Unionization and Firm Inventory Management: Empirical Evidence

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Abstract

Motivation: Prior literature reveals that unionizations have a significant effect on firm performance and decision making. In this paper, we explore whether and to what extent the union elections shape firm policy on inventory management.

Premise: This paper focuses on the causal effects of unionization on firm investment in inventory. We argue that the theoretical predictions on firm inventory policy following union election events are mixed, which necessitates empirical investigation of the relation between unionization and firm inventory management.

Approach: We implement the regression discontinuity approach with the union election vote data from 1980 to 2010. We perform a host of sensitivity tests to ensure that our findings are robust.

Results: We document that firms with union election wins have significantly lower inventory levels. This negative relation is more prominent for firms that have higher labor costs, less operational flexibility, and are financially constrained. Our findings also indicate that firms in states with stronger labor rights or with higher labor intensity are associated with lower inventory investment after successful union elections. We further find that firms with union election wins significantly improve their operating efficiency through higher inventory turnovers. Firms tend to shift from bank credit to trade credit to finance their inventory after the unionization.

Conclusion: In response to rising labor costs, operating inflexibility, and financial constraints caused by the union formation, firms choose to reduce their inventory level with the incentives to balance cost, speed up inventory turnover, and save internal capital for future investments.

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Consistency: This paper demonstrates that unionization is one critical factor in corporate inventory management. With the trade-off between inventory holding and shortage risks, firms are more inclined to lean inventory policies to mitigate the costs and risks of unionization.

Keywords: financial constraints, inventory management, operation flexibility, unionization

JEL Classification Codes: C44, G31, G32, J01

INTRODUCTION

Employees as critical stakeholders could participate in corporate activities by forming unions and bargaining with firm managers. Labor unions generally negotiate for higher wages, higher job security, and better benefits, which may incur reallocation of firm resources from shareholders and other stakeholders. Thus unions may actively get involved in the production process and present significant influence on the firm performance (e.g., Clark 1984; Chen, Kacperczyk, and Ortiz-Molina 2011; Bradley, Kim, and Tian 2016; Huang et al. 2017). In this study, we intend to investigate the causal effects of labor unions on one important aspect of firm operation and investment, namely inventory management.

Inventory management is challenging because it requires a trade-off between carrying costs and shortage costs. On the one hand, keeping a lean inventory yields benefits such as minimizing waste and increasing efficiency (Womack, Jones, and Roos 1990), which further leads to improvement of firm performance (Chen, Frank, and Wu 2005, Eroglu and Hofer 2011, Isaksson and Seifert 2014). On the other hand, as a buffer between production and sales, firms must hold sufficient inventory to keep regular production and shield for any uncertainties along the supply chain. Nonetheless, theoretical predictions of the effects of labor unions on firm inventory management can be vague. It is plausible that firms may choose to stockpile inventories to gain bargaining power over unions and countervail the influences of labor unions (Klasa, Maxwell, and Ortiz-Molina 2009; Hamm et al. 2018). It is also plausible that firms may reduce investment in inventories to free up some resources (He, Tian, and Yang 2016) because of the increased labor costs and operational inflexibility induced by labor unions (Chen, Kacperczyk, and Ortiz-Molina 2011). Therefore, the relation between labor unions and firm inventory management is essentially an empirical question, which necessitates further investigation.

In this study, using a sample of 823 union elections collected from the National Labor Relations Board (NLRB) over the 1980–2010 time period, we find the supportive evidence that unionizations have a significant and negative effect on firm investment in inventories. In particular, our results show that firms with successful union election votes tend to have lower inventories in the election year and one year after the election. Our empirical approach, based on a regression discontinuity (RD) design, allows us to draw the causal inference, and our results are robust to a host of sensitivity analyses. We then examine possible mechanisms and report that the negative relation between unionization and firm investment in inventories is stronger for firms with higher pre-election labor costs, lower operating flexibility, and more financial constraints. Furthermore,

our findings reveal that the effects of unions on inventories are more prominent for firms in states with stronger labor rights and that are more labor-intensive. We also report that, after successful union election votes, firms improve operation efficiency by increasing inventory turnover rate and using more trade credits instead of bank loans.

LITERATURE REVIEW

Employees play a critical role in firm operation and decision-making. Organized workers use collective bargaining power to demand higher wages, more benefits, and better job security. The rising labor costs and rent expropriation induced by labor unions lead to reduced operation flexibility and increased cost of capital (Chen, Chen, and Liao 2011; Chen, Kacperczyk, and Ortiz-Molina 2011; Qiu and Shen 2017). Existing literature has documented that labor unions may have negative effects on firm profitability (Clark 1984), cash holding (Klasa, Maxwell, and Ortiz-Molina 2009), and capital investments (Fallick and Hassett 1999). Other research shows that unions are negatively associated with firm innovation (Bradley, Kim, and Tian 2016), CEO compensation (Huang et al. 2017), tax aggressiveness (Chyz et al. 2013), and corporate social responsibility activities (Chun and Shin 2018). To deal with the abovementioned effects of labor unions, firms implement various accounting and financing measures, such as reporting higher losses (DeAngelo and DeAngelo 1991), adopting income-decreasing accounting methods (Bowen, DuCharme, and Shores 1995), smoothing earnings (Hamm, Jung, and Lee 2018), and strategically missing the analysts' earnings estimates (Bova 2013). Firms may also choose to hold less cash (Klasa, Maxwell, and Ortiz-Molina 2009), issue more debt to increase the leverage (Bronars and Deere 1991; Matsa 2010; Myers and Saretto 2015), and conduct more asset sales (Lie and Que 2019).

Nonetheless, research investigating the effects of labor unions on firm operations is still scant and generates limited insights. In this study, we focus on one important aspect of firm operation, namely inventory management, and intend to shed further light on the effects of labor unions on firm inventory management. Inventory management is an important intermediate step in production, which has a strong effect on firm performance (Chen, Frank, and Wu 2005; Capkun, Hameri, and Weiss 2009; Eroglu and Hofer 2011; Isaksson and Seifert 2014). Existing research has identified various determinants of investment in inventories, such as access to liquidity (Kashyap, Lamont, and Stein 1994), internal finance (Carpenter et al. 1994), capital intensity and sales surprise (Gaur, Fisher, and Raman 2005), sales growth rate (Gaur and Kesavan 2015), and cost of equity (Dasgupta, Li, and Yan 2019). Our study thus extends this line of research by examining whether and to what extent labor unions may affect firm inventory management.

