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Asymmetric Cost Behavior and Dividend Policy

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ABSTRACT

Costs are sticky on average, that is, they fall less for sales decreases than they rise for equivalent sales increases. We examine the effect of this asymmetric cost behavior on a firm's dividend policy. Given investors' aversion to dividend cuts, we predict that firms with higher resource adjustment costs and stickier costs pay lower dividends than their peers because they are less able to sustain any higher level of dividend payouts in the future. We find evidence consistent with this prediction. Further, using a regression discontinuity design that exploits variation in labor adjustment costs generated by close-call

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union elections, we provide evidence suggesting that the negative relation between cost stickiness and dividend payouts is driven by resource adjustment costs. Our paper sheds new light on the determinants of dividend policy and demonstrates the role of cost behavior in corporate decisions.

JEL codes: G31, G35, J51, M41

Keywords: asymmetric cost behavior; cost stickiness; dividend payouts; resource adjustment cost

1. *Introduction*

What determines a firm's dividend policy? Since Lintner [1956] and Miller and Modigliani [1961], financial economists have proposed a number of economic and behavioral factors that determine a firm's dividend policy. DeAngelo, DeAngelo, and Skinner [2008] develop an asymmetric information framework that combines security valuation costs of Myers and Majluf [1984] with agency costs of Jensen [1986], and conclude that "reported earnings are the key driver of firms' payout policy" (p. 161). Because costs are a fundamental determinant of earnings, cost behavior can have a first-order impact on a firm's dividend policy. In this paper, we examine whether an important feature of cost behavior, cost stickiness, affects a firm's dividend payouts.

Prior research documents that costs fall less for sales decreases than they rise for equivalent sales increases on average (see Banker and Byzalov [2014] and Banker et al. [2018] for reviews). Intuitively, this asymmetric cost behavior stems from differential managerial responses to sales changes: in the presence of resource adjustment costs, managers retain slack resources and do not cut costs proportionally when sales decrease, but they tend to add required resources and increase costs proportionally when sales increase. This cost model is based on the two primitives of cost behavior (adjustment costs and managerial decisions), and it is broader than the traditional bifurcation of costs into fixed and variable components. Many resources are neither predetermined (i.e., fixed) nor mechanically determined (i.e., variable). A case in point is labor, a key ingredient of a firm's production function. When adjusting the amount of labor to use, firms have to incur firing costs for existing employees and/or searching and training costs for new employees. Such labor adjustment costs are substantial, but neither small enough to make labor costs variable nor large enough to make them fixed. Anderson, Banker, and Janakiraman [2003] refer to these types of resources as "sticky" resources.

In the presence of higher adjustment costs, firms are less willing to cut or expand resources (e.g., Banker, Byzalov, and Chen [2013]). However, because firms cannot fully meet the increased demand unless they add the needed resources, this effect of adjustment costs is likely to be stronger for resource reduction than for resource expansion. Thus, firms with higher adjustment costs are likely to exhibit greater cost stickiness. When sales decrease, firms with higher adjustment costs cut fewer resources and suffer a bigger decline in earnings than their peers.

This "ratcheting" notion behind cost stickiness naturally links to the inherent asymmetry of observed dividend policies: dividend increases are small and frequent, whereas dividend decreases exhibit the reverse pattern (Skinner and Soltes [2011]). Survey evidence in Brav et al. [2005] suggests that managers follow these asymmetric dividend policies because they believe that dividends convey information to investors and that there are negative consequences to cutting dividends. Empirically, the market reaction to a dividend reduction typically ranges between –6% and –10% (DeAngelo, DeAngelo, and Skinner [2008, p. 182]). To explain these empirical patterns, standard signaling models propose that firms use dividends to show that they are good-quality firms with high intrinsic value, as they can bear the costs associated with keeping a high level of dividends, such as raising external funds through borrowing, passing up investment opportunities, or paying taxes (Bhattacharya [1979], John and Williams [1985], Miller and Rock [1985]). Behavioral models argue that loss-averse investors mentally account for dividends and capital gains separately (Thaler [1999]) and that dividend decreases bring more pain than symmetric increases bring pleasure (Kahneman and Tversky [1979], Shefrin and Statman [1984], Baker, Mendel, and Wurgler [2016]). We hypothesize that given investors' aversion to dividend cuts, firms choose a lower level of dividend payouts to start with in the presence of higher resource adjustment costs and stickier costs because they are less able to sustain any higher level of dividend payouts in the future.

Our hypothesis builds on two ideas grounded in the payout literature (DeAngelo, DeAngelo, and Skinner [2008]). First, to maximize investor welfare, a firm's payouts should roughly match its free cash flows over the lifecycle because (1) cash accumulation fosters agency costs (Jensen [1986]) and (2) external financing is costly (Myers and Majluf [1984]). Second, a firm's current-period dividend payment is the reference point against which investors will judge future dividends. Baker, Mendel, and Wurgler [2016] formalize these ideas and develop a behavioral dividend signaling model with reference dependence. In their *multiperiod* model, a reference point is embedded in a representative investor's utility function, where the investor is particularly hurt by a drop in dividends below the reference point. The manager's objective function then reflects both a desire for a high stock price today (by paying a higher level of dividends to signal private information about the firm's ability to pay) and a preference for avoiding a dividend cut in the future. Thus, when deciding on the level of dividend payouts in the current period, the manager considers not only the firm's budget constraints in the current period (e.g., current earnings or free cash flows), but also its ability to sustain the same level of payouts in the future should economic conditions change.

We argue that, ceteris paribus, firms with stickier costs pay a lower level of dividends in the current period because they are less able to sustain any higher level of dividend payouts in the future than firms with less sticky costs. The reason is not simply that a firm that has experienced a shock and has sticky costs faces tighter budget constraints in the current period. Rather, we expect the negative relation between cost stickiness and dividend payouts to hold because a firm's *current* cost behavior is a property of the firm's production process and thus applies to its *future* shocks or constraints. Negative shocks in the future will affect firms with stickier costs to a greater degree, inducing these firms to adopt more conservative dividend policies in the current period. It is also worth noting that firms with stickier costs do not necessarily expect a lower level of core or sustainable earnings than their peers: these firms' revealed preference for sticky resources (e.g., skilled labor) suggests that such a production process likely enhances their expected operating performance in equilibrium. Hence, our hypothesis, rooted in a firm's *asymmetric* cost behavior, is different from the argument that the *level* of a firm's long-run ongoing sustainable earnings drives its dividend policy.

Following Anderson, Banker, and Janakiraman [2003], we measure cost stickiness as the degree of asymmetry in cost responses to decreases versus increases in sales (based on 16 quarterly observations of sales and costs). As a first step, we show that the observed degree of cost stickiness varies predictably with the economic determinants of managers' cost management decisions. That is, firms with higher adjustment costs, more optimistic managerial expectations, fewer slack resources, or stronger empire-building incentives exhibit a higher degree of cost stickiness. These results support the validity of our cost stickiness measure.

To understand the relation between cost stickiness and dividend payouts, we start by estimating an ordinary least squares (OLS) regression of a firm's dividend payouts on its degree of cost stickiness. Because managers and investors usually think of dividend policies in nominal per-share terms, our main analysis focuses on the level of dividends per share.[1] In the determinant model of dividend payouts, we control for firm size, financial leverage, growth opportunities, cash holdings, asset tangibility, the level of core or sustainable earnings, earnings quality, earnings volatility, and industry-by-year fixed effects. Including industry-by-year fixed effects removes unobserved time-varying industry shocks by comparing the behavior of firms in the same industry at the same point in time. Consistent with our prediction, the results show that firms with stickier costs exhibit lower dividend payouts. In the cross-section, a one-standard-deviation greater degree of cost stickiness is associated with a 3.3% lower level of dividend payouts. These results are inconsistent with static signaling models (e.g., Bhattacharya [1979], John and Williams [1985], Miller and Rock [1985]), in which a firm's reported earnings or other observed constraints are a sufficient statistic for

[1] We report results for different measures of dividend payouts and cost stickiness in subsection 3.2.

the firm's dividend payouts. Rather, our results support the multiperiod model of Baker, Mendel, and Wurgler [2016], in which a firm's dividend payouts in the current period depend not only on the firm's current budget constraints (e.g., core earnings), but also on its ability to maintain the same level of payouts in the future should economic conditions change.

Next, we examine resource adjustment costs as one important mechanism for the negative relation between cost stickiness and dividend payouts. This empirical analysis is the critical step in our study. As noted in Banker and Byzalov [2014], observed cost behavior reflects managers' operating decisions based on the magnitude of resource adjustment costs, managerial expectations for future sales, slack resources carried over from the prior period, and managerial incentives (see subsection 2.1 for detailed explanations). Thus, the relation between cost stickiness and dividend payouts depends on the relative strength of these different underlying economic forces. We conjecture that firms with higher adjustment costs choose a lower level of dividend payouts to start with because a negative shock in the future will result in a bigger decline in free cash flows for them than for their peers. Thus, the observed negative relation between cost stickiness and dividend payouts is likely driven by resource adjustment costs.[2]

To provide more direct evidence that links adjustment costs, cost stickiness, and dividend payouts, we use a regression discontinuity (RD) design that exploits variation in labor adjustment costs generated by close-call union elections. Organized labor, such as unions, makes wages stickier and layoffs more costly, and thereby increases the adjustment cost of a firm's labor stock. Furthermore, unions frequently intervene in a firm's restructuring activities, for example, by blocking plant closures to save workers' jobs, which makes it harder for the firm to adjust its physical capital. Thus, although DiNardo and Lee [2004] find that the impact of unionization on wages is close to zero, we argue that labor unions increase a firm's resource adjustment costs and its degree of cost stickiness.[3]

We collect data on union elections from the National Labor Relations Board (NLRB). In these secret-ballot elections, a simple majority (50% plus one vote) in favor of unionization is required to win. Although unionization is clearly nonrandom, the RD approach exploits locally exogenous variation in union status around the 50% cutoff and thus the labor adjustment costs generated by elections that pass or fail by a small margin

[2] Other explanations of cost behavior might also predict a negative relation between cost stickiness and dividend payouts, but we do not test for them in our paper.

