *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

Variables	First-stage		Second-stage	First-stage		Second-stage
	UNION COVERAGE	*UNION COVERAGE* ×Deficit	*Leverage* $_{t+1}$	*UNION dummy*	*UNION dummy* ×Deficit	*Leverage* $_{t+1}$
	(1)	(2)	(3)	(4)	(5)	(6)
UNION COVERAGE			-0.449**			
			(-2.505)			
UNION COVERAGE			-0.017***			
×Deficit dummy			(-2.700)			
UNION dummy						-0.303**
						(-2.543)
UNION dummy						-0.015***
×Deficit dummy						(-2.989)
ln(TENURE)	0.023***	-0.160***		0.034***	-0.199***	
	(5.124)	(-17.112)		(5.861)	(-17.593)	
ln(TENURE)	0.002	0.338***		0.001	0.432***	
×Deficit dummy	(1.083)	(62.122)		(0.611)	(68.735)	
Deficit dummy	-0.004	-0.415***	0.009***	-0.003	-0.527***	0.010***
	(-0.906)	(-33.122)	(3.192)	(-0.453)	(-35.957)	(3.386)
Leverage	-0.050***	-0.045**	0.596***	-0.053***	-0.041*	0.603***
	(-5.109)	(-2.303)	(35.373)	(-4.561)	(-1.761)	(39.860)
ΔEmployee/Asset	-0.582***	0.013	-0.393	0.039	-0.033	-0.120
	(-2.820)	(0.037)	(-1.586)	(0.147)	(-0.077)	(-0.591)
ROA	-0.010	-0.066*	-0.123***	-0.013	-0.084*	-0.123***
	(-0.601)	(-1.815)	(-5.549)	(-0.706)	(-1.896)	(-5.688)
Cash/Asset	0.037***	0.058***	-0.034***	0.021*	0.065***	-0.044***
	(3.893)	(3.092)	(-2.615)	(1.858)	(2.789)	(-3.965)
Inventory/Asset	0.024**	-0.053*	0.038**	0.006	-0.073**	0.028*
	(2.137)	(-1.880)	(2.079)	(0.493)	(-2.077)	(1.673)
Dividend/Asset	-0.100	-0.633**	0.187	-0.275*	-0.756**	0.149
	(-0.677)	(-2.388)	(1.246)	(-1.676)	(-2.291)	(1.019)
ln(Sales)	0.012***	0.006	0.022***	0.005	0.005	0.018***
	(4.072)	(1.275)	(5.473)	(1.498)	(0.898)	(5.467)
MTB	0.002*	-0.002	0.002	0.000	-0.003	0.002
	(1.788)	(-0.734)	(1.278)	(0.314)	(-0.980)	(0.869)
Altman Z-score	-0.007***	0.004	0.000	-0.003	0.008*	0.003
	(-3.468)	(0.994)	(0.153)	(-1.136)	(1.781)	(1.224)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,381	24,381	24,381	24,381	24,381	24,381
Kleibergen-Paap rk LM statistic			28.822***			33.107***
Cragg-Donald Wald F statistic			44.178			75.239
Kleibergen-Paap rk Wald F statistic			14.646			18.229

Table 4 Interest coverage ratio

This table indicates the results from the analysis of the interest coverage ratio. Panel A shows the summary statistics, and Panel B shows the mean (median) difference test between the subsample of unionized firms and that of non-unionized firms. *ICR* denotes the interest coverage ratio. *ICR* is deemed to be 0 when the operating income is negative. Panel C shows the results from the two-stage instrumental variable resgresssions. The dependent variable is the log of one plus *ICR* at the time t+1 ($ln(1+ICR)_{t+1}$). The independent variables and the control variables are as same as introduced in Table 2. Continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses are robust t-statistics for the first-stage (z-statistics for the second-stage). *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

Panel A: Summary statistics. (N=24,381)

Variables	Mean	Standard deviation	25th percentile	Median	75th percentile
ICR	94.733	291.757	2.648	12.111	44.860

Panel B: Mean (median) difference test based on the existence or absence of labor unions.

Variables	Unionized firms			Non-unionized firms			Mean difference (t-stat.)	Median difference (z-stat.)
	Mean	Median	Standard deviation	Mean	Median	Standard deviation		
ICR	89.338	12.888	281.988	99.917	11.164	300.765	-10.579	1.723
							(-2.831)	(8.155)

Panel C: Regression results.

Variables	First-stage	Second-stage	First-stage	Second-stage
	UNION COVERAGE	$ln(1+ICR)_{t+1}$	*UNION dummy*	$ln(1+ICR)_{t+1}$
	(1)	(2)	(3)	(4)
UNION COVERAGE		5.118**		
		(2.227)		
UNION dummy				3.525**
				(2.257)
ln(TENURE)	0.025***		0.036***	
	(5.628)		(6.237)	
ln(1+ICR)	0.000	0.334***	0.001*	0.333***
	(0.433)	(19.606)	(1.774)	(19.525)
ΔEmployee/Asset	-0.455**	3.068	0.174	0.127
	(-2.268)	(0.844)	(0.674)	(0.038)
ROA	-0.013	1.039**	-0.023	1.055**
	(-0.778)	(2.509)	(-1.233)	(2.562)
Cash/Asset	0.038***	-0.769***	0.023**	-0.654***
	(3.998)	(-3.446)	(2.011)	(-3.164)
Inventory/Asset	0.017	-0.712***	-0.001	-0.621**
	(1.541)	(-2.743)	(-0.074)	(-2.475)
Dividend/Asset	0.042	-3.471	-0.132	-2.794
	(0.291)	(-1.091)	(-0.835)	(-0.885)
ln(Sales)	0.009***	-0.202***	0.002	-0.164***
	(3.312)	(-4.349)	(0.656)	(-3.957)
MTB	0.002	0.169***	0.000	0.177***
	(1.575)	(5.430)	(0.178)	(5.749)
Altman Z-score	-0.004**	0.101***	0.000	0.078**
	(-2.247)	(2.642)	(0.106)	(2.211)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	24,381	24,381	24,381	24,381
Kleibergen-Paap rk LM statistic		31.245***		35.335***
Cragg-Donald Wald F statistic		94.672		158.318
Kleibergen-Paap rk Wald F statistic		31.676		38.895