One hypothesis posits that unionizations may reduce firm investment in inventory. Labor unions tend to increase firms' fixed labor costs due to demand for higher wages and job security (Chen, Kacperczyk, and Ortiz-Molina 2011). From the cost-management perspective, firms may choose to reduce the inventory level because inventory is less expensive and less time-consuming to adjust (Carpenter et al. 1994). In addition, labor unions often intervene in the restructuring of firm physical capital, which reduces firm operating flexibility (Chen,

Kacperczyk, and Ortiz-Molina 2011). Thus, firms may resort to the improvement of inventory turnover to offset such inefficiency. Moreover, the formation of the unions may add another layer of financial constraints to the firm (He, Tian, and Yang 2016), which forces the firms to reduce inventory to free up some internal capital for future investment opportunities. Overall, this hypothesis predicts that after the passage of the union elections, firms choose to reduce the inventory level in the short term.

The competition hypothesis states that firms may choose to stockpile inventories to gain bargaining power over unions. Firms cannot stop employees from forming a collective bargaining unit, but they can take certain actions to countervail the influences of labor unions. Those actions range from utilizing strategic accounting policies (DeAngelo and DeAngelo 1991; Bowen, DuCharme, and Shores 1995; Hamm, Jung, and Lee 2018) to adopting specific financial decisions (Bronars and Deere 1991; Klasa, Maxwell, and Ortiz-Molina 2009; Matsa 2010; Myers and Saretto 2015). In this sense, firms can strategically reduce their cash holding (Klasa, Maxwell, and Ortiz-Molina 2009) and make investment in inventories to shield against union rent-seeking. More important, unions frequently use labor strikes as a weapon in the collective bargaining process. Holding sufficient inventories, especially in the form of finished goods, may allow firms to reduce future strike risks.

We are not the first to explore the link between unionization and firm inventory management. For example, Cullinan and Knoblett (1994) find no significant differences in the choice of inventory policy for unionized firms in all industries. Hamm et al. (2018) find that managers in manufacturing industries have more incentive to stockpile inventories in response to concerns of strikes due to stronger unions. Our study differs from their papers in that we directly examine the union election votes and adopt a regression discontinuity design to draw causal inferences.

DATA, SAMPLE, AND MEASURES

We construct our sample using several databases. We obtain the union election data in the 1980–1999 time span from Professor Thomas J. Holmes's website,[1] and we retrieve union election data in the 1999–2010 time span from the NLRB website. The union election data provide details including the company name, industry, election date, total number of votes, and number of votes for the union. We carefully merge two sets of data and match union firms to Compustat firms using the names, election dates, and industries (Lee and Mas 2012). We require our sample union elections to have available election results and at least 100 voters. For firms with multiple election records, we retain the first one (Bradley, Kim, and Tian 2016). Following the convention in corporate finance research, we exclude financial firms (SIC 6000–6999) and utility companies (SIC 4900–4999) because these firms operate in highly regulated industries. Our final sample consists of 823 elections from 1980 to 2010. Table 1 reports the distribution of elections by year and by one-digit SIC code.

The main dependent variable is the inventory scaled by sales (Alessandria, Kaboski, and Midrigan 2010), demeaned by the industry and year average inventory level to adjust for the variations among industries and years. It measures

[1] http://users.econ.umn.edu/~holmes/data/geo_spill/

TABLE 1. Distributions of Unionization Election by Year and Industry

Election Year	Number of Union Elections	Rate of Union Elections Win
1978	66	0.29
1979	74	0.27
1980	68	0.15
1981	43	0.23
1982	21	0.29
1983	20	0.35
1984	21	0.24
1985	32	0.22
1986	26	0.35
1987	21	0.29
1988	30	0.23
1989	26	0.12
1990	20	0.35
1991	13	0.08
1992	19	0.05
1993	20	0.35
1994	25	0.24
1995	19	0.32
1996	31	0.10
1997	19	0.37
1998	19	0.21
1999	25	0.24
2000	21	0.24
2001	21	0.38
2002	20	0.20
2003	17	0.35
2004	16	0.19
2005	16	0.25
2006	17	0.35
2007	7	0.57
2008	10	0.30
2009	9	0.33
2010	11	0.55
1 Digit SIC Code	**Number of Union Elections**	**Rate of Union Elections Win**
1	10	0.20
2	266	0.26
3	345	0.27
4	25	0.24
5	115	0.18
7	37	0.35
8	17	0.41
9	8	0.00

the extent to which a firm's inventory-to-sales ratio is above or below the average industry level in a specific year (Chen, Frank, and Wu 2005).

We construct two variables related to union elections. *Union votes* is the number of votes for unionization divided by the total number of votes in an election. *Passage* is the election result dummy which equals 1 when the *union votes* is greater than 50% and 0 otherwise (Bradley, Kim, and Tian 2016).

We include a set of variables to capture various aspects of firm characteristics (Chen, Kacperczyk, and Ortiz-Molina 2011; Isaksson and Seifert 2014). *Total assets* is measured as the natural logarithm of the firm total book assets. *Profitability* is the income before extraordinary items scaled by the total assets. *Tobin's q* is the natural logarithm of the market value of firm assets scaled by the book value of firm assets. *Leverage* is the ratio of firm book debt to total book assets. All the variables are winsorized at 1% and 99% to mitigate the concern of extreme values. Table 2 reports the summary statistics of the main variables used in regression analysis. Note that, for our sample union elections, on average 42% of participants in the election are in favor of unionization. The election passage rate is 25%, which suggests that about one-fourth of elections in our sample results in a union formation. Those voting percentages and results are consistent with previous studies (e.g., Qiu and Shen 2017; DiNardo and Lee 2004; He, Tian, and Yang 2016) and others.