[3] Firms may respond to union activism by hiring temporary workers or closing stores. However, these actions often encounter strong resistance from labor unions. For example, after workers claimed that Walmart closed five U.S. stores to retaliate against them for organizing, Walmart reopened the stores (Layne [2015]). Further, the Supreme Court of Canada ruled that Walmart violated Quebec's labor code when it closed a unionized store (Marin [2014]). Similarly, Hugo Boss lost an outsourcing battle against the union in Cleveland (Putre [2011]). Therefore, whether unionization leads to stickier costs is an empirical question that we test for in our paper.

of votes. This approach essentially compares firms where union elections barely pass to firms where union elections barely fail. As shown in prior literature (e.g., DiNardo and Lee [2004], Lee and Mas [2012], Bradley, Kim, and Tian [2017]), for these close-call union elections, passing is very close to an independent, random event and is unlikely to be correlated with unobservable firm characteristics. Therefore, we use the RD design to test the prediction based on the adjustment cost explanation of asymmetric cost behavior.

We first show that the degree of cost stickiness in the four years subsequent to union elections is higher for firms where union elections pass than for firms where the attempt to unionize fails. This result supports our use of labor power as a proxy for labor adjustment costs. Next, we find that unionization has a negative effect on a firm's dividend payouts. During the four-year window post union elections, firms whose union elections pass pay about 44.3% lower dividends than those whose union elections fail. We note that this average treatment effect is fairly local, that is, specific to the unionization setting; hence, it may not hold in other settings (Leuz and Wysocki [2016]). To tighten the link between cost stickiness and dividend payouts in our RD design, we conduct a two-step mediation analysis and show that unionization has a significant negative effect on a firm's dividend payouts that are explained by its cost behavior. In addition, we find that the negative effect of unionization on dividend payouts is concentrated in firms with a high ex ante degree of cost stickiness. Together, these results provide evidence that firms pay out lower dividends in the presence of higher resource adjustment costs and stickier costs.

Our paper contributes primarily to two strands of literature. First, it contributes to the large literature on dividend policy by identifying a firm's cost behavior as an important economic factor (see Lease et al. [2000], DeAngelo, DeAngelo, and Skinner [2008], Farre-Mensa, Michaely, and Schmaltz [2014] for excellent reviews).[4] Our results are inconsistent with static signaling models in which a firm's budget constraints are a sufficient statistic for its dividend payouts. Rather, our results highlight the natural connection between a firm's asymmetric cost behavior and the asymmetry in its dividend policy. Given that investors are particularly averse to dividend cuts, managers set the current dividend payouts based not only on the firm's budget constraints (e.g., core earnings or earnings quality), but also on their expectations about the firm's ability to maintain the same level of payouts in the future when facing negative shocks. Our results suggest that it is important to consider a firm's cost behavior beyond traditional budget

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[4] This literature identifies a variety of potential factors influencing a firm's dividend policy, including corporate taxes, signaling motives, agency considerations, compensation practices, and management incentives. See, for example, Watts [1973], Black [1976], Gonedes [1978], Healy and Palepu [1988], Smith and Watts [1992], DeAngelo, DeAngelo, and Skinner [1992, 1996, 2000, 2004], Fama and French [2001, 2004], DeAngelo, DeAngelo, and Stulz [2006], Skinner [2008], and Hanlon and Hoopes [2014].

constraints in understanding corporate dividend policy in a multiperiod setting.

Second, our results contribute to the literature on asymmetric cost behavior (see Banker and Byzalov [2014], Banker et al. [2018] for thorough reviews and references). Prior research in this growing area highlights that cost behavior can affect earnings quality, earnings prediction, detection of earnings manipulation, and analysts' earnings forecasts (e.g., Banker and Chen [2006], Weiss [2010], Kama and Weiss [2013], Banker et al. [2016]). Our paper links cost behavior to a firm's dividend policy, demonstrating that this accounting research topic can have important implications for research in corporate finance.

The rest of our paper proceeds as follows. Section 2 describes the data, variable measurement, and summary statistics of the variables used in our OLS analysis. Section 3 presents the OLS results. Section 4 discusses the methodology, data, and diagnostic tests for our RD analysis. Section 5 reports the results of our RD analysis. Section 6 concludes.

2. *Data, Variable Measurement, and Descriptive Statistics for the OLS Analysis*

We start by estimating an OLS regression of a firm's dividend payouts on its degree of cost stickiness after controlling for common determinants of dividend payouts. Our main data source is Compustat. Our sample includes all public firms (excluding financial firms and utilities) from 1978 to 2016.[5] In this section, we first develop and validate a firm-year measure of cost stickiness. We then describe the construction of the variables used in the OLS analysis and present the summary statistics of these variables.

2.1 A FIRM-YEAR MEASURE OF COST STICKINESS

Following Noreen and Soderstrom [1997] and Anderson, Banker, and Janakiraman [2003], we estimate firm *i*'s cost stickiness in year *t* by running the empirical model below with its previous 16 quarters of data (year $t - 3$ to year *t*):

$$\Delta LnSG\&A = \beta_0 + \beta_1 \times \Delta LnSales + \beta_2 \times Decrease \times \Delta LnSales + \mu, \quad (1)$$

where $\Delta LnSG\&A$ is the log-change in quarterly selling, general, and administrative expenses (i.e., costs), $\Delta LnSales$ is the log-change in quarterly sales, and *Decrease* is a dummy variable that equals 1 if $\Delta LnSales$ is less than

[5] We use this sample period to measure dividend payouts and include pre-1978 data when computing lagged control variables. This sample period is consistent with our regression discontinuity analysis (to be discussed in detail later), which uses union election data from 1977 to 2012 and analyzes dividend payouts over a four-year period after the election (i.e., 1978–2016).

zero, and 0 otherwise.[6] β_1 (or $\beta_1 + \beta_2$) measures the percentage change in costs for a 1% increase (or decrease) in sales. β_2 captures the degree of asymmetry in cost behavior with respect to changes in sales. We define our cost stickiness measure (*CostStickiness*) as the negative of β_2, so that a larger value of *CostStickiness* indicates a higher level of cost stickiness.

As noted in Banker and Byzalov [2014], observed cost behavior reflects managers' operating decisions based on resource adjustment costs, managerial expectations, slack resources, and managerial incentives. To ensure that *CostStickiness* captures a firm's asymmetric cost behavior, we examine its validity by relating it to these economic determinants of cost stickiness. The first determinant is the magnitude of resource adjustment costs (e.g., Anderson, Banker, and Janakiraman [2003], Banker, Byzalov, and Chen [2013]). In the presence of higher adjustment costs, firms are less willing to cut or expand resources. However, because firms cannot fully meet the increased demand unless they add the needed resources, this effect of adjustment costs is likely to be stronger for resource reduction than for resource expansion. Thus, firms with higher adjustment costs are likely to exhibit greater cost stickiness. We use a firm's asset intensity (i.e., assets to sales ratio) as a proxy for its resource adjustment costs (Anderson, Banker, and Janakiraman [2003]).

The second determinant of cost management decisions is managerial expectations for future demand (e.g., Anderson, Banker, and Janakiraman [2003], Banker et al. [2014]). Optimistic expectations about future demand lead managers to retain unused resources when sales decrease because they believe these resources will be needed in the future. This proclivity to retain resources results in a greater degree of cost stickiness. In contrast, pessimistic expectations about future demand lead managers to aggressively cut unused resources when sales decrease because they believe these resources will be redundant in the future. This proclivity to cut resources results in a lower degree of cost stickiness. Anderson, Banker, and Janakiraman [2003] argue that managers are more pessimistic in the presence of two consecutive sales decreases and are more optimistic during economic booms. We thus use these two variables as proxies for managerial expectations.

The third determinant of cost management decisions is the amount of slack resources carried over from the prior period (Weiss [2010], Banker et al. [2014]). When initial slack is small, firms will fully expand resources in response to a sales increase but will only cut resources after the maximum acceptable level of slack is reached. In contrast, when there is a significant

[6] This empirical model is used to estimate how costs respond to changes in sales regardless of the drivers of sales changes (e.g., macroeconomic conditions, industry trends, or seasonality). Using 16 quarters of data to estimate firm responses is not uncommon in prior research. For example, De Franco, Kothari, and Verdi [2011] use such a model to estimate how a firm's reported quarterly earnings respond to economic news (as proxied by the stock return) during the quarter.

amount of initial slack, firms will only add resources after this slack is exhausted but will cut resources aggressively after a sales decrease to reduce unused capacity. Thus, firms with a lower amount of initial slack are likely to exhibit greater cost stickiness. Banker et al. [2014] argue that a sales increase in the prior period leads to a lower amount of initial slack in the current period. We use this variable to proxy for a firm's initial slack in the current period.