RESULTS

Identification Strategy: A Regression Discontinuity Approach

In this study, we intend to test whether and to what extent the labor unions may affect firm inventory investment by treating the union elections as an event. Endogeneity concern arises if unobserved variables simultaneously influence the passage of union elections and firm decisions on inventory investment. Therefore, ordinary least squares (OLS) estimates can be biased due to the omitted variable problem. To address the endogeneity problem and make causal inferences, we adopt a regression discontinuity approach. The fundamental idea of the RD approach is that firms just below the cutoff (lose the union election by

TABLE 2. Summary Statistics

Variable	N	Mean	Standard Deviation	P25	P50	P75
Union votes	823	0.42	0.20	0.29	0.38	0.51
Passage	823	0.25	0.44	0.00	0.00	1.00
Inventory	823	0.16	0.10	0.10	0.15	0.22
Total assets	823	4543	13258	149	675	2938
Sales	823	5019	11639	223	980	3836
Profitability	823	0.04	0.07	0.02	0.05	0.08
Tobin's q	796	1.33	0.57	0.96	1.18	1.49
Leverage	822	0.30	0.18	0.16	0.27	0.40

Notes: This table reports the summary statistics for all the variables. *Union votes* is the percentage of the votes for the union. *Passage* is a dummy which equals 1 when union votes are greater than 50% and 0 otherwise. *Inventory* is the ratio of inventory scaled by sales. *Total assets* and *Sales* are the firm's total assets and sales in raw numbers. *Profitability* is the income before extraordinary items scaled by the total assets. *Tobin's q* is the ratio of the market value of equity to the book value of equity. *Leverage* is the ratio of total debt to total assets.

a small voting share) are good comparisons to those just above the cutoff (win the union election by a small voting share) (Lee and Lemieuxa 2010). Observations within a small window around the cutoff are as good as randomized (Lee 2008). In our settings, firms within a small window around the 50% vote threshold should have similar observable and unobservable characteristics, except the status of union passage, and the difference of outcomes (inventory) reveals the causal effects of union passage (Cattaneo, Titiunik, and Vazquez-Bare 2019).

Tests on RD Design Assumptions

The RD research design has two important assumptions. The first assumption is that all of the parties involved in the votes cannot precisely manipulate the number of votes near the cutoff point (Lee and Lemieuxa 2010). We perform three tests on the validity of this assumption. Figure 1 shows the histogram of the voting results of union elections. We do not see an obvious discontinuity around the 50% threshold, which suggests that there is no precise manipulations around the cutoff. We then perform a manipulation test proposed by Cattaneo, Jansson, and Ma (2019), and report our results in Table 3. For all three different band-

FIGURE 1. Distribution of Union Votes

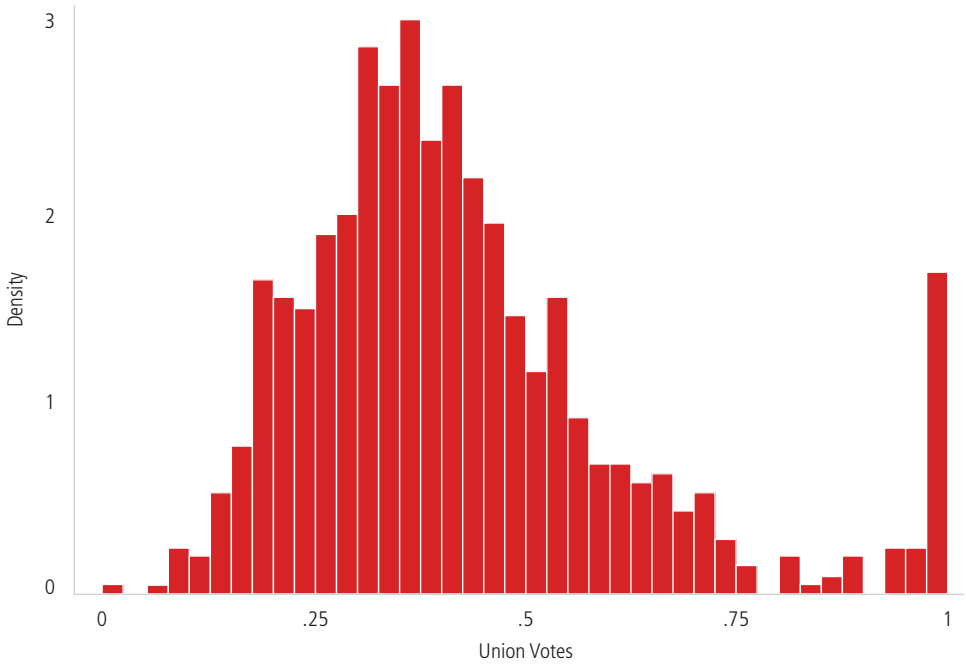


TABLE 3. Density Tests of Votes on Unionization

Density Tests Setting	Bandwidth Left	Bandwidth Right	Density Test *p*-Value
Unrestricted, Different Bandwidth	0.10	0.11	0.22
Unrestricted, Same Bandwidth	0.10	0.10	0.17
Restricted, Same Bandwidth	0.19	0.19	0.74

Notes: This table reports the results of Cattaneo, Jansson, and Ma (2019) density tests on union votes under three regression discontinuity settings. The null hypothesis is that the running variable is continuous at the cutoff. The second and third columns show the MSE-Optimal bandwidth selected for the tests. The last column shows the testing *p*-value.

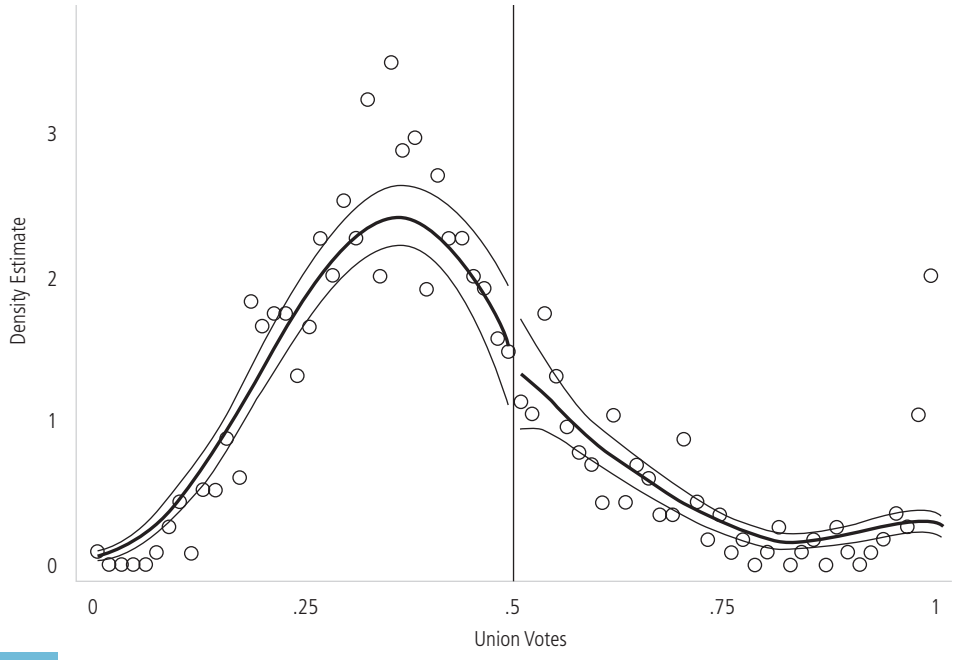
width choices, the results fail to reject the null hypothesis of no manipulation. We also conduct the McCrary (2008) density test. In particular, Figure 2 shows the estimated density, where the x-axis is the *union votes* and the y-axis shows the estimated density. The thick line is the fitted density function of the running variable;and the thin lines present the 95% confidence interval. From the plot, we observe a relatively continuous density line on the left and right of the cutoff. The discontinuity estimate is –0.04 with a standard error of 0.23, which fails to reject the null hypothesis of no manipulation as well.

The second assumption of RD design posits that other variables should be continuous around the cutoff. We test the differences of other firm financials between firms with successful union elections and firms with unsuccessful union elections within a small range. Panel A of Table 4 shows the comparison of voting results for two groups of firms within the range of 48% to 52%, and confirms that they have no significant differences in terms of firm financials. Panel B of Table 4 further confirms that other firm financials have no significant discontinuity in the pre-election period.

Global Polynomial RD

We implement a series of global polynomial RD estimations that utilize all the observations with higher-order terms of *union votes*. It also allows for separate estimations for the observations on the left and the right of the threshold. We choose the quadratic polynomials model because higher-order polynomials may suffer from problems such as noisy estimates, sensitivities to the degree of the polynomial, or poor coverage of confidential intervals (Gelman and Imbens 2019). We include the control variables for firm financials, year fixed effects, and industry fixed effects, and report our results in Table 5. For the sake of brevi-

FIGURE 2. McCrary (2008) Density Plot



ty, we do not report the coefficients of *union votes* and control variables. The coefficients of *passage* are significantly negative across all model specifications. In other words, *ceteris paribus*, the successful union elections have a negative effect on firm inventories. Furthermore, the negative effect holds for both the union election year and one year after union election. Figure 3 is a graphical illustration of the effects of labor unions on firm inventory investment under the

TABLE 4. Tests of Continuity Assumptions

Panel A: Comparison of Firms with Union Votes between 48% and 52%				
Variable	**Passage = 0**	**Passage = 1**	**Difference**	***p*-Value**
Total assets	5.70	6.14	−0.44	0.45
Sales	6.04	6.58	−0.53	0.35
Profitability	0.04	0.04	0.01	0.63
Tobin's q	0.79	0.77	0.03	0.67
Leverage	0.31	0.32	−0.01	0.91
Panel B: Discontinuity Tests on Predetermined Variables				
Pre-Election Variable	**MSE-Optimal Bandwidth**	**Effective Number of Observations**	**RD Estimator**	***p*-Value**
Inventory	0.10	242	−0.04	0.12
Total assets	0.12	291	0.65	0.22
Sales	0.09	228	0.68	0.23
Profitability	0.08	206	−0.01	0.32
Tobin's q	0.08	197	−0.05	0.28
Leverage	0.10	241	0.09	0.17

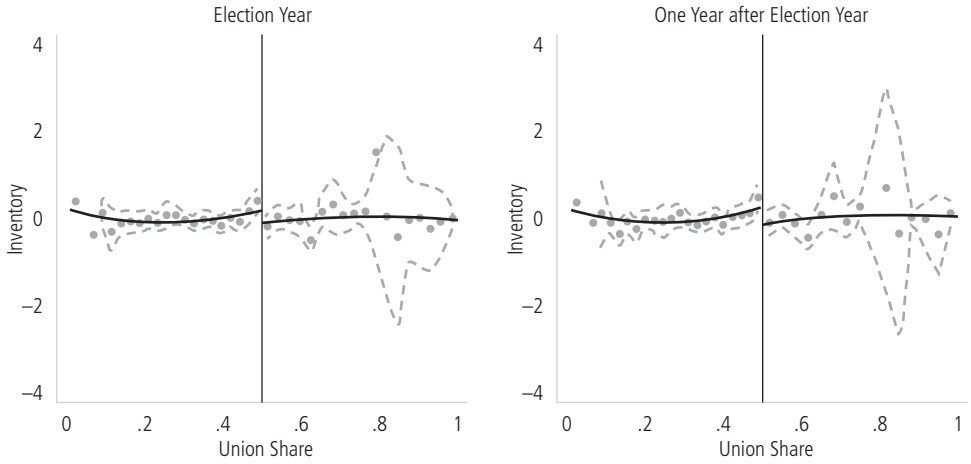
Notes: Panel A compares the observable characteristics between unionized and nonunionized firms by a small margin. Panel B reports the regression discontinuity results on variables in the pre-election year. Inventory is adjusted by industry and year average. Total assets, sales, and Tobin's q are taken as natural logarithms due to their skewness.