The fourth determinant of cost management decisions is managers' self-serving incentives and the associated agency problems. Managers have incentives to retain resources within their firms to enjoy private benefits (Jensen, [1986]). This empire-building behavior can result in a greater degree of cost stickiness (Anderson, Banker, and Janakiraman [2003]).[7] Following Chen, Lu, and Sougiannis [2012], we use prior-period free cash flows as a proxy for managers' empire-building incentives.

Panel A of table 1 reports the descriptive statistics of the variables used in the validation test. The detailed definitions of these variables are provided in the appendix. To reduce the influence of extreme values, we winsorize all continuous variables at the 1% level. The average (median) cost stickiness in our sample is 0.057 (0.022), consistent with the notion that costs are sticky *on average* (Banker and Byzalov [2014]). There are also observations with negative values of *CostStickiness*, consistent with the existence of anti-sticky cost behavior (i.e., costs rise less in response to a sales increase than they fall when sales decrease by an equivalent amount). Costs are anti-sticky when, for example, managers are pessimistic about future sales or there is a significant amount of initial slack (Banker and Byzalov [2014]). In those situations, managers cut costs aggressively in the presence of a sales decrease.

Panel A also shows that the average asset intensity (defined as the natural logarithm of the assets to sales ratio) is 0.014. 11.8% of the firm-year observations in our sample have consecutive negative sales growth in the past two years, and 73.2% of the firm-year observations have positive sales growth from year $t-2$ to year $t-1$. The average GDP growth rate over the sample is 2.5%, and the average free cash flows to assets ratio is 3.9%.

In panel B of table 1, we regress a firm's *CostStickiness* measured over year t to $t+3$ on its current (i.e., year t) asset intensity (as a proxy for resource adjustment costs), a dummy variable indicating whether the firm's sales growth rates in year t and year $t-1$ are both negative and the current GDP growth rate (as proxies for managerial expectation), a dummy variable indicating whether the firm's sales growth rate in year $t-1$ is positive (as a proxy for initial slack in year t), and its free cash flows to assets ratio in year $t-1$ (as a proxy for managerial incentives). Column 1 of panel B summarizes the predicted signs of the regression coefficients for the validation test. Specifically, a firm's cost stickiness should be positively related to its

[7] Other incentives of managers, such as their desire to meet earnings targets, might result in excessive cost cutting and a lower degree of cost stickiness (Kama and Weiss [2013]).

TABLE 1

Descriptive Statistics and Validation Tests for CostStickiness

Panel A: Descriptive statistics of the variables used in the validation tests

Variable	Mean	P25	Median	P75	SD	*N*
$CostStickiness_{t,t+3}$	0.057	–0.477	0.022	0.595	1.431	78,764
$AINT_t$	0.014	–0.461	–0.066	0.403	0.718	78,764
$SUCCDEC_t$	0.118	0.000	0.000	0.000	0.322	78,764
ΔGDP_t	0.025	0.018	0.027	0.038	0.017	78,764
INC_{t-1}	0.732	0.000	1.000	1.000	0.443	78,764
FCF_{t-1}	0.039	0.003	0.065	0.119	0.164	78,764

Panel B: *CostStickiness* validation tests

Dependent Variable		$CostStickiness_{t,t+3}$	
	(1)	(2)	(3)
$AINT_t$	+	0.025**	0.023
		(1.992)	(1.457)
$SUCCDEC_t$	–	–0.066***	–0.062***
		(–3.363)	(–3.007)
ΔGDP_t	+	0.948***	
		(2.612)	
INC_{t-1}	+	0.032**	0.025*
		(2.323)	(1.672)
FCF_{t-1}	+	0.160***	0.225***
		(4.162)	(5.473)
Industry × year FE		No	Yes
Observations		78,764	78,162
R^2		0.001	0.081

This table reports the descriptive statistics of the variables used in the *CostStickiness* validation tests and the results of these tests. $CostStickiness_{t,t+3}$ is estimated using quarterly Compustat data from year t to year $t + 3$. Panel A reports the descriptive statistics. Panel B lists the predicted signs of the estimated coefficients for the *CostStickiness* validation tests in column 1 and reports the results of these tests in columns 2 and 3. All variables are defined in the appendix. Each regression includes a separate (unreported) intercept. The t-statistics, based on standard errors clustered by firm, are presented in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

asset intensity, the current GDP growth, past sales growth, and past free cash flows. Meanwhile, cost stickiness should be lower when a firm consistently experiences negative sales growth.

Columns 2 and 3 of panel B report the results of the validation test. Column 2 presents the model specification without any fixed effects. The coefficient estimates of the five determinants are statistically significant at the 5% or 1% level and follow their predicted signs in column 1. The economic magnitudes are also large. For example, a one-standard-deviation increase in asset intensity is associated with an increase in cost stickiness of about 0.018 (= 0.718 × 0.025), which is more than 30% of the sample average (0.057). Overall, the results demonstrate that *CostStickiness* reasonably captures the important economic forces behind cost stickiness.

Contemporary cost management research (see Banker et al. [2018] for a review) demonstrates that costs are not only mechanistically related to operating processes, but also caused by deliberate managerial decisions. Thus, even for firms in the same industry at the same point in time, the observed degree of cost stickiness is expected to vary predictably with the economic determinants of managers' cost management decisions (i.e., resource adjustment costs, managerial expectations, slack resources, and managerial incentives). In column 3, we add three-digit SIC industry-by-year fixed effects to the model specification. The GDP growth rate is dropped from this model because its variation is absorbed by the fixed effects. We continue to observe that a firm's cost stickiness is lower when a firm consistently experiences negative sales growth, and it is positively related to past sales growth and free cash flows. These results suggest that *CostStickiness* reflects deliberate cost management decisions and is well suited to our purpose of examining the role of cost behavior in firm-specific corporate decisions.

2.2 VARIABLES USED IN THE OLS ANALYSIS

Managers and investors commonly think about dividend policy in nominal per-share terms (Brav, Graham, Harvey, and Michaely [2005], Baker, Mendel, and Wurgler [2016]). Thus, our main dependent variable is the level of annual split-adjusted dividends per share, computed following Floyd, Li, and Skinner [2015]. We regress a firm's dividends per share (*DPS*) in year $t + 1$ on its degree of cost stickiness (measured over year $t - 3$ to year t) after controlling for a wide spectrum of firm characteristics that have been shown by prior literature to affect a firm's dividend payouts.

First, we control for the basic firm characteristic, firm size (*Size*). We also control for financial leverage (*Leverage*), as debt (like paying out dividends) is a way of disciplining managers to mitigate the agency problem of free cash flows (Jensen [1986], Berger, Ofek, and Yermack [1997]). Further, we include Tobin's *Q* (*TobinQ*) in the regression model to control for a firm's investment opportunities. In addition, we control for a firm's cash holdings (*Cash*) and its asset tangibility (*Tangibility*) because both could affect a firm's budget constraints (e.g., Jagannathan, Stephens, and Weisbach [2000], John, Knyazeva, and Knyazeva [2011]).

Importantly, we include in the regression model several earnings-related variables as key controls. Following Skinner and Soltes [2011], we use three variables to control for the level of a firm's core or sustainable earnings: earnings before extraordinary items after adding back after-tax net interest costs (*ROA*), special items (*NegSI*), and an indicator for losses (*Loss*). We also control for the earnings persistence parameter (*Persistence*) as Skinner and Soltes [2011] find that it is related to a firm's dividend payouts. Some studies (e.g., Jagannathan, Stephens, and Weisbach [2000]) show that greater uncertainty about a firm's cash flows could increase the demand for precautionary cash holdings and reduce the level of payouts.

TABLE 2
Descriptive Statistics of the Variables used in the OLS Analysis

Variable	Mean	P25	Median	P75	SD	*N*
CostStickiness	0.037	–0.503	0.015	0.588	1.448	87,807
DPS	0.219	0.000	0.000	0.200	0.496	87,807
Assets ($billion)	1.878	0.042	0.203	0.964	5.530	87,807
Size	5.335	3.736	5.311	6.871	2.235	87,807
Leverage	0.249	0.047	0.200	0.354	0.309	87,807
TobinQ	1.875	1.017	1.345	1.978	2.591	87,807
Cash	0.150	0.025	0.082	0.214	0.172	87,807
Tangibility	0.283	0.108	0.227	0.401	0.221	87,807
ROA	0.007	–0.006	0.053	0.098	0.324	87,807
NegSI	0.014	0.000	0.000	0.010	0.061	87,807
Loss	0.263	0.000	0.000	1.000	0.441	87,807
Persistence	0.488	0.158	0.488	0.832	0.513	87,807
ROAVol	0.101	0.021	0.044	0.098	0.308	87,807

This table reports the descriptive statistics of the variables used in our ordinary least squares (OLS) analysis. All variables are defined in the appendix.

Therefore, we use the standard deviation of *ROA* (over year $t-3$ to year t) as a proxy for such cash flow uncertainty (*ROAVol*).[8] We control for these earnings-related variables to ensure that the documented effect of a firm's *asymmetric* cost behavior on its dividend payouts is not driven by the mechanical relation between costs and earnings.