TABLE 5. Global Polynomial Regression Discontinuity Estimation

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variable	**Inventory ($t = 0$)**			**Inventory ($t = 1$)**		
Passage	−0.026*	−0.026*	−0.025*	−0.032*	−0.033**	−0.031*
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
Observations	823	823	796	763	763	740
R-squared	0.006	0.008	0.010	0.011	0.012	0.022
Polynomial	2	2	2	2	2	2
Year and Industry FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Notes: This table reports the results of quadratic global polynomial regression discontinuity estimation. The dependent variable is the inventory-to-sales ratio adjusted by the industry and year average. $t = 0$ refers to the election year, and $t = 1$ refers to the first year after the election year. Only the coefficients of *passage* are reported for brevity. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

FIGURE 3. Global Polynomial RD Plots on Inventory



quadratic global polynomial approach. Nonetheless, global polynomial RD is subject to a few concerns. For example, in addition to the concern regarding the choice of the degree of polynomial (Gelman and Imbens 2019), the inclusion of observations far from the cutoff in global polynomial may introduce bias (He, Tian, and Yang 2016) and result in poor estimations at the boundary points (Cattaneo, Idrobo, and Titiunik 2019).

Local Linear RD

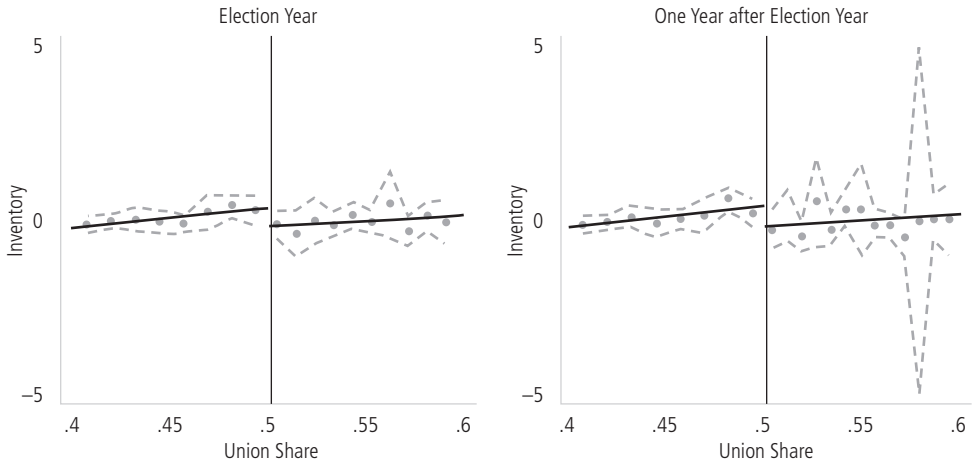
In this section, we implement a nonparametric local linear RD approach to address the abovementioned concerns in global polynomial RD, which focuses on a small window around the 50% voting threshold. Another advantage of local RD is that it is unnecessary to include the explanatory variables in the regression to obtain consistent estimates (Lee and Lemieuxa 2010). In our RD settings, we use both the triangular and uniform (rectangular) kernels. We also use two different data-driven methods for bandwidth selection, with one minimizing the mean squared error (MSE-Optimal) (Imbens and Kalyanaraman 2012) and one minimizing the coverage error of confidential intervals (CER-Optimal) (Cattaneo, Idrobo, and Titiunik 2019). Table 6 reports the estimation results based on the local linear RD approach. Using various bandwidths and kernel settings, we find that labor unions have a significant and negative effect on firm inventory levels for the election year and one year after the election. Using the average inventory-to-sale level as the benchmark, we find that the inventory-to-sale ratio is 6% lower in the election year and at least 7% lower in one year after the election. Overall, these results, along with the global polynomial RD results, suggest a negative effect of unionization on firm investment in inventories. Figure 4 illustrates the effects of labor unions under the settings of the triangular kernel and MSE-Optimal bandwidth selections. Each dot represents the mean of observations within the evenly spaced bin. The solid line is the fitted linear estimates, and the dashed lines indicate the 95% confidence interval. We observe an obvious drop in inventory levels from the left side to the right side of the 50% union vote percentage.

TABLE 6. Local Linear Regression Discontinuity Estimation Results

	(1)	(2)	(3)	(4)
	Inventory ($t = 0$)		Inventory ($t = 1$)	
Kernel	Triangular	Uniform	Triangular	Uniform
Panel A: MSE-Optimal Bandwidth Selection				
Passage	−0.066***	−0.060**	−0.074***	−0.084***
	(0.025)	(0.026)	(0.027)	(0.028)
Bandwidth Left	0.10	0.08	0.10	0.07
Bandwidth Right	0.10	0.08	0.10	0.07
Effective Obs. Left	170	115	161	100
Effective Obs. Right	89	76	80	62
Panel B: CER-Optimal Bandwidth Selection				
Passage	−0.072***	−0.085***	−0.086***	−0.094***
	(0.027)	(0.028)	(0.029)	(0.031)
Bandwidth Left	0.07	0.05	0.07	0.05
Bandwidth Right	0.07	0.05	0.07	0.05
Effective Obs. Left	109	80	104	67
Effective Obs. Right	72	59	64	50

Notes: This table reports the results of local linear regression discontinuity estimation. The dependent variable is the inventory-to-sales ratio adjusted by the industry and year average. $t = 0$ refers to the election year, and $t = 1$ refers to the first year after the election year. The triangular kernel is used in column 1 and column 3 and the uniform kernel is used in column 2 and column 4. Panel A reports the results using the MSE-Optimal bandwidth and Panel B reports the results using the CER-Optimal bandwidth. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

FIGURE 4. Local Linear RD Plots on Inventory



Robustness Checks

In this section, we conduct a host of robustness checks to ensure the validity of our findings. First, we use artificial cutoffs instead of the 50% and rerun the local RD regressions. Specifically, we use artificial cutoffs ranging from 40% to

60% stepped by 5% each time and expect to see no treatment effects other than at the real cutoff. In Table 7, we present the local RD estimates with each placebo cutoff for inventory ratio in the election year and one year after the election using the triangular kernel and MSE-Optimal bandwidth. As we expected, only the real cutoff provides a significant treatment effect. The placebo cutoff tests under other local RD settings show similar results.

Next, we use a similar approach that examines the sensitivity of our previous finding on different lengths of bandwidth. The choice of bandwidth is a trade-off between precision and bias. Wider bandwidth provides more accurate estimates from more observations but brings more misspecification error, while narrower bandwidth reduces the bias from linear specification but tends to raise the variation (Bradley, Kim, and Tian 2016; Cattaneo, Idrobo, and Titiunik 2019). In addition to the MSE-Optimal and CER-Optimal bandwidths in our base regression, we manually assign the bandwidth to be 75% and 125% of the MSE-Optimal bandwidth, and 75% and 125% of the CER-Optimal bandwidth, as recommended by Campello et al. (2018). Untabulated results show that the effects of union election on inventory are robust to those artificial bandwidths.