Table 2 presents descriptive statistics of the variables used in our baseline OLS analysis, including cost stickiness, dividend payouts, and the control variables mentioned above. Definitions of all variables appear in the appendix. To reduce the influence of extreme values, we winsorize all continuous variables at the 1% level. The average cost stickiness (measured over the most recent four years) is 0.037, with a standard deviation of 1.448. The average annual split-adjusted dividends per share are $0.219 with a standard deviation of $0.496. Regarding the control variables, an average firm has book assets of $1.88 billion, leverage ratio of 24.9%, Tobin's *Q* of 1.88, cash holding to assets ratio of 15.0%, asset tangibility of 28.3%, ROA of 0.7%, loss rate of 26.3%, negative special items to assets ratio of 1.4%, earnings persistence parameter of 0.488, and ROA volatility of 10.1%.

3. Results of the OLS Analysis

In this section, we present the results of the baseline OLS regression of a firm's dividend payouts on its degree of cost stickiness after controlling for common determinants of dividend payouts. We perform a battery of

[8] Our inferences are unchanged when we use the standard deviation of seasonally adjusted quarterly *ROA* (over year $t-3$ to year t) as the proxy.

additional analyses to ensure that our results are robust to alternative measures of cost stickiness or dividend payouts.

3.1 BASELINE OLS RESULTS

In our baseline OLS regressions, the dependent variable is a firm's dividends per share (*DPS*), and the key independent variable is the cost stickiness measure that indicates the degree of asymmetry in cost responses to decreases versus increases in sales (*CostStickiness*). We control for common firm-level determinants of dividend payouts as discussed in subsection 2.2. We present models without and with three-digit SIC industry-by-year fixed effects. If variation in cost stickiness occurs largely across industries, then including this set of fixed effects is likely to significantly reduce the explanatory power of cost stickiness for dividend payouts. However, as costs are not only mechanistically related to operating processes but also caused by deliberate managerial decisions (Banker et al. [2018]), there is likely to be meaningful variation in the degree of cost stickiness even for firms in the same industry at the same point in time (see subsection 2.1). The advantage of including industry-by-year fixed effects is that it helps remove unobservable time-varying industry characteristics that could affect the relation between the degree of cost stickiness and dividend payouts. Standard errors are corrected for heteroskedasticity and clustered at the firm level.

Table 3 presents the baseline OLS results. Column 1 does not include any fixed effects, and column 2 controls for industry-by-year fixed effects. As shown in both columns, there is a significant, negative relation between cost stickiness and dividend payouts. The economic magnitude of the relation is also nontrivial. For example, the coefficient estimate of –0.005 for *CostStickiness* in column 1 indicates that a one-standard-deviation greater degree of cost stickiness is associated with a 3.3% lower level of dividend payouts (relative to the sample mean of 0.219). Because we control for a firm's level of core earnings (*ROA*, *NegSI*, *Loss*) and its earnings persistence and volatility (*Persistence*, *ROAVol*), the driver of this result is not the mechanical relation between costs and earnings. For firms with the same level, persistence, and volatility of profits, those with greater cost stickiness pay lower dividends in the current period because a firm's *current* cost behavior applies to its *future* shocks or constraints. This relation between cost stickiness and dividend payouts is not subsumed by other traditional economic variables that are used to explain a firm's payout policy.

We conduct two subsample analyses to further understand our baseline findings. If the negative relation between cost stickiness and dividend payouts is driven by resource adjustment costs, dividend payouts of firms with ample financial resources would be less likely to be affected by the asymmetry in their cost behavior. Consistent with this prediction, we find that the negative relation between cost stickiness and dividend payouts is only

TABLE 3
OLS Regressions of Dividend Payouts on Cost Stickiness

Dependent Variable	*DPS*	
	(1)	(2)
CostStickiness	−0.005***	−0.004**
	(−2.595)	(−2.253)
Size	0.071***	0.063***
	(29.479)	(25.654)
Leverage	−0.026**	−0.041***
	(−2.434)	(−4.031)
TobinQ	0.004***	0.006***
	(3.593)	(5.603)
Cash	−0.045**	0.058***
	(−2.014)	(2.638)
Tangibility	0.122***	0.029
	(5.171)	(0.967)
ROA	−0.049***	−0.035***
	(−5.678)	(−4.402)
NegSI	−0.160***	−0.061**
	(−6.207)	(−2.540)
Loss	−0.116***	−0.081***
	(−23.241)	(−16.527)
Persistence	0.046***	0.023***
	(8.146)	(4.235)
ROAVol	−0.015**	−0.004
	(−2.433)	(−0.604)
Industry × year FE	No	Yes
Observations	87,807	86,718
R^2	0.151	0.326

This table presents the results of OLS regressions of dividend payouts on cost stickiness and control variables. The dependent variable, dividends per share (*DPS*), is measured at year $t+1$. Cost stickiness in year t is estimated using the most recent 16 quarterly observations from year $t-3$ to year t. All other variables, measured at year t, are defined in the appendix. Each regression includes a separate (unreported) intercept. The t-statistics, based on standard errors clustered by firm, are presented in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

present in firms with relatively low (i.e., below median) cash holdings or retained earnings (see table A1 of the online appendix).[9]

3.2 ROBUSTNESS CHECKS

We perform a battery of additional analyses to ascertain the robustness of our baseline results. First, we develop three alternative measures of cost stickiness. Following the methodology of Wittenberg-Moerman [2008], we employ a three-digit SIC industry-level estimation of cost stickiness using equation (1). This industry-level measure of cost stickiness is then assigned to each firm in that industry. In addition, while our main analysis defines a

[9] The difference in the coefficient estimates on *CostStickiness* between the high and low subsamples (based on cash holdings or retained earnings) is not statistically significant at the conventional level.

TABLE 4

OLS Regressions of Dividend Payouts on Alternative Cost Stickiness Measures

Dependent Variable	*DPS*		
	(1)	(2)	(3)
CostStickiness	−0.029***		
(*Industry*)	(−5.378)		
CostStickiness		−0.012***	
(*OperatingCost*)		(−3.923)	
CostStickiness			−0.009***
(*TotalCost*)			(−3.000)
Controls	Yes	Yes	Yes
Industry × year FE	No	Yes	Yes
Observations	129,920	95,962	81,421
R^2	0.159	0.323	0.330

This table presents the results of OLS regressions of dividend payouts on alternative measures of cost stickiness and control variables. The dependent variable, dividends per share (*DPS*), is measured at year $t + 1$. *CostStickiness* (*Industry*) is an industry-level cost stickiness measure, estimated at the (three-digit SIC) industry-year level using quarterly data from year $t - 3$ to year t. *CostStickiness* (*OperatingCost*) and *CostStickiness* (*TotalCost*) are defined similarly to *CostStickiness* but estimated using operating costs and total costs, respectively, as the cost measure. We include the same set of control variables as in table 3 in all models. Each regression includes a separate (unreported) intercept. The t-statistics, based on standard errors clustered by firm, are presented in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

firm's cost stickiness based on selling, general, and administrative expenses (following Anderson, Banker, and Janakiraman [2003]), we construct the cost stickiness measure using two other common definitions of costs, such as operating costs (Kama and Weiss [2013]) and total costs (Rouxelin, Wongsunwai, and Yehuda [2018]). Table 4 shows that our baseline OLS results continue to hold when we use these alternative measures of cost stickiness. In terms of economic significance, the coefficient estimates for these three alternative measures indicate that a one-standard-deviation greater degree of cost stickiness is associated with a 5.0%, 3.7%, and 3.0% lower level of dividend payouts.[10]

Second, we use five alternative measures of dividend payouts as the dependent variable in our baseline regression, including the dividend to assets ratio (*Div/Asset*), the dividend to market value ratio (*Div/MV*), the dividend to sales ratio (*Div/Sales*), the dividend to income ratio (*Div/Income*), and the natural logarithm of aggregate dividend dollars (*LnDiv*). As shown in table 5, cost stickiness has a significantly negative association with all these alternative measures of dividend payouts. In terms of economic significance, a one-standard-deviation greater degree of cost stickiness is associated with a 2.2–3.4% lower level of dividend payouts based on these alternative measures.

[10] The standard deviations of the three alternative cost stickiness measures are 0.351, 0.683, and 0.746, respectively, and the means of *DPS* in the corresponding regression samples are 0.202, 0.219, and 0.222, respectively.

TABLE 5

OLS Regressions of Alternative Dividend Payout Measures on Cost Stickiness

Dependent Variable	*Div/Assets* (1)	*Div/MV* (2)	*Div/Sales* (3)	*Div/Income* (4)	*LnDiv* (5)
CostStickiness	–0.017**	–0.016***	–0.024**	–0.288**	–0.020***
	(–2.273)	(–2.749)	(–2.304)	(–2.536)	(–3.902)
Controls	Yes	Yes	Yes	Yes	Yes
Industry × year FE	Yes	Yes	Yes	Yes	Yes
Observations	85,616	85,110	85,476	81,913	85,622
R^2	0.273	0.347	0.266	0.249	0.535

This table presents the results of OLS regressions of alternative dividend payout measures on cost stickiness and control variables. Cost stickiness in year t is estimated using the most recent 16 quarterly observations from year $t-3$ to year t. All dependent variables are measured at year $t+1$. *Div/Assets* is common dividends (*dvc*) divided by assets (*at*) multiplied by 100. *Div/MV* is common dividends (*dvc*) divided by market value of equity (*prcc_f* × *csho*) multiplied by 100. *Div/Sales* is common dividends (*dvc*) divided by sales (*sale*) multiplied by 100. *Div/Income* is common dividends (*dvc*) divided by net income (*ibcom*) multiplied by 100. *LnDiv* is the natural logarithm of one plus common dividends (*dvc*). We include the same set of control variables as in table 3 as well as industry × year fixed effects in all models. Each regression includes a separate (unreported) intercept. The t-statistics, based on standard errors clustered by firm, are presented in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Third, prior research suggests that firms may substitute dividends with stock repurchases in response to transitory earnings shocks (e.g., Guay and Harford [2000], Skinner [2008], Floyd, Li, and Skinner [2015]). Hence, we repeat our baseline analysis using total payouts (i.e., the sum of annual cash dividends and stock repurchases) as the dependent variable.[11] In untabulated analysis (table A2 of the online appendix), we find that firms with stickier costs have significantly lower total payouts (including both dividends and share repurchases), suggesting that asymmetric cost behavior affects the total amount, instead of just the form, of a firm's payouts. In terms of economic significance, a one-standard-deviation greater degree of cost stickiness is associated with a 1.5–2.7% lower level of total payouts. We also repeat the regressions using stock repurchases as the dependent variable and do not find consistent evidence that cost stickiness significantly affects stock repurchases (untabulated).