Exploring Underlying Mechanisms

Our findings that the union election reduces a firm's inventory level are consistent with the first hypothesis we propose. In this section, we further examine the underlying mechanisms of union influences.

TABLE 7. Local Linear Regression Discontinuity Results with Artificial Cutoffs

Artificial Cutoffs	Bandwidth	RD Estimator	Robust S.E.	Effective Number of Observations
Inventory (t = 0)				
40%	0.04	0.04	0.03	162
45%	0.02	0.02	0.05	76
50%	0.10	−0.07***	0.02	259
55%	0.07	−0.02	0.04	99
60%	0.06	−0.04	0.04	79
Inventory (t = 0)				
40%	0.04	0.05	0.03	143
45%	0.02	0.04	0.06	75
50%	0.10	−0.07***	0.03	241
55%	0.07	0.00	0.04	93
60%	0.06	−0.03	0.04	74

Notes: This table reports the results of local linear regression discontinuity estimation with different cutoffs. The dependent variable is the inventory-to-sales ratio adjusted by the industry and year average. $t = 0$ refers to the election year and $t = 1$ refers to the first year after the election year. The triangular kernel and MSE-Optimal bandwidth are used in the estimation. The results are similar when using other settings. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Firm Labor Costs

One of the direct results of the passage of union elections is the rising labor costs. As we discussed in the literature review section, firms may choose to decrease inventory levels because it is easier and less costly to adjust and restore compared to other types of capital (Carpenter et al. 1994). Therefore, firms with higher costs of goods sold would have more incentives to change their inventory policy after a union election since the labor costs' shock would be stronger for those firms already having a higher costs level. The high cost of goods sold also provides more room for future cost control for such firms. We use the gross margin to measure the cost pressure that firms are facing before union elections. The gross margin is calculated as the difference between sales and cost of goods sold scaled by the sales. Lower gross margin indicates higher costs related to the goods sold.

The results are reported in Panel A of Table 8. We assign firms to the subsample of high costs if their industry and year adjusted gross margin is below the 30th percentile and to the subsample of low costs if above the 70th percentile. The results are consistent with our expectation that firms with high costs before the union election experience a significant drop in inventory. Firms with low costs are less affected by the union formation, probably due to their ability to absorb the shock without the need to alter the inventory.

Operating Flexibility

Labor unions tend to tighten firm operating flexibility by making wages sticky and imposing difficulties for firms to lay off workers (Chen, Kacperczyk, and Ortiz-Molina 2011). Unions are more likely to intercede the firms' intention to adjust physical capital. Therefore, it is plausible that firms with less operating flexibility are more likely to reduce inventories because significant inventory costs may worsen the operating flexibility in the event of successful union elections (Raturi and Singhal 1990).

We follow Mandelker and Rhee (1984) and Chen, Kacperczyk, and Ortiz-Molina (2011) to estimate the operating leverage as the elasticity of a firm's operating income with respect to its sales using the most recent 12 quarterly data before the union election. Higher operating leverage indicates lower operating flexibility. Similar to the labor costs section, we construct subsamples based on whether a firm's pre-election operating leverage falls into the upper or lower 30th percentile range. The local RD results are presented in Panel B of Table 8. Our findings suggest that firms with low operating flexibility significantly adjust inventory levels after the passage of union elections.

Financial Constraints

Dasgupta, Li, and Yan (2019) argue that firms show different inventory behaviors when they are financially constrained. Facing an unfavorable cost shock, financially constrained firms are more likely to liquidate inventory in the short run since other types of capital are costly to adjust and it takes time to rebuild for such firms. Thus, as successful union elections put more pressure on rising labor costs, we expect that firms that are already in tight financial situations have more incentives to reduce their inventory level to free up capital for future investment opportunities.

TABLE 8. Underlying Mechanism

	(1)	(2)	(3)	(4)
Panel A: Subsample by Gross Margin				
	High Costs (Gross Margin < P30)		**Low Costs (Gross Margin > P70)**	
Variable	**Inventory (t = 0)**	**Inventory (t = 1)**	**Inventory (t = 0)**	**Inventory (t = 1)**
Passage	–0.119**	–0.098**	–0.056	–0.030
	(0.053)	(0.047)	(0.059)	(0.064)
Bandwidth Left	0.091	0.127	0.090	0.096
Bandwidth Right	0.091	0.127	0.090	0.096
Effective Obs. Left	20	32	60	61
Effective Obs. Right	26	27	23	21
Panel B: Subsample by Operating Flexibility				
	High Operating Flexibility (Operating Leverage < P30)		**Low Operating Flexibility (Operating Leverage > P70)**	
Variable	**Inventory (t = 0)**	**Inventory (t = 1)**	**Inventory (t = 0)**	**Inventory (t = 1)**
Passage	–0.003	–0.026	–0.112***	–0.102**
	(0.041)	(0.052)	(0.039)	(0.040)
Bandwidth Left	0.179	0.161	0.105	0.150
Bandwidth Right	0.179	0.161	0.105	0.150
Effective Obs. Left	107	86	50	81
Effective Obs. Right	33	28	21	21
Panel C: Subsample by Financial Constraints				
	Financially Constrained (Total assets < P30)		**Financially Unconstrained (Total assets > P70)**	
Variable	**Inventory (t = 0)**	**Inventory (t = 1)**	**Inventory (t = 0)**	**Inventory (t = 1)**
Passage	–0.120***	–0.128***	–0.067	–0.058
	(0.038)	(0.047)	(0.044)	(0.041)
Bandwidth Left	0.104	0.094	0.104	0.116
Bandwidth Right	0.104	0.094	0.104	0.116
Effective Obs. Left	55	44	49	57
Effective Obs. Right	24	20	27	27

Notes: This table reports the results of local linear regression discontinuity estimation with different subsamples. The dependent variable is the inventory-to-sales ratio adjusted by the industry and year average. t = 0 refers to the election year and t = 1 refers to the first year after the election year. The triangular kernel and MSE-Optimal bandwidth are used in the estimation. The results are similar when using other settings. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Following prior literature, we categorize firms to be financially constrained if their pre-election total assets are within the bottom 30th percentile and to be financially unconstrained if within the top 30th percentile. We separately examine the unionization effect on inventory for those two subsamples of firms and present results in Panel C of Table 8. Consistent with our expectations, the negative unionization effects are intense among financially constrained firms. In untabulated RD regressions, we find similar results based on different financial constraints measures (Whited and Wu 2006; Hadlock and Pierce 2010).

Labor Unions and State Labor Rights

In this section, we investigate how state laws related to employee rights may affect the negative relation between unionization and firm inventor investment. We focus on two labor laws that have been widely discussed in the literature (John, Knyazeva, and Knyazeva 2015). The first labor law is the right-to-work (RTW) statute, which allows employees to enjoy the union benefits without joining the union (Bradley, Kim, and Tian 2016). Thus, RTW results in a "free-rider" problem and reduces the union's bargaining power (Holmes 1998; Matsa 2010). The passage of RTW is considered to weaken the union power and state labor rights. We obtain the year each state adopted the RTW statute from the Department of Labor. The second legislation related to state labor rights is the wrongful discharge law (WDL) that protects employees from unjust discharge by employers (Autor, Donohue, and Schwab 2004). There are three common exceptions in WDL, namely, implied contract, public policy, and good faith exceptions. Passing WDL in a state is conducive to a pro-labor movement. We acquire the year that each state passes any of those exceptions from Autor, Donohue, and Schwab (2006).

As suggested by John, Knyazeva, and Knyazeva (2015), we consider a state to have strong labor rights if it has at least one of the WDL exceptions or does not adopt the RTW statue. Firms in states with strong labor rights are expected to have leaner inventory after unionization because unions are more likely to influence the operation and performance of firms in those states. We construct subsamples based on the strength of state labor rights at the time of union elections and re-run our local RD analysis. Consistent with our expectation, the results reported in Table 9 indicate that the effects of labor unions on inventory are stronger for our sample firms located in states with stronger labor rights.

Labor Unions and Firm Labor Intensity

The negative relation between unionization and inventory investment may also be contingent on the firm's labor intensity. Labor-intensive firms rely more on human capital in their operations, which allows the unions to acquire more bargaining power (Hilary 2006; John, Knyazeva, and Knyazeva 2015). As a result, such firms would face high labor-adjustment costs and substantial union influences after successful union elections. Therefore, we expect to observe a stronger effect of labor unions on inventory investment for firms with higher labor intensity.

Following existing research (Hamm, Jung, and Lee 2018), we calculate labor intensity as the total number of employees scaled by total assets. A firm belongs to the high or low labor-intensive subsample if its industry- and year-adjusted labor intensity before union election is in the top or bottom 30th percentile. We run our local linear RD regression for the two subsamples and report the results in Table 10. In line with our expectation, we observe significantly negative RD estimates for firms with high labor intensity, but not for firms with low labor intensity. Our findings suggest that the labor unions have a stronger effect on firms that rely more on human capital.

TABLE 9. Unionization and State Labor Rights

	(1)	(2)	(3)	(4)
	States with Strong Labor Rights		States with Weak Labor Rights	
Variable	Inventory (t = 0)	Inventory (t = 1)	Inventory (t = 0)	Inventory (t = 1)
Passage	–0.064**	–0.077**	–0.039	–0.043
	(0.027)	(0.030)	(0.041)	(0.042)
Bandwidth Left	0.107	0.105	0.140	0.141
Bandwidth Right	0.107	0.105	0.140	0.141
Effective Obs. Left	146	133	48	46
Effective Obs. Right	78	67	19	19

Notes: This table reports the results of local linear regression discontinuity estimation for firms from states with different levels of labor rights legislation. The dependent variable is the inventory-to-sales ratio adjusted by the industry and year average. t = 0 refers to the election year and t = 1 refers to the first year after the election year. The triangular kernel and MSE-Optimal bandwidth are used in the estimation. The results are similar when using other settings. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The Effects of Labor Unions on Operating Efficiency

Our previous findings suggest that union wins are associated with lower inventory levels. In this section, we examine how the reduced inventory levels change the firm's business efficiency. Specifically, we focus on the net operating cycle (NOC) or cash conversion cycle that calculates the time between paying for inventory and collecting the cash for selling the inventory. Shorter NOC indicates that firms collect cash from the sale of inventory more efficiently. NOC equals the sum of days of inventory outstanding (DIO) and days of sales outstanding (DSO) subtracting the days of payable outstanding (DPO). Following Dechow (1994) and others, we calculate DIO as 360 times the average inventory scaled by the cost of goods sold, DSO as 360 times the average accounts receivables scaled by sales, and DPO as 360 times the average accounts payable scaled by the

TABLE 10. Unionization and Firm Labor Intensity

	(1)	(2)	(3)	(4)
	High Labor Intensity (Number of Employment/Assets > P70)		Low Labor Intensity (Number of Employment/Assets < P30)	
Variable	Inventory (t = 0)	Inventory (t = 1)	Inventory (t = 0)	Inventory (t = 1)
Passage	–0.163**	–0.184**	–0.021	–0.072
	(0.080)	(0.082)	(0.060)	(0.062)
Bandwidth Left	0.076	0.073	0.094	0.089
Bandwidth Right	0.076	0.073	0.094	0.089
Effective Obs. Left	36	35	40	31
Effective Obs. Right	27	23	23	19

Notes: This table reports the results of local linear regression discontinuity estimation for firms with high and low labor intensity. The dependent variable is the inventory-to-sales ratio adjusted by the industry and year average. t = 0 refers to the election year and t = 1 refers to the first year after the election year. The triangular kernel and MSE-Optimal bandwidth are used in the estimation. The results are similar when using other settings. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

cost of goods sold. In Table 11, we examine the union effects on both the NOC and its three components. From the first two columns, we observe significantly negative coefficients, indicating that firms enhance their operating efficiency after the union wins. In addition, the results from columns 3 to 8 suggest that the efficiency improvements are mainly from speeding up the inventory turnover. Our findings are consistent with the first hypothesis that firms have a positive response to the union wins.