Fourth, we include in the model the cost-sales sensitivity for sales increases (i.e., β_1 in equation (1)) and do not find evidence that this variable affects a firm's dividend payouts (see table A3 of the online appendix). More importantly, both the magnitude and statistical significance of the coefficient estimate on *CostStickiness* remain largely unchanged.

Finally, we restrict the sample to observations with positive values of *CostStickiness*. Observations with negative values of *CostStickiness* are consistent with the existence of anti-sticky cost behavior (Weiss [2010], Banker and Byzalov [2014]). In those situations, firms cut costs aggressively in the presence of a sales decrease. Our OLS results on the negative relation between

[11] We follow Grullon and Michaely [2002] to define repurchases as the total expenditures on the purchase of common and preferred stocks minus any reduction in the redemption value of the net preferred stocks outstanding.

cost stickiness and dividend payouts for the full sample suggest that firms with anti-sticky costs (e.g., firms with excess capacity) have a higher level of dividend payouts than firms with sticky costs. In table A4 of the online appendix, we show that the negative relation between cost stickiness and dividend payouts continues to hold in the subsample of firms that exhibit sticky costs (i.e., firms with positive values of *CostStickiness*).

4. Methodology, Data, and Diagnostic Tests for the RD Analysis

The results based on OLS regressions presented in section 3 consistently show a negative relation between cost stickiness and dividend payouts. However, it is unclear what underlying economic force drives this negative relation. As noted in Banker and Byzalov [2014], observed cost behavior reflects managers' operating decisions based on the magnitude of resource adjustment costs, managerial expectations for future sales, slack resources carried over from the prior period, and managerial incentives. Thus, the relation between cost stickiness and dividend payouts depends on the relative strength of these different underlying economic forces. We conjecture that firms with higher adjustment costs choose a lower level of dividend payouts to start with because they expect to suffer a bigger decline in free cash flows in the future than their peers if sales decrease. Thus, the observed negative relation between cost stickiness and dividend payouts is likely driven by resource adjustment costs. To provide more direct evidence that links adjustment costs, cost stickiness, and dividend payouts, we use an RD design that exploits variation in labor adjustment costs generated by close-call union elections.

4.1 METHODOLOGY OF THE RD ANALYSIS

A key determinant of the degree of cost stickiness is the magnitude of resource adjustment costs (Banker and Byzalov [2014]). In the analysis below, we use labor power as a proxy for a firm's resource adjustment costs. Organized labor, such as unions, makes wages stickier and layoffs more costly, and thereby increases the adjustment cost of a firm's labor stock. Furthermore, unions frequently intervene in a firm's restructuring activities, for example, by blocking plant closures to save workers' jobs, which makes it harder for the firm to adjust its physical capital. As a result, labor unions increase a firm's resource adjustment costs and its degree of cost stickiness. In response to stickier costs induced by greater labor power, firms would set a lower level of dividend payouts.

To identify the effect of a firm's labor adjustment costs on its cost stickiness (and in turn its dividend policy), we adopt an RD design in which the unionization status of our sample firms is determined by a simple majority vote (50% plus one vote).[12] The RD design exploits a unique feature

[12] As DiNardo and Lee [2004] describe in detail, a prototypical union election scenario is as follows: (1) a group of employees decides to try to form a union, (2) the employees petition

of the union election data—we observe the percentage of votes in favor of unionization in every union election.

The intuition behind our RD strategy is as follows. Elections that pass (leading to unionization and hence increasing the firm's labor adjustment costs) or fail with votes within a narrow bandwidth around the 50% threshold should follow the pattern of a quasi-randomized experiment. Essentially, this empirical approach compares the subsequent cost stickiness and dividend payouts of firms where union elections barely pass to those of firms where union elections barely fail. For a close-call union election, unionization is locally exogenous in the sense that it is unlikely to be systematically correlated with unobservable firm characteristics that could affect a firm's cost stickiness or dividend policy. In other words, the assignment of treatment (i.e., unionization status) to the set of firms near the 50% threshold is likely to be random, which helps us identify the effect of labor adjustment costs on cost stickiness and dividend payouts.

Another advantage of the RD design is that we do not have to include observable covariates (i.e., control variables) in our analysis (as in a standard multiple regression framework), because firms with votes falling in a narrow band around the threshold are likely to be similar in all dimensions of characteristics. Hence, firm covariates are unnecessary for identification (see survey papers on the RD approach, such as Imbens and Lemieux [2008] and Lee and Lemieux [2010], for more detailed discussions).

4.2 UNION ELECTION DATA

We collect union election data, including the closing date of an election, the number of eligible participants/voters, and the outcome of the election, from the NLRB. Our sample covers union elections held between 1977 and 2012.[13] We drop elections with missing voting outcomes, missing election closing dates, or fewer than 50 eligible participating employees.[14] We manually match our union election sample to Compustat by company name and address, so that we can extract relevant financial statement information and other firm characteristics from Compustat.

Our sampling procedure results in 2,264 unique union elections, 31.6% of which are passed in favor of unionization. The mean percentage of votes

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the NLRB to hold an election, (3) the NLRB makes a ruling on whether the people whom the union seeks to represent have a "community of interest," a coherent group for the purposes of bargaining, and (4) the NLRB holds a secret-ballot election at the work site.

[13] Data over the 1977–1999 period are used by Holmes [2006] and available from Thomas Holmes's Web site. Data over the 2000–2010 period are posted by the NLRB (http://www.data.gov/). Data after 2010 are manually collected from the NLRB (https://www.nlrb.gov/news-outreach/graphs-data/tally-of-ballots).

[14] We focus on elections with at least 50 eligible participating employees because union elections with a smaller size are likely to have a negligible impact on corporate decisions. In addition, elections with fewer participants may also be subject to precise manipulation of votes, which violates the crucial identifying assumption of the RD design. This type of filter is commonly adopted by studies of labor union elections (e.g., Ruback and Zimmerman [1984], Lee and Mas [2012]).

in an election that are in favor of unionization is 44.4%, with a standard deviation of 20.1%.

4.3 DIAGNOSTIC TESTS

The success of an RD strategy hinges on the satisfaction of two key identifying assumptions, namely, agents' imprecise manipulation of the forcing variable and the absence of discontinuity in predetermined firm characteristics around the cutoff point. We perform two sets of diagnostic tests in this section to ensure that these identifying assumptions are not violated in our setting.

The assumption of imperfect control by any agent requires that agents (workers and firms) in an election cannot *precisely* manipulate the forcing variable (i.e., the share of favorable votes) near the known cutoff.[15] The implication is that the distribution of the forcing variable should not have any sizable jumps around the 50% threshold. To check the validity of this assumption, we perform a formal statistical analysis, developed by McCrary [2008], to test for discontinuity in the density of the vote shares. The z-statistic for the McCrary test of discontinuity is –0.268 (the coefficient of estimate is –0.037 with a standard error of 0.138), which is statistically insignificant. Thus, we are unable to reject the null hypothesis that the density function at the cutoff is continuous, which suggests that no agents have precisely manipulated the votes around the known 50% threshold to achieve their desired unionization status. Our finding of no precise manipulation around the known cutoff is consistent with prior literature using the same election data from the NLRB (e.g., DiNardo and Lee [2004], Lee and Mas [2012], Bradley, Kim, and Tian [2017]).

The other important assumption of the RD design is that there is no discontinuity in firm characteristics other than the unionization status across the known cutoff point. In other words, firms close to the left and the right of the cutoff point (i.e., those with vote shares slightly above or below the 50% threshold) should be similar in terms of observable, predetermined characteristics that might affect the outcome (cost stickiness and dividend payouts) and/or the assignment variable (vote shares). If there are any significant jumps in the distribution of these firm characteristics near the 50% threshold, then the treatment effect we observe using the RD design could be biased.[16]

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[15] Note that this assumption does not require the absence of vote manipulation in the elections. In reality, both firms and unions run campaigns to push for success, which leads to some degree of manipulation of shares. However, as long as agents do not have *precise* control over the forcing variable (even though some manipulation exists), an exogenous discontinuity still allows for random assignment of treatment (Lee [2008]).

[16] Note, however, that this assumption is much less restrictive than the textbook assumptions regarding endogeneity (such as the exclusion restriction). It does not require those predetermined characteristics to be exogenous: as long as they are determined prior to the assignment variable (the voting share) and continuously distributed around the cutoff point (i.e., with no

We perform a formal diagnostic test for this assumption by running nonparametric local linear regressions on various firm characteristics at the predetermined year (i.e., one year before the reported closing date of the union election). The nonparametric local linear regression is the most stringent RD model that does not consider all elections in the sample but only examines union elections in the vicinity of the 50% threshold within a certain bandwidth. We use the optimal bandwidth suggested by Imbens and Kalyanaraman [2012] that minimizes the mean squared error in a sharp RD setting.[17] Compared to the global polynomial method, the local linear estimation model has better local fitness (Bakke and Whited [2012]), more attractive rate optimality, and superior bias properties (Fan and Gijbels [1992], Hahn, Todd, and van der Klaauw [2001]). We use the triangular kernel because the statistics literature has shown that a triangular kernel is optimal for estimating local linear regressions at the boundary due to its greater weight on observations closer to the cutoff point (Fan and Gijbels [1992]).

In untabulated analysis (table A5 of the online appendix), we find that none of the local linear RD estimates for the ex ante firm characteristics (i.e., *Size*, *Leverage*, *TobinQ*, *Cash*, *Tangibility*, *ROA*, *NegSI*, *Loss*, *Persistence*, and *ROAVol*) are statistically significant, which suggests that there is no discontinuity in the distribution of these variables around the known 50% threshold. More importantly, the predetermined values of our key variables, *CostStickiness* (the ex ante measure estimated from year $t-3$ to year t) and *DPS* measured at year $t-1$, do not exhibit discontinuity around the narrow bandwidth of the cutoff point, suggesting that our main RD results are unlikely to be driven by ex ante differences in cost stickiness or payout policy between firms whose union elections pass and those whose union elections fail.

In summary, the above two sets of diagnostic tests show that the key identifying assumptions of the RD design, namely, agents' imprecise manipulation of the forcing variable and the absence of discontinuity in predetermined firm characteristics, are not violated, supporting that the variation in unionization status is as good as that from a randomized experiment (Lee [2008]).

5. *Results of the RD Analysis*

In this section, we first report the main RD results. To tighten the link between cost stickiness and dividend payouts in our RD design, we next

jumps), then the RD procedure will yield valid and consistent estimates. See Lee and Lemieux [2010] for a more detailed discussion of this assumption and related tests.

[17] A sharp RD design requires a discontinuity in the probability of assignment from zero to one around the cutoff. A fuzzy RD design requires only a different probability of assignment around the cutoff.

conduct a two-step mediation analysis. Furthermore, we perform a subsample analysis in the RD setting to examine whether the effect of unionization on dividend payouts is concentrated in firms in which unionization can significantly influence cost behavior. Finally, we discuss results for robustness checks in the RD setting.

5.1 MAIN RD RESULTS

We aim to consider the long-term effect of increased labor adjustment costs on firms' cost stickiness and their dividend payouts. Hence, we examine how unionization affects the cost stickiness measure estimated using the 16 quarterly observations after the closing year of the union election (year $t+1$ to year $t+4$) as well as the average dividend payouts during the same four-year window subsequent to the union election.

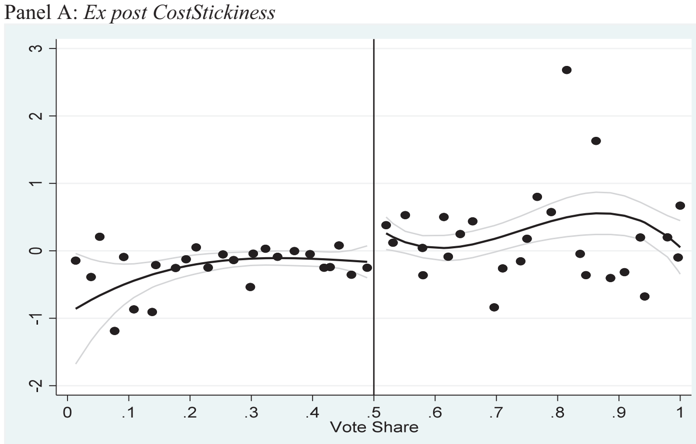
Before we explore the effect of labor adjustment costs on cost stickiness and dividend payouts in a rigorous regression framework, we first visually check the relation between passing a union election and these variables in figure 1. Panel A of figure 1 plots ex post cost stickiness (i.e., cost stickiness estimated over the four-year window subsequent to union elections), and panel B plots the dividend payouts. The horizontal axis depicts the forcing variable, vote share, which is the percentage of votes in favor of unionization. To the left of the 50% cutoff point, firms fail to unionize after the labor union election; to the right of the cutoff, firms succeed in becoming unionized. The spectrum of vote share is divided into 50 equally spaced bins (with a bin width of 2%).[18] The dots in the graphs represent the average plotted variable (cost stickiness or dividend payouts) in each bin, and the solid curve is the result of a fitted cubic polynomial (with a 90% confidence interval). From figure 1, we observe discontinuity in both the ex post cost stickiness and the average post-election dividend payouts across the cutoff during the four years post the union election: there is a significant increase in cost stickiness and a significant drop in dividend payouts when the vote share moves from the left to the right of the 50% threshold. These patterns suggest a positive effect of labor adjustment costs on cost stickiness and a negative effect of labor adjustment costs on dividend payouts.

Next, we carry out a formal RD analysis for firms' ex post cost stickiness and dividend payouts after union elections using a nonparametric local linear regression (local RD) model with the optimal bandwidth following Imbens and Kalyanaraman [2012] and the triangular kernel (Fan and Gijbels [1992]).[19] Panel A of table 6 reports the results for ex post cost stickiness. The coefficient estimate on *Unionization* is positive and significant at the 1% level. Specifically, during the four-year window post the election, firms where union elections pass have a cost stickiness measure that is 0.622

[18] Alternative choices of bin widths do not change our results qualitatively.

[19] To check the robustness of our findings, we also adopt a rectangular kernel (no weighting) in local linear estimation and obtain qualitatively similar results (see table A6 of the online appendix).

Panel A: *Ex post CostStickiness*



Panel B: Average *DPS*

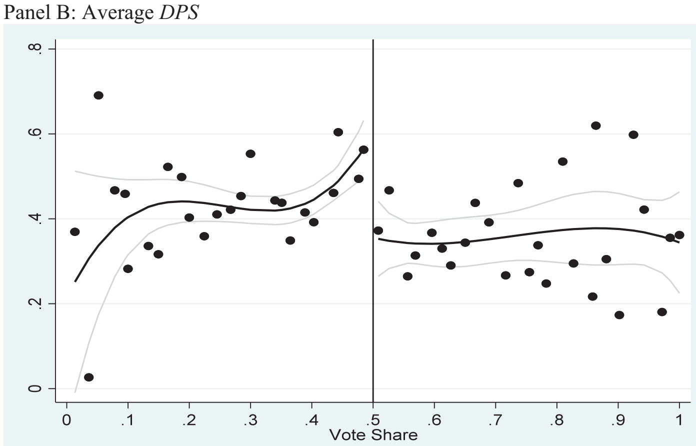


FIG. 1.—Regression discontinuity plots for ex post cost stickiness and dividend payouts. This figure presents regression discontinuity plots using a fitted cubic polynomial estimated with a 90% confidence interval around the fitted value. The horizontal axis is union vote share (i.e., the percentage of votes in an election in favor of unionization). The dots depict the ex post *CostStickiness* or average *DPS* over the four-year period after the union elections in each of the 50 equally spaced bins (with a bin width of 2%).

higher than those firms where the attempt to unionize fails, which is economically sizable relative to the standard deviation of this variable for the RD sample (i.e., 1.634).

We repeat the preceding local RD analysis for the average dividend payouts during the four-year window after the union election. Panel B of table 6 reports the results. The coefficient estimate on *Unionization* is negative and significant at the 5% level, indicating a negative effect of labor adjustment costs on dividend payouts. In terms of economic magnitude,

TABLE 6

Regression Discontinuity Analysis on Ex Post Cost Stickiness and Dividend Payouts

Panel A: Cost stickiness after the election	
Dependent Variable	*CostStickiness*
Unionization	0.622***
	(3.002)
Observations	1,825
Bandwidth	±0.178
Panel B: Dividends per share after the election	
Dependent Variable	*Average DPS*
Unionization	−0.185**
	(−2.182)
Observations	2,264
Bandwidth	±0.172

This table presents the results of nonparametric local linear regression using the optimal bandwidth following Imbens and Kalyanaraman [2012] and the triangular kernel. Panels A and B report the results for firms' ex post cost stickiness and average dividends per share after union elections, respectively. Cost stickiness is calculated using the 16 quarterly observations after the closing year of the union election (year $t+1$ to year $t+4$). Average dividends per share (*DPS*) are measured as the average of *DPS* over the same four-year window subsequent to the union election. *Unionization* is a dummy variable that equals 1 if a majority of employees voted for unionization in a given election and 0 if a majority of employees voted against unionization in a given election. The *z*-statistics are presented in parentheses below the coefficients. The optimal bandwidth following Imbens and Kalyanaraman [2012] is presented at the bottom of each panel. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

the coefficient estimate (−0.185) suggests that during the four-year window post the elections, firms whose union elections pass pay about 44.3% lower annual dividends per share (relative to the sample mean of 0.418) than those whose union elections fail.