The Effects of Labor Unions on the Sources of Finance for Inventories

Inventory literature generally identifies two commonly used sources to finance inventory, namely trade credit and bank credit (Buzacott and Zhang 2004). We argue that labor union shifts firms' inventory sourcing from bank credit to trade credit for two reasons. First, the operating inflexibility caused by unionization may further induce an increase in the firm's risks such as the default risk and delayed payments due to disappointing sales (Chen, Kacperczyk, and Ortiz-Molina 2011). Trade credit indeed provides a channel between retailers and their suppliers to share those demand risks (Yang and Birge 2018). Also, prior studies find that suppliers are often inclined to offer trade credit to their customers in trouble to maintain the future business (Wilner 2000; Cuñat 2007). Therefore, the unionization will encourage the firm to use trade credits with suppliers. Second, during difficult times, firms tend to substitute trade credit for bank borrowings due to the bank credit rationing (Petersen and Rajan 1997; Atanasova and Wilson 2004) and their financial constraints (Danielson and Scott 2004). Since union passage would add further financial constraints as we discussed in the literature review section, firms after union win would decrease the usage of financial credit either due to the increasing costs of financial distress or the rising difficulty to borrow more from banks. Consequently, firms may demonstrate less usage of bank financing.

TABLE 11. Unionization and Firm Operating Cycles

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	NOC ($t = 0$)	NOC ($t = 1$)	DIO ($t = 0$)	DIO ($t = 1$)	DSO ($t = 0$)	DSO ($t = 1$)	DPO ($t = 0$)	DPO ($t = 1$)
Passage	−42.265**	−46.189**	−37.422***	−44.262***	−4.865	−1.435	−7.776*	−5.579
	(16.932)	(17.975)	(13.555)	(14.440)	(8.948)	(9.539)	(4.263)	(5.568)
Bandwidth Left	0.063	0.065	0.072	0.067	0.102	0.086	0.093	0.093
Bandwidth Right	0.063	0.065	0.072	0.067	0.102	0.086	0.093	0.093
Effective Obs. Left	85	88	104	97	165	125	148	143
Effective Obs. Right	68	60	71	60	88	70	85	76

Notes: Dependent variables in the first two columns are the net operating cycle, which equals the days of inventory outstanding plus the days of sales outstanding and minus days of payable outstanding. Dependent variables in column 3 and column 4 are the days of inventory outstanding calculated as 360 times average inventory scaled by total costs of goods sold. Dependent variables in column 5 and column 6 two columns are the days of sales outstanding, calculated as 360 times average accounting receivables scaled by sales. Dependent variables in the last two columns are the days of payable outstanding, calculated as 360 times the average accounting payable scaled by the costs of goods sold. $t = 0$ refers to the election year and $t = 1$ refers to the first year after the election year. All dependent variables are adjusted by industry and year average. The triangular kernel and MSE-Optimal bandwidth are used in the estimation. The results are similar when using other settings. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We focus on the manufacturing, wholesale, and retailing business industries in this section not only because they contain the most observations of our sample, but more importantly, firms in those two industries often have to offer trade credit and favorable payment terms to survive in the business and stay competitive (Peura, Yang, and Lai 2017). Following Yang (2011), we measure trade credit as the accounts payable scaled by inventory level and bank credit as the short-term debt scaled by inventory level. We implement local RD tests on those two financing sources and report results in Table 12. Our results show that firms increase the usage of trade credit after the unionization and decrease the usage of bank credit one year after the unionization. These results are consistent with our expectation that unionization provides firms with incentives to shift the inventory financing source from bank credit to trade credit.

CONCLUSION

How do firms change inventory investment in response to the union election? Two competing hypotheses provide opposing predictions. Based on the union election data and RD approach, we find evidence that firms reduce inventory levels in the short run after winning union elections. This negative relationship is consistent in both the global polynomial and local linear RD estimates and robust to various RD settings. Leaner inventory leads to improvement in the operating efficiency, which offsets the disadvantage brought by the unions. Moreover, the effects of labor unions on firm inventory investment are more prominent for firms located in states with stronger labor rights and that are more labor-intensive. The operation inflexibility and financial constraints caused by union elections make firms reduce bank credit and increase the use of trade credit. In sum, our findings reveal a positive reaction of firms on the unionizations.

We believe that our paper makes several contributions to the literature. First, we expand the unionization literature and show how the passage of union elections changes the firm's inventory behaviors. Previous research focused on the influence of unionization on firm performance and how firms enhance their

TABLE 12. Unionization and Sources of Inventory Financing

	(1)	(2)	(3)	(4)
Variable	Trade Credit ($t = 0$)	Trade Credit ($t = 1$)	Bank Credit ($t = 0$)	Bank Credit ($t = 1$)
Passage	0.239**	0.281***	−0.203	−0.295**
	(0.104)	(0.105)	(0.128)	(0.143)
Bandwidth Left	0.153	0.164	0.103	0.090
Bandwidth Right	0.153	0.164	0.103	0.090
Effective Obs. Left	252	248	149	115
Effective Obs. Right	103	96	77	61

Notes: Dependent variables in the first two columns are the trade credit (account payable) scaled by the inventory level. Dependent variables in the last two columns are the bank credit (short-term debt) scaled by then inventory level. $t = 0$ refers to the election year and $t = 1$ refers to the first year after the election year. All dependent variables are adjusted by industry and year average. The triangular kernel and MSE-Optimal bandwidth are used in the estimation. The results are similar when using other settings. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

bargaining power. Our findings illustrate that union pressures lead firms to be more inclined to leaner inventory policy. Second, we contribute to the inventory management literature by providing evidence that unionization is another factor shaping corporate inventory investments. Our results also confirm that reducing inventory helps to mitigate operational costs and inefficiencies. With the operational shocks, firms rely more on trade credit than bank credit to finance their inventory. Finally, we employ the RD approach to build a causal relationship and alleviate potential endogeneity concerns. Conventional OLS regression between union and inventory suffers from omitted variable concern in which some unobservable variables may simultaneously correlate with the unionization and inventory decision. There are also reversed causality concerns that employees in firms with higher inventory may be more likely to vote for a union election. RD design mitigates such concerns by employing a local comparison where the passing of election is close to a random effect.

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