5.2 MEDIATION ANALYSIS BASED ON PREDICTED DIVIDEND PAYOUTS

To tighten the link between cost stickiness and dividend payouts in our RD design, we conduct a two-step mediation analysis in this section. First, we regress a firm's average post-election dividend payouts (over year $t+1$ to year $t+4$, with year t being the closing year of the union election) on its degree of cost stickiness over the same window. Then, we decompose the average dividend payouts into two components: a predicted component based on the firm's cost behavior (i.e., the fitted value of the dividend payouts from the above regression) and a residual component that is orthogonal to its cost behavior (i.e., the residual value of the dividend payouts from the above regression). To facilitate comparison of their relative magnitudes, we standardize these two components to have a mean of zero and a standard deviation of one.

Second, we repeat our nonparametric local linear regressions for these two components of a firm's average post-election dividend payouts. The results reported in table 7 show that unionization has a significant negative effect on a firm's dividend payouts that are explained by its cost behavior

TABLE 7

Regression Discontinuity Analysis on Predicted Dividend Payouts

Dependent Variable	*Predicted Average DPS*	*Residual Average DPS*
Unionization	–0337**	–0154
	(–2326)	(–0869)
Observations	1,648	1,648
Bandwidth	±0164	±0142

This table presents the results of nonparametric local linear regression discontinuity analysis for the *predicted* and *residual* post-election average dividend payouts over year $t+1$ to year $t+4$ (with year t being the closing year of the union election) using the optimal bandwidth following Imbens and Kalyanaraman [2012] and the triangular kernel. The *predicted* and *residual* average dividends per share are calculated from a simple OLS model that regresses average post-election dividends per share on the cost stickiness measure computed over the same window (i.e., from year $t+1$ to year $t+4$). Both dependent variables are standardized to have a mean of zero and a standard deviation of one. *Unionization* is a dummy variable that equals 1 if a majority of employees voted for unionization in a given election and 0 if a majority of employees voted against unionization in a given election. The z-statistics are presented in parentheses below the coefficients. The optimal bandwidth following Imbens and Kalyanaraman [2012] is presented at the bottom. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

(i.e., the predicted average dividend payouts). This result tightens the link between cost stickiness and dividend payouts in our RD design.

It is worth emphasizing that we do not claim that cost stickiness is the only or the most important channel through which unionization affects corporate policies. However, our results highlight the economic significance of this channel, which has been largely ignored in the prior literature on labor unions (e.g., Ruback and Zimmerman [1984], DiNardo and Lee [2004], Lee and Mas [2012], Bradley, Kim, and Tian [2017], Cheng [2017], Campello et al. [2018]).[20]

5.3 SUBSAMPLE ANALYSIS

In this section, we perform a subsample analysis in the RD setting to examine whether the effect of unionization on dividend payouts is concentrated in firms in which unionization can significantly influence cost behavior.

We predict that the negative effect of unionization on dividend payouts is concentrated in firms with a higher ex ante degree of cost stickiness. Firms whose costs are already sticky to begin with would face a greater cash flow risk after the enhanced labor power makes the costs even stickier, and they would thus commit to paying out less. To test this prediction, we first calculate, for each union election, the ex ante cost stickiness level by using the most recent 16 quarterly observations up to the election year. We then

[20] Our results are unlikely to be driven by higher wages after unionization: DiNardo and Lee [2004] find that the impact of unionization on wages is close to zero. Our results that unionization increases cost stickiness suggest that workers are less likely to get laid off (but are not necessarily paid more) after unionization. Our results are also unlikely to be driven by the possibility that firms commit to a lower level of dividend payouts to demonstrate their need for union concessions (DeAngelo and DeAngelo [1990, 1991]): in their thorough literature review, DeAngelo, DeAngelo, and Skinner [2008] conclude that this managerial signaling motive has at best a minor influence on payout policy.

TABLE 8
Subsample RD Analysis Based on Ex Ante Cost Stickiness

Dependent Variable	*Average DPS*	
	(1)	(2)
	High Ex Ante Cost Stickiness	Low Ex Ante Cost Stickiness
Unionization	–0.385**	–0.029
	(–2.197)	(–0.285)
Observations	838	836
Bandwidth	±0.154	±0.182

This table presents the results of regression discontinuity analysis on post-election average dividend payouts for subsamples partitioned by ex ante cost stickiness. The dependent variable is the average dividend payouts over year $t + 1$ to year $t + 4$ (with year t being the closing year of the union election). Ex ante cost stickiness is calculated using the most recent 16 quarterly observations up to the election year. We split the sample into two subsamples based on the median ex ante cost stickiness. Column 1 (2) reports the result of nonparametric local linear regression for firms with higher-than-median (lower-than-median) ex ante cost stickiness using the optimal bandwidth following Imbens and Kalyanaraman [2012] and the triangular kernel. *Unionization* is a dummy variable that equals 1 if a majority of employees voted for unionization in a given election and 0 if a majority of employees voted against unionization in a given election. The z-statistics are presented in parentheses below the coefficients. The optimal bandwidth following Imbens and Kalyanaraman [2012] is presented at the bottom. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

split the sample into two halves based on the sample median of ex ante cost stickiness and carry out our RD analysis for each subsample. We report the estimation results in table 8.

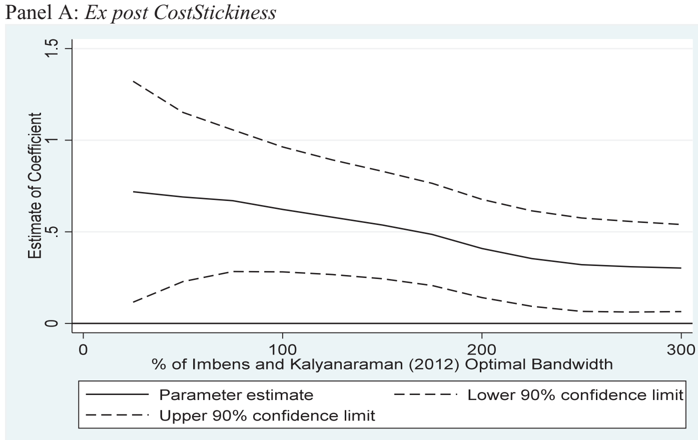
Consistent with our prediction, the coefficient estimate on *Unionization* is negative and significant in column 1 (i.e., for firms with high ex ante cost stickiness), suggesting that the negative effect of labor adjustment costs on dividend payouts is concentrated in firms with a high ex ante degree of cost stickiness. On the contrary, the RD estimate in column 2 (i.e., for firms with low ex ante cost stickiness) is smaller in magnitude than that in column 1 and statistically insignificant. This may be because firms with an ex ante low level of cost stickiness have flexible operations to begin with; thus enhanced labor power has no material effect on their cash flow risk, so they have less need to keep a lower dividend payout. A formal test using a local parametric model shows that the difference in the coefficient estimates on *Unionization* between the two subsamples is statistically significant at the 1% level.

Together, the results based on the RD analysis provide evidence that firms pay out lower dividends in the presence of higher resource adjustment costs and stickier costs.

5.4 ROBUSTNESS CHECKS

In this section, we discuss the results of robustness checks in the RD setting. First, we check whether our local linear regression estimates are sensitive to the choice of bandwidths, which involves a classical trade-off between bias and precision. On the one hand, a wider bandwidth makes use of more observations within the local neighborhood of the cutoff and thus yields more precise estimates. On the other hand, a wider bandwidth could introduce more noise and bias into the estimation because the use of

Panel A: *Ex post CostStickiness*



Panel B: Average *DPS*

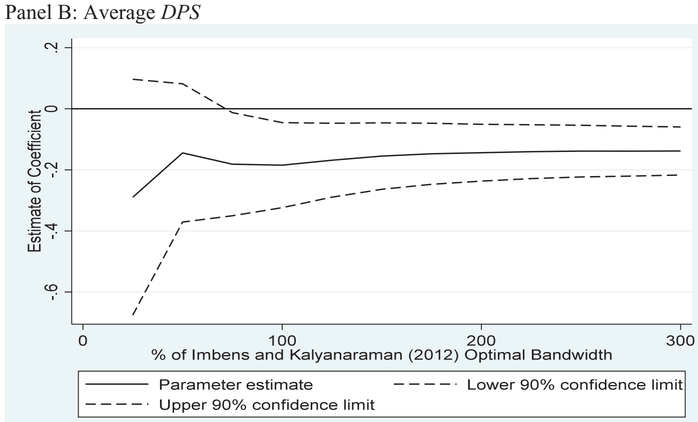


FIG. 2.—Alternative RD bandwidths. This figure plots the estimated local RD coefficients along with their 90% confidence intervals (on the vertical axis) against alternative values of bandwidths (on the horizontal axis). A value of 100 on the horizontal axis represents the optimal bandwidth suggested by Imbens and Kalyanaraman [2012]. A value of 200 means 200% of (i.e., two times) the optimal bandwidth, and so forth. The dependent variables in the two panels are ex post *CostStickiness* and average *DPS* over the four-year period after the union elections, respectively.

more "nonlocal" observations away from the cutoff can make the linear approximation inaccurate. The converse is true for a narrower bandwidth. To address the concern that our main local RD results in table 6 are driven by the bandwidth we have chosen, we plot the estimated local RD coefficients along with their 90% confidence intervals (on the vertical axis) as a function of the chosen bandwidth (on the horizontal axis) in figure 2. A value of 100 on the horizontal axis represents the optimal bandwidth suggested by Imbens and Kalyanaraman [2012]. A value of 200 means 200% of (i.e., two times) the optimal bandwidth, 300 means 300%, and so forth. Panel

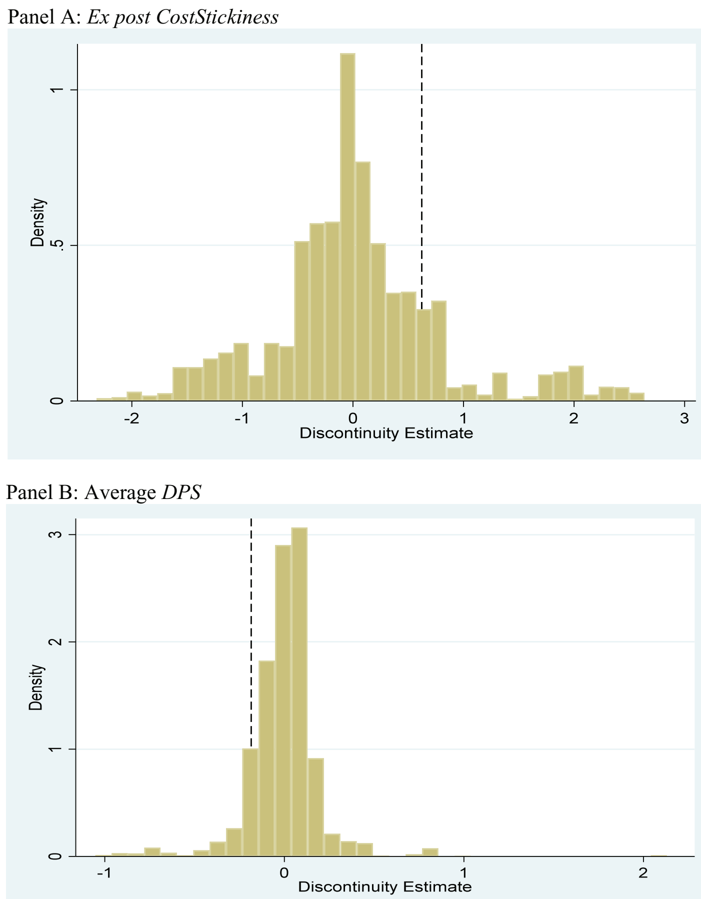


FIG. 3.—Placebo tests. This figure plots a histogram of the distribution of the local RD estimates from 5,000 placebo tests. The horizontal axis represents the RD estimates from the placebo tests that artificially select an alternative threshold other than 50%. The dashed vertical line represents the RD estimate at the true 50% threshold. The vertical axes in the two panels are the densities of the estimated coefficients for ex post *CostStickiness* and average *DPS* over the four-year period after the union elections, respectively.

A plots ex post cost stickiness, and panel B plots the ex post average *DPS*. The local RD estimates are almost always positive (negative) and stable for cost stickiness (dividend payouts) over the whole spectrum of bandwidth choices. These results show that our local linear RD estimates are unlikely to be driven by any specific choice of bandwidth.

Second, if our RD estimation truly reflects a positive (negative) effect of labor adjustment costs on cost stickiness (dividend payouts), we should not observe a similar effect if we artificially assume a threshold other than 50% that determines union election outcomes. Hence, we run placebo tests to check whether we still observe discontinuity in cost stickiness or dividend payouts at randomly selected thresholds that differ from the true 50% threshold. We run this placebo test 5,000 times and plot a histogram of the distribution of the corresponding local RD estimates in figure 3. The vertical dashed line stands for the value of the local RD estimate obtained using the true cutoff point of 50%. Both histograms in figure 3 are approximately centered on 0, suggesting that the positive (negative) effect of labor adjustment costs on cost stickiness (dividend payouts) is absent if we artificially pick a cutoff point other than 50%. This placebo analysis enhances our confidence in the RD procedure and the resulting estimates, because it rules out chance as an explanation for our main findings in the previous sections.

Third, we examine alternative firm-specific measures of cost stickiness and dividend payouts as in tables 4 and 5 using the local RD analysis. The analysis (contained in table A7 of the online appendix) shows that our main RD results continue to hold in these robustness tests.

6. Conclusion

We show that asymmetric cost behavior is an important determinant of a firm's dividend policy. We find that firms with stickier costs pay out lower dividends than firms with less sticky costs. Further, we use an RD design that exploits variation in labor adjustment costs generated by close-call union elections. We show that unionization has a significantly negative effect on a firm's dividend payouts that are explained by its cost behavior and that the negative effect of unionization on dividend payouts is concentrated in firms with a high ex ante degree of cost stickiness.

Our findings are inconsistent with static dividend signaling models in which a firm's budget constraints (e.g., current earnings or free cash flows) are a sufficient statistic for its dividend payouts. Instead, our findings build on the natural link between a firm's asymmetric cost behavior, a feature of the production process, and the well-documented asymmetric dividend policy. Given that investors are particularly averse to dividend cuts, a firm's current dividend payouts depend not only on the firm's budget constraints, but also on the expectation about its ability to maintain the same level of payouts in the future when facing negative shocks. Our findings suggest that it is important to consider a firm's cost behavior beyond traditional budget constraints in understanding corporate dividend policy in a multiperiod setting.

APPENDIX

Definition of Variables

Variable	Definition
Measures of cost stickiness and dividend payouts	
CostStickiness	To calculate cost stickiness for a firm in year *t*, we first estimate the following empirical model using the most recent 16 quarters of data (year $t-3$ to year *t*): $\Delta LnSG\&A = \beta_0 + \beta_1 \times \Delta LnSales + \beta_2 \times Decrease \times \Delta LnSales + \mu$, where $\Delta LnSG\&A$ is the log-change in quarterly selling, general, and administrative expenses (i.e., costs), $\Delta LnSales$ is the log-change in quarterly sales, and *Decrease* is a dummy variable that equals 1 if $\Delta LnSales$ is less than zero, and 0 otherwise. *CostStickiness* is defined as the negative of β_2.
CostStickiness (*Industry*)	It is defined similarly to *CostStickiness* but estimated by running the above regression at the (three-digit SIC) industry-year level with quarterly data.
CostStickiness (*OperatingCost*)	It is defined similarly to *CostStickiness* but uses operating costs (measured as the difference between sales (*salesq*) and operating income after depreciation (*oiadpq*)) as the cost measure.
CostStickiness (*TotalCost*)	It is defined similarly to *CostStickiness* but uses total costs (measured as the sum of costs of goods sold (*cogsq*) and the selling, general and administrative expenses (*xsgaq*)) as the cost measure.
DPS	Annual split-adjusted dividends per share (*dvpsx_f/ajex*).
Div/Assets (%)	Common dividends (*dvc*) divided by book value of total assets (*at*) multiplied by 100 (i.e., in percentage points).
Div/MV (%)	Common dividends (*dvc*) divided by market value of equity ($prcc\_f \times csho$) multiplied by 100 (i.e., in percentage points).
Div/Sales (%)	Common dividends (*dvc*) divided by sales (*sale*) multiplied by 100 (i.e., in percentage points).
Div/Income (%)	Common dividends (*dvc*) divided by income before extraordinary items (*ibcom*) multiplied by 100 (i.e., in percentage points). Observations with negative *ibcom* but positive *dvc* are dropped.
LnDiv	The natural logarithm of one plus common dividends (*dvc*).
Determinants of cost stickiness	
AINT	Asset intensity, defined as the natural logarithm of the ratio of assets (*at*) to sales (*sale*).
SUCCDEC	A dummy variable that equals 1 if sales growth in year *t* ($sale_t - sale_{t-1}$) and year $t-1$ ($sale_{t-1} - sale_{t-2}$) is negative, and 0 otherwise.
ΔGDP	GDP growth rate in year *t*, defined as $(GDP_t - GDP_{t-1}) / GDP_{t-1}$.
INC	A dummy variable that equals 1 if sales growth in year *t* ($sale_t - sale_{t-1}$) is positive, and 0 otherwise.
FCF	Free cash flows in year *t* divided by assets (*at*). Free cash flows are calculated as net cash flows of operating activities (*oancf*) minus common dividends (*dvc*) minus preferred dividends (*dvp*).
Measures of firm characteristics	
Assets	Book value of total assets (*at*).
Size	The natural logarithm of book value of total assets (*at*).
Leverage	Leverage ratio, defined as book value of long-term debt (*dltt*) divided by book value of total assets (*at*).
TobinQ	Tobin's *Q*, defined as market value of equity ($prcc\_f \times csho$) plus book value of assets (*at*) minus book value of equity (*ceq*) minus deferred taxes (*txdb*) divided by book value of total assets (*at*).

(Continued)

APPENDIX—*Continued*

Variable	Definition
Cash	Cash holdings to assets ratio, defined as cash and short-term investments (*che*) divided by book value of total assets (*at*).
Tangibility	Tangible assets ratio, defined as net property, plant and equipment (*ppent*) divided by book value of total assets (*at*).
ROA	Return on assets, defined as earnings ($ib + 0.6 \times xint - 0.6 \times idit$) divided by lagged total assets (*at*).
NegSI	Special items (*spi*) deflated by lagged total assets (*at*), multiplied by negative one.
Loss	An indicator variable that is set to 1 if earnings ($ib + 0.6 \times xint - 0.6 \times idit$) are less than zero.
Persistence	The regression coefficient of current earnings ($ib + 0.6 \times xint - 0.6 \times idit$) on lagged earnings for each firm-year using the most recent 16 years of annual data with at least four nonmissing observations.
ROAVol	The standard deviation of *ROA* over the most recent four years (year $t-3$ to year t).

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